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**Third Generation Partnership Project (3GPP™)**

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Contents:

1 Opening of the meeting 12

2 Meeting agenda, arrangement and meeting report 12

3 Incoming LS 12

4 Up to Rel-16 maintenance for LTE and NR 18

4.1 UE RF requirements 18

4.2 BS RF requirements and BS conformance testing 42

4.3 UE/BS EMC requirements 57

4.4 RRM requirements 62

4.5 Demodulation and CSI requirements 79

4.6 OTA and TRP/TRS test aspects 85

4.7 Rel-15/16 TEI 85

4.8 Moderator summary and conclusions (for Agenda 4) 86

5 Rel-17 maintenance for LTE and NR 86

5.1 Rel-17 spectrum related WI maintenance 86

5.1.1 Bands introduced in Rel-17 and related requirements 86

5.1.2 NR/LTE/MR-DC basket WIs 88

5.1.3 Others 91

5.2 Rel-17 non-spectrum related WI maintenance 92

5.2.1 UE RF requirements 92

5.2.2 BS RF requirements and BS conformance testing 97

5.2.3 RRM requirements 103

5.2.4 Demodulation and CSI requirements 129

5.2.5 OTA and TRP/TRS test aspects 132

5.3 Rel-17 TEI 133

5.4 Moderator summary and conclusions (for Agenda 5) 134

6 Rel-18 maintenance for LTE and NR 135

6.1 Rel-18 spectrum related WI maintenance 135

6.1.1 Introduction of 900 MHz LTE Band in the US 135

6.1.2 Introduction of evolved shared spectrum bands 136

6.1.3 30 MHz Channel Bandwidth for NR NTN in FR1 137

6.1.4 New bands and BW allocation for 5G terrestrial broadcast - part 2 137

6.1.5 Other WIs related to bands introduced in Rel-18 139

6.2 Rel-18 non-spectrum related WI maintenance 140

6.2.1 UE RF requirements 140

6.2.2 BS RF requirements 140

6.2.3 RRM requirements 140

6.2.4 Other dedicated Rel-18 Wis 140

6.2.4.1 NB-IoT/eMTC core & perf. requirements for NTN 140

6.2.4.1.1 SAN RF requirement and conformance testing 140

6.2.4.1.2 UE RF requirement 140

6.2.4.1.3 RRM requirement 141

6.2.4.1.4 Demodulation requirements 143

6.2.4.2 In-Device Co-existence (IDC) enhancements for NR and MR-DC 145

6.3 Rel-18 TEI 145

6.4 Moderator summary and conclusions 146

7 Rel-18 on-going spectrum related WIs for NR 147

7.1 Issues arising from basket WIs but not subject to block approval 147

7.1.1 UE RF requirements 147

7.1.1.1 Band combinations with UL configurations including intra-band ULCA with IMD or triple beat issues 147

7.1.1.2 Others 149

7.1.2 Moderator summary and conclusions 150

7.2 Moderator summary and conclusions (for basket WI AI 7.3 to AI 7.26) 150

7.3 Rel-18 Dual Connectivity (DC) of 1 band LTE (1DL/1UL) and 1 NR band (1DL/1UL) 152

7.3.1 Rapporteur input (WID/TR/big CR) 152

7.3.2 UE RF requirements without FR2 band 152

7.3.3 UE RF requirements with FR2 band 153

7.4 Rel-18 Dual Connectivity (DC) of 2 bands LTE inter-band CA (2DL/1UL) and 1 NR band (1DL/1UL) 153

7.4.1 Rapporteur input (WID/TR/big CR) 153

7.4.2 UE RF requirements without FR2 band 153

7.4.3 UE RF requirements with FR2 band 155

7.5 Rel-18 WID on DC of x bands LTE inter-band CA (x=3,4,5) and 1 NR band 155

7.5.1 Rapporteur input (WID/TR/big CR) 155

7.5.2 UE RF requirements without FR2 band 156

7.5.3 UE RF requirements with FR2 band 158

7.6 Rel-18 WID: DC of x bands (x=1,2,3,4) LTE inter-band CA (xDL/1UL) and 2 bands NR inter-band CA (2DL/1UL) 158

7.6.1 Rapporteur input (WID/TR/big CR) 158

7.6.2 UE RF requirements without FR2 band 159

7.6.3 UE RF requirements with FR2 band 161

7.7 Rel-18 Dual Connectivity (DC) of x bands (x=1,2,3) LTE inter-band CA (xDL/1UL) and y bands NR inter-band CA (yDL/1UL) 162

7.7.1 Rapporteur input (WID/TR/big CR) 162

7.7.2 UE RF requirements without FR2 band 162

7.7.3 UE RF requirements with FR2 band 162

7.8 Rel-18 WID: DC of x LTE bands and y NR bands with z bands DL and 3 bands UL (x=1, 2, 3, 4, y=1, 2; 3<=z<=6) 163

7.8.1 Rapporteur input (WID/TR/big CR) 163

7.8.2 UE RF requirements without FR2 band 163

7.8.3 UE RF requirements with FR2 band 163

7.9 Rel-18 NR intra band Carrier Aggregation for xCC DL/yCC UL including contiguous and non-contiguous spectrum (x>=y) 163

7.9.1 Rapporteur input (WID/TR/big CR) 163

7.9.2 UE RF requirements for FR1 (resubmitted CR) 164

7.9.3 UE RF requirements for FR2 164

7.10 Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for 2 bands DL with x bands UL (x=1,2) 165

7.10.1 Rapporteur input (WID/TR/big CR) 165

7.10.2 UE RF requirements without FR2 band 166

7.10.3 UE RF requirements with FR2 band 169

7.11 Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for 3 bands DL with x bands UL (x=1,2) 170

7.11.1 Rapporteur input (WID/TR/big CR) 170

7.11.2 UE RF requirements without FR2 band 171

7.11.3 UE RF requirements with FR2 band 175

7.12 Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for y bands DL with x bands UL (y=4,5,6, x=1,2) 176

7.12.1 Rapporteur input (WID/TR/big CR) 176

7.12.2 UE RF requirements without FR2 band 177

7.12.3 UE RF requirements with FR2 band 179

7.13 Rel-18 Band combinations for SA NR supplementary uplink (SUL), NSA NR SUL, NSA NR SUL with UL sharing from the UE perspective (ULSUP) 179

7.13.1 Rapporteur input (WID/TR/big CR) 179

7.13.2 UE RF requirements 180

7.14 NR CA band combinations with two SUL cells in Rel-18 180

7.14.1 Rapporteur input (WID/TR/big CR) 180

7.14.2 UE RF requirements 180

7.15 Rel-18 band combinations for concurrent operation of NR/LTE Uu bands/band combinations and one NR/LTE V2X PC5 band 180

7.15.1 Rapporteur input (WID/TR/big CR) 180

7.15.2 UE RF requirements (resubmitted CR) 181

7.16 High-power UE operation for fixed-wireless/vehicle-mounted use cases in LTE bands and NR bands 181

7.16.1 Rapporteur input (WID/TR/big CR) 181

7.16.2 UE RF requirements 181

7.17 High power for FR1 for DC\_R18\_xBLTE\_yBNR\_zDLnUL with power class PC2 and PC1.5 182

7.17.1 Rapporteur input (WID/TR/big CR) 182

7.17.2 UE RF requirements 183

7.18 High power UE for FR1 for NR\_CA\_R18\_intra with power class 2 and 1.5 on TDD band(s) 184

7.18.1 Rapporteur input (WID/TR/big CR) 184

7.18.2 UE RF requirements with PC2 and PC1.5 184

7.19 High power UE (power class 1.5) for NR TDD bands 184

7.19.1 Rapporteur input (WID/TR/big CR) 184

7.19.2 UE RF requirements 184

7.20 High power UE for FR1 NR inter-band CA/DC or SUL band combination with y DL-x UL and PCm (m<3) and high power on TDD 184

7.20.1 Rapporteur input (WID/TR/big CR) 184

7.20.2 UE RF requirements with PC2 and PC1.5 185

7.21 High power UE for FR1 for inter-band NR\_CADC\_R18\_yBDL\_xBUL with power class 2 on single carrier uplink on FDD band 188

7.21.1 Rapporteur input (WID/TR/big CR) 188

7.21.2 UE RF requirements 189

7.22 High power UE for FR1 for FDD single band(s) with PC2 189

7.22.1 Rapporteur input (WID/TR/big CR) 189

7.22.2 UE RF requirements (resubmitted CR) 189

7.23 Rel-18 downlink interruption for NR and EN-DC band combinations at dynamic Tx switching 191

7.23.1 Rapporteur input (WID/TR/big CR) 191

7.23.2 UE RF requirements 192

7.24 Additional NR bands for UL-MIMO in Rel-18 192

7.24.1 Rapporteur input (WID/TR/big CR) 192

7.24.2 UE RF requirements 192

7.25 Adding new NR FDD bands for RedCap in Rel-18 192

7.25.1 Rapporteur input(WID/TR/big CR) 192

7.25.2 UE RF requirements 192

7.26 Adding new channel bandwidth(s) support to existing NR bands 193

7.26.1 Rapporteur input (WID/TR/big CR) 193

7.26.2 UE RF requirements 193

7.26.3 BS RF requirements 194

7.27 Simultaneous Rx/Tx inter-band combinations for NR CA/DC, NR SUL and LTE/NR DC in Rel-18 194

7.27.1 Rapporteur input (WID/TR/big CR) 195

7.27.2 Identification of simultaneous Rx/Tx capability for band combinations and UE RF requirements 195

7.28 4Rx support for NR FR1 bands (<2.6GHz) in Rel-18 196

7.28.1 Rapporteur input (WID/TR/big CR) 196

7.28.2 UE RF requirements 196

7.29 3Tx NR inter-band UL Carrier Aggregation (CA) and EN-DC 196

7.29.1 Rapporteur input (WID/TR/big CR) 196

7.29.2 UE RF requirements with PC2 and PC1.5 196

7.30 Enhancement for 700/800/900MHz band combinations 198

7.30.1 Rapporteur input (Big CR/resubmitted CR) 198

7.30.2 UE RF requirements and related transmission schemes 198

7.30.2.1 CA configuration of CA\_n5-n8 198

7.30.2.2 CA configuration of CA\_n5-n105 and CA\_n5-n28-n105 198

7.30.2.3 CA configuration of CA\_n28-n105 199

7.30.2.4 CA configuration of CA\_n26-n28 199

7.30.2.5 CA configuration of CA\_n26(2A) 199

7.30.2.6 Other configurations 200

7.30.3 Release independency 200

7.30.4 Moderator summary and conclusions 200

7.31 Introduction of the satellite L-/S-band 201

7.31.1 General aspects and Rapporteur input (WID/TR/big CR) 201

7.31.2 UE RF requirements 201

7.31.3 SAN RF requirements 202

7.31.4 RRM requirements 203

7.31.5 Moderator summary and conclusions 203

7.32 New FDD Bands using the uplink from n28 and the downlink of n75 and n76 203

7.32.1 UE RF requirements 204

7.32.2 BS RF requirements 204

7.32.3 RRM requirements 206

7.32.4 Moderator summary and conclusions 206

7.33 Introduction of 900 MHz NR Band in the US 206

7.33.1 UE RF requirements 206

7.33.2 BS RF requirements (resubmitted CR) 207

7.33.3 RRM requirements 209

7.33.4 Moderator summary and conclusions 209

7.34 Introduction of NR bands n31 and n72 209

7.34.1 General aspects 209

7.34.2 Band definition and co-existence 210

7.34.3 UE RF requirements (resubmitted CR) 210

7.34.4 BS RF requirements and conformance testing (resubmitted CR) 210

7.34.5 RRM core and performance requirements 213

7.34.6 Moderator summary and conclusions 213

8 Rel-18 on-going non-spectrum related work items and study items for NR 213

8.1 Study on simplification of band combination specification for NR and LTE 213

8.1.1 General aspects (TR) 213

8.1.2 Simplification of working procedure 213

8.1.3 Simplification of specification and reduction of test burden 214

8.1.4 Moderator summary and conclusions 216

8.2 Study on NR FR2 OTA testing enhancements 216

8.2.1 General aspects 216

8.2.2 Test methods for RF requirements 217

8.2.3 Test methods for RRM requirements 218

8.2.4 Test methods for Demodulation requirements 219

8.2.5 Test uncertainty assessments 219

8.2.6 Moderator summary and conclusions 219

8.3 Further RF requirements enhancement for NR and EN-DC in FR1 220

8.3.1 UE RF requirements 220

8.3.1.1 General aspects (TR/big CR) 220

8.3.1.2 4Tx UE RF requirements 220

8.3.1.3 8Rx UE RF requirements (resubmitted CR) 222

8.3.1.4 Lower MSD for inter-band CA/EN-DC/DC combinations 224

8.3.1.4.1 Study of approach for UE indication and signaling design 225

8.3.1.4.2 UE RF requirements for lower MSD 227

8.3.2 RRM performance requirements 227

8.3.2.1 RLM test cases to support 8Rx 227

8.3.3 Demodulation and CSI requirements 227

8.3.3.1 8Rx UE demodulation and CSI 227

8.3.3.1.1 General aspects 228

8.3.3.1.2 PDSCH requirements 228

8.3.3.1.3 SDR requirements 232

8.3.3.1.4 CQI reporting requirements 232

8.3.3.2 4Tx BS demodulation 233

8.3.4 Moderator summary and conclusions 234

8.4 NR Channel raster enhancement 235

8.4.1 UE and BS channel raster 235

8.4.1.1 Channel raster for TN 235

8.4.1.2 Channel raster for NTN 236

8.4.2 UE capability 236

8.4.3 Moderator summary and conclusions 237

8.5 Low NR band 4Rx for handheld UE and 3Tx for inter-band UL CA and EN-DC 237

8.5.1 Enhancements for 4Rx at low frequency band (<1GHz) 237

8.5.2 Enhancements of 3Tx for band combinations with two bands 237

8.5.2.1 Tx requirements for band combinations with 3Tx (big CR/resubmitted CR) 237

8.5.2.2 Rx requirements for band combinations with 3Tx (big CR/resubmitted CR) 238

8.5.3 Moderator summary and conclusions 238

8.6 NR RF requirements enhancement for FR2, Phase 3 238

8.6.1 General aspects (TR/big CR) 238

8.6.2 UL 256QAM (resubmitted CR) 238

8.6.3 Beam correspondence requirements for RRC\_INACTIVE and initial access 241

8.6.3.1 Beam correspondence requirement applicability 241

8.6.3.2 UE beam type and DRX implications 243

8.6.3.3 Beam correspondence test issues 243

8.6.4 BS demodulation requirements 243

8.6.4.1 UL 256QAM performance requirements 243

8.6.5 Moderator summary and conclusions 246

8.7 Requirement for NR FR2 multi-Rx chain DL reception 246

8.7.1 UE RF requirements for simultaneous DL reception with up to 4 layer MIMO 246

8.7.1.1 General aspects (TR/Big CR) 246

8.7.1.2 UE RF requirements 247

8.7.2 RRM core requirements for simultaneous DL reception from different directions 248

8.7.2.1 General aspects 249

8.7.2.2 L1-RSRP measurement delay 250

8.7.2.3 RLM and BFD/CBD requirements 252

8.7.2.4 Scheduling/measurement restrictions 253

8.7.2.5 TCI state switching delay with dual TCI 254

8.7.2.6 Receive timing difference between different directions 256

8.7.3 RRM performance requirements 257

8.7.4 Demodulation performance and CSI requirements 257

8.7.4.1 General aspects 258

8.7.4.2 PDSCH requirements 259

8.7.4.3 PMI reporting requirements 261

8.7.5 Moderator summary and conclusions 262

8.8 Even Further RRM enhancement for NR and MR-DC 263

8.8.1 General aspects 263

8.8.2 RRM core requirements for FR2 SCell activation delay reduction 263

8.8.2.1 Enhancement for FR2 SCell activation 263

8.8.2.2 Other enhancements for FR2 SCell activation 265

8.8.3 RRM core requirements for FR1-FR1 NR-DC 266

8.8.4 RRM performance requirements for FR2 SCell activation delay reduction 267

8.8.5 RRM performance requirements for FR1-FR1 NR DC 269

8.8.6 Moderator summary and conclusions 269

8.9 Further enhancements on NR and MR-DC measurement gaps and measurements without gaps 270

8.9.1 General aspects 270

8.9.2 RRM core requirements for pre-configured MGs, multiple concurrent MGs and NCSG 271

8.9.2.1 Scope and general issues 271

8.9.2.2 Case 1 requirements (Pre-configured MG and concurrent MG) 271

8.9.2.3 Case 2 requirements (NCSG and concurrent MG) 273

8.9.3 RRM core requirements for measurements without gaps 275

8.9.3.1 Measurement without gaps for UEs reporting NeedForGapsInfoNR 275

8.9.3.2 Inter-RAT measurement without gap 277

8.9.4 RRM performance requirements for pre-configured MGs, multiple concurrent MGs and NCSG 280

8.9.5 RRM performance requirements for measurements without gaps 281

8.9.6 Moderator summary and conclusions 282

8.10 Completion of specification support for bandwidth part operation without restriction in NR 282

8.10.1 General aspects 283

8.10.2 RRM core requirements 284

8.10.3 Moderator summary and conclusions 286

8.11 Support of intra-band non-collocated EN-DC/NR-CA deployment 286

8.11.1 UE RF architecture and RF requirements 286

8.11.2 RRM Core requirement 287

8.11.3 RRM performance requirements 288

8.11.4 Demodulation performance requirements 289

8.11.5 Moderator summary and conclusions 291

8.12 Enhanced NR support for high speed train scenario in frequency range 2 292

8.12.1 RRM core requirement maintenance 292

8.12.1.1 Simultaneous multi-panel operation for train roof-mounted FR2 high power devices 292

8.12.1.2 Intra-band carrier aggregation (CA) scenario 293

8.12.1.3 UL timing adjustment solutions 294

8.12.1.4 RRM aspects for tunnel deployment scenario 295

8.12.1.5 Others 295

8.12.2 RRM performance requirements 296

8.12.3 Demodulation performance requirements 296

8.12.3.1 General and channel modelling 296

8.12.3.2 PDSCH requirements with CA 297

8.12.3.3 PDSCH requirements with multi-Rx Chain DL reception 298

8.12.3.4 Demodulation aspects for tunnel deployment scenario 299

8.12.4 Moderator summary and conclusions 299

8.13 Air-to-ground network for NR 300

8.13.1 General aspects (TR/big CR) 300

8.13.2 FR1 co-existence evaluation for ATG network 300

8.13.2.1 Co-existence scenario and network layout 300

8.13.2.2 Co-existence system parameters and modeling 301

8.13.2.3 Co-existence simulation results 301

8.13.3 UE RF requirements 301

8.13.3.1 Tx requirements 302

8.13.3.2 Rx requirements 302

8.13.3.3 Others 303

8.13.4 BS RF requirements 303

8.13.5 BS RF conformance testing requirements 304

8.13.6 RRM core requirements 305

8.13.6.1 General aspects 305

8.13.6.2 Mobility requirements 305

8.13.6.3 Timing adjustments 305

8.13.6.4 Signaling characteristics 305

8.13.6.5 Measurement requirements 305

8.13.7 RRM performance requirements 306

8.13.8 Demodulation performance requirements 307

8.13.8.1 General aspects 307

8.13.8.2 UE demodulation performance and CSI requirements 307

8.13.8.3 BS demodulation performance requirements 309

8.13.9 Moderator summary and conclusions 310

8.14 NR support for dedicated spectrum less than 5MHz for FR1 311

8.14.1 System parameter maintenance (resubmitted CR) 311

8.14.2 UE RF requirement maintenance (resubmitted CR) 312

8.14.3 BS RF requirement maintenance (resubmitted CR) 313

8.14.4 RRM core requirement 315

8.14.5 RRM performance requirements 317

8.14.6 Demodulation performance requirements 318

8.14.6.1 UE demodulation performance and CSI requirements 318

8.14.6.2 BS demodulation performance requirements 319

8.14.7 Moderator summary and conclusions 321

8.15 Enhancement of TRP and TRS requirements and test methodologies 321

8.15.1 General aspects 322

8.15.2 Enhancement of test methodology 322

8.15.2.1 Anechoic chamber test methodology 322

8.15.2.2 Reverberation chamber test methodology 324

8.15.2.3 MU assessment 325

8.15.2.4 Testing time reduction 325

8.15.3 Performance requirements 326

8.15.4 Moderator summary and conclusions 327

8.16 Enhancement of Multiple Input Multiple Output Over-the-Air test methodology and requirements for NR UEs 327

8.16.1 General aspects and TR 327

8.16.2 FR2 MIMO OTA test methodology enhancement 328

8.16.3 FR1 MIMO OTA test methodology enhancement 328

8.16.4 MU assessment 330

8.16.5 Performance requirements 330

8.16.6 Moderator summary and conclusions 330

8.17 BS and UE EMC enhancements 331

8.17.1 BS EMC enhancements 331

8.17.2 UE EMC enhancements 332

8.17.3 Moderator summary and conclusions 332

8.18 NR demodulation performance evolution 332

8.18.1 General aspects (TR/big CR) 332

8.18.2 Advanced receiver to cancel inter-user interference for MU-MIMO 333

8.18.2.1 Receiver assumption and NWA signaling 333

8.18.2.2 Test parameters and simulation results 334

8.18.3 Absolute physical layer throughput requirements with link adaptation 335

8.18.4 Moderator summary and conclusions 336

8.19 Study on evolution of NR duplex operation 336

8.19.1 General aspects (TR) 336

8.19.2 Study the feasibility of and impact on RF requirements 336

8.19.2.1 Adjacent channel co-existence evaluation 336

8.19.2.2 Implementation feasibility of SBFD 339

8.19.2.2.1 Feasibility of FR1 BS aspects 339

8.19.2.2.2 Feasibility of FR2 BS aspects 340

8.19.2.2.3 Feasibility of FR1 UE aspects 341

8.19.2.2.4 Feasibility of FR2 UE aspects 341

8.19.2.3 Impacts on BS RF requirements 341

8.19.2.4 Impacts on UE RF requirements 343

8.19.3 Summary of regulatory aspects 343

8.19.4 Moderator summary and conclusions 343

8.20 Study on low-power wake-up signal and receiver for NR 344

8.20.1 General aspects 344

8.20.2 Evaluation of Low power wake-up receiver architectures 344

8.20.3 Evaluation of wake-up signal designs 345

8.20.4 Review of outcome of RAN1 studies related to RRM 345

8.20.5 Moderator summary and conclusions 347

8.21 Study on Artificial Intelligence (AI)/Machine Learning (ML) for NR air interface 347

8.21.1 General aspects (RAN4 part of TR) 347

8.21.2 Specific issues related to use case for AI/ML 349

8.21.3 Interoperability and testability aspect 350

8.21.4 Moderator summary and conclusions 352

8.22 Expanded and improved NR positioning 352

8.22.1 RF requirements 352

8.22.2 RRM core requirements 353

8.22.2.1 General aspects 353

8.22.2.2 SL Positioning 355

8.22.2.3 LPHAP use case 357

8.22.2.4 RedCap Positioning 360

8.22.2.5 PRS/SRS bandwidth aggregation 363

8.22.2.6 Carrier Phase Positioning 365

8.22.3 RRM performance requirements 366

8.22.4 Moderator summary and conclusions 367

8.23 Multi-carrier enhancements for NR 368

8.23.1 General aspects 368

8.23.2 Switching time and other RF aspects up to 3 or 4 bands (resubmitted CR) 368

8.23.2.1 UL Tx switching with single TAG 368

8.23.2.2 UL Tx switching with multiple TAGs 369

8.23.3 RRM core requirements maintenance 370

8.23.3.1 DL interruption for Tx switching across 3/4 bands 370

8.23.4 RRM performance requirements 370

8.23.5 Moderator summary and conclusions 371

8.24 Further NR mobility enhancements 371

8.24.1 General aspects 371

8.24.2 RRM Core requirements 371

8.24.2.1 L1/L2 based inter-cell mobility 371

8.24.2.1.1 General aspects and scenarios 372

8.24.2.1.2 L1-RSRP measurement requirements 373

8.24.2.1.3 L1/L2 inter-cell mobility delay requirements 376

8.24.2.1.4 Others 377

8.24.2.2 NR-DC with selective activation of cell groups via L3 enhancements 379

8.24.2.3 Improvement on SCell/SCG setup delay 380

8.24.2.4 Enhanced CHO configurations 382

8.24.3 RRM performance requirements 382

8.24.4 Moderator summary and conclusions 384

8.25 Dual Tx/Rx Multi-SIM for NR 384

8.25.1 General aspects 384

8.25.2 RRM requirements for Rel-17 MUSIM gaps 384

8.25.2.1 General aspects 385

8.25.2.2 Collisions between gaps and priority rules 386

8.25.2.3 On network A requirements 388

8.25.2.4 On network B requirements 389

8.25.3 RRM performance requirements 391

8.25.4 Moderator summary and conclusions 391

8.26 NR NTN enhancement 392

8.26.1 General aspects 392

8.26.1.1 System parameters 392

8.26.1.2 Regulatory information 392

8.26.1.3 Others 393

8.26.2 Co-existence study for above 10GHz bands 393

8.26.3 SAN RF requirements 394

8.26.4 SAN RF conformance testing requirements 397

8.26.5.1 RF requirements 398

8.26.5.2 Release independent requirements 402

8.26.6 RRM core requirements 402

8.26.6.1 NR-NTN RRM requirements in above 10 GHz bands 402

8.26.6.2 Network verified UE location 405

8.26.6.3 NTN-TN and NTN-NTN mobility and service continuity enhancements 405

8.26.7 RRM performance requirements 407

8.26.8 Demodulation performance requirements 407

8.26.8.1 SAN demodulation performance requirements 407

8.26.8.2 UE demodulation performance and CSI requirements 408

8.26.9 Moderator summary and conclusions 409

8.27 Further NR coverage enhancements 410

8.27.1 UE RF requirements 410

8.27.1.1 Enhancement of increasing UE power high limit for CA and DC (resubmitted CR) 411

8.27.1.2 Enhancement to reduce MPR/PAR (resubmitted CR) 414

8.27.2 BS demodulation performance requirements 416

8.27.3 Moderator summary and conclusions 417

8.28 NR Network-controlled Repeaters 418

8.28.1 General aspects 418

8.28.2 RF core requirements 418

8.28.2.1 RF requirements for NCR-Fwd 418

8.28.2.2 RF requirements for NCR-MT 419

8.28.3 EMC core requirements 420

8.28.4 RF conformance testing 421

8.28.5 RRM core requirements 422

8.28.6 Demodulation performance requirements 422

8.28.7 Moderator summary and conclusions 423

8.29 NR MIMO evolution for downlink and uplink 424

8.29.1 UE RF requirements for simultaneous transmission with multi-panel (STxMP) 424

8.29.1.1 Configured transmitted power 424

8.29.1.2 Other UE RF requirements 425

8.29.2 RRM core requirements 427

8.29.2.1 RRM requirements impacts 427

8.29.2.2 Timing requirements for UL multi-DCI multi-TRP with two TAs 428

8.29.2.3 Unified TCI framework 430

8.29.3 RRM performance requirements 431

8.29.4 Demodulation performance requirements 432

8.29.4.1 UE demodulation performance and CSI requirements 433

8.29.4.2 BS demodulation performance requirements 433

8.29.5 Moderator summary and conclusions 434

8.30 NR sidelink evolution 435

8.30.1 General aspects (TR/big CR) 435

8.30.2 UE RF requirements 436

8.30.2.1 Sidelink on a single unlicensed spectrum 436

8.30.2.1.1 System parameters (channel bandwidth, channel arrangement) 436

8.30.2.1.2 Tx requirements 437

8.30.2.1.3 Rx requirements 439

8.30.2.2 Con-current operation on Uu and sidelink 439

8.30.2.3 Sidelink CA 440

8.30.2.4 Co-channel coexistence for LTE sidelink and NR sidelink 441

8.30.3 RRM core requirements 442

8.30.3.1 Sidelink CA 442

8.30.3.2 SL unlicensed operation 443

8.30.3.3 Co-channel coexistence for LTE SL and NR SL 445

8.30.4 RRM performance requirements 445

8.30.5 UE demodulation performance requirements 445

8.30.6 Moderator summary and conclusions 446

8.31 Enhanced support of reduced capability NR devices 447

8.31.1 UE RF requirements 447

8.31.2 RRM core requirements 448

8.31.3 Moderator summary and conclusions 449

8.32 Enhanced NR Sidelink Relay 450

8.32.1 RRM core requirements 450

8.32.2 RRM performance requirements 451

8.32.3 Moderator summary and conclusions 451

8.33 Mobile IAB (Integrated Access and Backhaul) for NR 452

8.33.1 Co-existence study 452

8.33.2 RF core requirements 452

8.33.3 RF conformance testing 453

8.33.4 RRM core requirements 453

8.33.5 RRM performance requirements 454

8.33.6 Demodulation performance requirements 454

8.33.7 Moderator summary and conclusions 455

8.34 Network energy saving for NR 455

8.34.1 BS RF requirements 455

8.34.2 BS conformance testing requirements 456

8.34.3 RRM core requirements 456

8.34.3.1 RRM requirements impacts 457

8.34.3.2 SSB-less SCell operation 458

8.34.4 RRM performance requirements 460

8.34.5 UE demodulation performance and CSI requirements 461

8.34.6 Moderator summary and conclusions 462

8.35 NR Support for UAV 462

8.35.1 General aspects (big CR) 462

8.35.2 Necessary UE types and additional OOBE requirements for aerial UEs (resubmitted CR) 464

8.35.3 Moderator summary and conclusions 464

8.36 Enhancement of NR dynamic spectrum sharing 464

8.36.1 General and work plan 464

8.36.2 UE demodulation performance requirements 464

8.36.3 Moderator summary and conclusions 465

9 Rel-18 on-going work Items for LTE 466

9.1 Rel-18 LTE-Advanced Carrier Aggregation for x bands (2<=x<= 6) DL with y bands (y=1, 2) UL 466

9.1.1 Rapporteur input (WID/TR/big CR) 466

9.1.2 UE RF requirements for 1 UL 466

9.1.2.1 Requirements with specific issues 466

9.1.2.2 Requirements without specific issues 466

9.1.3 UE RF requirements for 2UL 467

9.1.3.1 Requirements with specific issues 467

9.1.3.2 Requirements without specific issues 467

9.1.4 Moderator summary and conclusions 467

9.2 Additional LTE bands for UE categories M1/M2/NB1/NB2 in Rel-18 467

9.2.1 Rapporteur input (WID/TR/big CR) 467

9.2.2 UE RF requirements 467

9.2.3 BS RF and MSR requirements 467

9.3 Introduction of the Extended L-band (UL 1668-1675, DL 1518-1525) for IoT NTN 467

9.3.1 General aspects (TR) 467

9.3.2 Band definition and system parameters 467

9.3.3 UE RF requirements (resubmitted CR) 467

9.3.4 SAN RF requirements (resubmitted CR) 468

9.3.5 RRM core requirements (resubmitted CR) 468

9.3.6 Moderator summary and conclusions 468

9.4 Introduction of a new FDD band (L+S band) for IoT NTN operation 468

9.4.1 General aspects (TR) 468

9.4.2 Band definition and system parameters 469

9.4.3 UE RF requirements (resubmitted CR) 469

9.4.4 SAN RF requirements (resubmitted CR) 470

9.4.5 RRM core requirements (resubmitted CR) 470

9.4.6 Moderator summary and conclusions 470

9.5 High Power UE (Power Class 2) for LTE FDD Band 14 470

9.5.1 General aspects (TR) 470

9.5.2 UE RF requirements 471

9.5.2.1 Tx requirements 471

9.5.2.2 Rx requirements 471

9.5.3 Release independency 471

9.5.4 Moderator summary and conclusions 471

9.6 IoT (Internet of Things) NTN (non-terrestrial network) enhancements 472

9.6.1 General aspects 472

9.6.2 UE RF requirements 472

9.6.3 SAN RF requirements 472

9.6.4 RRM core requirements 472

9.6.5 RRM performance requirements 474

9.6.6 Demodulation performance requirements 474

9.6.7 Moderator summary and conclusions 475

9.7 Enhanced LTE Support for UAV 476

9.7.1 General aspects 476

9.7.2 Necessary UE types and additional OOBE requirements for aerial UEs (resubmitted CR) 476

9.7.3 Moderator summary and conclusions 477

10 Rel-18 feature list 477

11 Liaison and output to other groups 479

11.1 R18 related 479

11.1.1 LS on combination of HST and RRM relaxation (R2-2311435) 479

11.1.2 LS on the CA Aggregated BW capability signaling by the UE (R2-2311440) 480

11.2 R17 related 481

11.2.1 Applicability of pre-configured measurement gaps for RedCap UE (R3-233478) 481

11.2.2 Monitoring of paging occasions for CG-SDT with HD-FDD Redcap UEs (R2-2304562) 481

11.2.3 LS on CG-SDT RRM test procedure (R5-235340) 482

11.2.4 Reply LS on monitoring of paging occasions for CG-SDT with HD-FDD Redcap UEs (R2-2311424) 483

11.2.5 Power class related topics 483

11.2.6 Others 486

11.3 R15, R16 related 486

11.3.1 LS on RRM test cases with testability issues (R5-233782) 486

11.3.2 LS on SRS antenna switching for TDD-FDD band combinations (R1-2308582) 486

11.3.3 Reply LS on intraBandENDC-Support (R2-2308855) 486

11.3.4 Reply LS on update for “interBandMRDC-WithOverlapDL-Bands-r16” in 38.306 (R2-2309218) 486

11.3.5 Reply LS on report quantity parameter setting for CQI reporting with 1Tx (R1-2310649) 487

11.3.6 Reply LS on power scaling and PHR in 38.213 (R1-2310555) 487

11.3.7 Others 487

11.4 Moderator summary and conclusions 487

12 RAN task 488

12.1 NTN testing work for NGSO deployments 488

13 Revision of the Work Plan 489

14 Any other business 490

## 1 Opening of the meeting

## 2 Meeting agenda, arrangement and meeting report

## 3 Incoming LS

## 3A Topic Summary (pre-meeting)

This agenda item is only for at-meeting-generated content related to topic summary.

### 3A.1 Main session topic summaries

### 3A.2 RRM session topic summaries

### 3A.3 BSRF\_Demod session topic summaries

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TDoc | Title | Source | Type | For | Abstract | Agenda item | TDoc Status | Decision |
| R4-2318193 | Topic summary for [109][301] BSRF\_Maintenance | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 6.4 | reserved |  |
| R4-2318194 | Topic summary for [109][302] NR\_ATG\_BSRF | Moderator (ZTE) | other | Information | [109][300] BDaT Session | 8.13.9 | reserved |  |
| R4-2318195 | Topic summary for [109][303] NR\_FR1\_lessthan\_5MHz\_BW\_BSRF | Moderator (Nokia) | other | Information | [109][300] BDaT Session | 8.14.7 | reserved |  |
| R4-2318196 | Topic summary for [109][304] NR\_LTE\_EMC\_enh | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 8.17.3 | reserved |  |
| R4-2318197 | Topic summary for [109][305] FS\_NR\_duplex\_evo\_Part1 | Moderator (Samsung) | other | Information | [109][300] BDaT Session | 8.19.4 | reserved |  |
| R4-2318198 | Topic summary for [109][306] FS\_NR\_duplex\_evo\_Part2 | Moderator (Qualcomm) | other | Information | [109][300] BDaT Session | 8.19.4 | reserved |  |
| R4-2318199 | Topic summary for [109][307] FS\_NR\_duplex\_evo\_Part3 | Moderator (CMCC) | other | Information | [109][300] BDaT Session | 8.19.4 | reserved |  |
| R4-2318200 | Topic summary for [109][308] NR\_NTN\_enh\_Part1 | Moderator (Thales) | other | Information | [109][300] BDaT Session | 8.26.9 | reserved |  |
| R4-2318201 | Topic summary for [109][309] NR\_NTN\_enh\_Part2 | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 8.26.9 | reserved |  |
| R4-2318202 | Topic summary for [109][310] NR\_NTN\_enh\_Part3 | Moderator (Samsung) | other | Information | [109][300] BDaT Session | 8.26.9 | reserved |  |
| R4-2318203 | Topic summary for [109][311] NR\_netcon\_repeater\_RF | Moderator (ZTE) | other | Information | [109][300] BDaT Session | 8.28.7 | reserved |  |
| R4-2318204 | Topic summary for [109][312] NR\_netcon\_repeater\_RFConformance | Moderator (CATT) | other | Information | [109][300] BDaT Session | 8.28.7 | reserved |  |
| R4-2318205 | Topic summary for [109][313] NR\_mobile\_IAB\_RF | Moderator (Qualcomm) | other | Information | [109][300] BDaT Session | 8.33.7 | reserved |  |
| R4-2318206 | Topic summary for [109][314] IoT\_NTN\_SANRF | Moderator (Huawei) | other | Information | [109][300] BDaT Session | 6.4 | reserved |  |
| R4-2318207 | Topic summary for [109][315] Demod\_Maintenance | Moderator (Nokia) | other | Information | [109][300] BDaT Session | 5.4 | reserved |  |
| R4-2318208 | Topic summary for [109][316] RF\_FR1\_enh2\_Demod | Moderator (Huawei) | other | Information | [109][300] BDaT Session | 8.3.4 | reserved |  |
| R4-2318209 | Topic summary for [109][317] NR\_RF\_FR2\_req\_Ph3\_Demod | Moderator (Nokia) | other | Information | [109][300] BDaT Session | 8.6.5 | reserved |  |
| R4-2318210 | Topic summary for [109][318] NR\_FR2\_multiRX\_DL\_Demod | Moderator (Qualcomm) | other | Information | [109][300] BDaT Session | 8.7.5 | reserved |  |
| R4-2318211 | Topic summary for [109][319] NonCol\_intraB\_ENDC\_NR\_CA\_Demod | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 8.11.5 | reserved |  |
| R4-2318212 | Topic summary for [109][320] NR\_HST\_FR2\_enh\_Demod | Moderator (Samsung) | other | Information | [109][300] BDaT Session | 8.12.4 | reserved |  |
| R4-2318213 | Topic summary for [109][321] NR\_ATG\_Demod | Moderator (CMCC) | other | Information | [109][300] BDaT Session | 8.13.9 | reserved |  |
| R4-2318214 | Topic summary for [109][322] NR\_FR1\_lessthan\_5MHz\_BW\_demod | Moderator (Nokia) | other | Information | [109][300] BDaT Session | 8.14.7 | reserved |  |
| R4-2318215 | Topic summary for [109][323] NR\_demod\_enh3\_Part1 | Moderator (CTC) | other | Information | [109][300] BDaT Session | 8.18.4 | reserved |  |
| R4-2318216 | Topic summary for [109][324] NR\_NTN\_enh\_SAN\_UE\_demod | Moderator (Huawei) | other | Information | [109][300] BDaT Session | 8.26.9 | reserved |  |
| R4-2318217 | Topic summary for [109][325] NR\_cov\_enh2\_demod | Moderator (CTC) | other | Information | [109][300] BDaT Session | 8.27.3 | reserved |  |
| R4-2318218 | Topic summary for [109][326] NR\_netcon\_repeater\_Demod | Moderator (ZTE) | other | Information | [109][300] BDaT Session | 8.28.7 | reserved |  |
| R4-2318219 | Topic summary for [109][327] NR\_MIMO\_evo\_DL\_UL\_demod | Moderator (Samsung) | other | Information | [109][300] BDaT Session | 8.29.5 | reserved |  |
| R4-2318220 | Topic summary for [109][328] NR\_SL\_enh2\_demod | Moderator (LGE) | other | Information | [109][300] BDaT Session | 8.30.6 | reserved |  |
| R4-2318221 | Topic summary for [109][329] NR\_mobile\_IAB\_demod | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 8.33.7 | reserved |  |
| R4-2318222 | Topic summary for [109][330] Netw\_Energy\_NR\_demod | Moderator (Huawei) | other | Information | [109][300] BDaT Session | 8.34.6 | reserved |  |
| R4-2318223 | Topic summary for [109][331] NR\_DSS\_enh | Moderator (Ericsson) | other | Information | [109][300] BDaT Session | 8.36.3 | reserved |  |
| R4-2318224 | Topic summary for [109][332] IoT\_NTN\_Demod | Moderator (MediaTek) | other | Information | [109][300] BDaT Session | 9.6.7 | reserved |  |
| R4-2318225 | Topic summary for [109][333] OTA\_Maintenance (placeholder) | Moderator (Keysight) | other | Information | [109][300] BDaT Session | 5.4 | reserved |  |
| R4-2318226 | Topic summary for [109][334] FS\_NR\_FR2\_OTA\_enh | Moderator (Qualcomm) | other | Information | [109][300] BDaT Session | 8.2.6 | reserved |  |
| R4-2318227 | Topic summary for [109][335] NR\_FR1\_TRP\_TRS\_enh | Moderator (vivo) | other | Information | [109][300] BDaT Session | 8.15.4 | reserved |  |
| R4-2318228 | Topic summary for [109][336] NR\_MIMO\_OTA\_enh | Moderator (CAICT) | other | Information | [109][300] BDaT Session | 8.16.6 | reserved |  |
| R4-2318229 | Topic summary for [108][337] RAN\_task\_NTN\_test | Moderator (MediaTek) | other | Information | [109][300] BDaT Session | 12.1 | reserved |  |

## 4 Up to Rel-16 maintenance for LTE and NR

**Guidance for maintenance agendas (AI 4, AI 5 and AI 6)**

The following guidance are provided for AI 4, AI5 and AI6:

- For maintenance agenda AI 4 (up to Rel-16), AI 5 (Rel-17) and AI 6 (Rel-18), formal CRs are expected and multiple formal CRs per company in the lowest agenda are allowed. For tracking the changes easily, it expected that one batch of CRs (Cat-F/A/…) will just cover a single topic/WI rather than multiple topics/WIs and Cat-F CR with corresponding Cat-A CRs needs be submitted under the same agenda.

- When submitting contributions to AI 4, AI 5 and AI 6, please add [WI\_code] in the beginning of titles for both discussion files and CRs to facilitate moderators and session chairs handling.

- When reserving the tdoc number, please use the correct WI code rather than simply using TEI and fill the column of “Related WIs” in your reservation spreadsheet. If you submit a CR with TEI as WI code, please inform session chair.

### 4.1 UE RF requirements

### 4.2 BS RF requirements and BS conformance testing

**R4-2318284 CR for TS 38.176-2, Correction on scaling factor for IAB-MT type 1-O**

*Type: CR For: Agreement  
 38.176-2 v16.7.0 CR-0034 rev Cat: F (Rel-16)  
  
 Source: CATT*

**Decision: Revised to R4-2321183 (from R4-2318284).**

[**R4-2321183**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321183.zip) **CR for TS 38.176-2, Correction on scaling factor for IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.176-2 v16.7.0 CR-0034 rev Cat: F (Rel-16)  
  
 Source: CATT*

**Decision: Agreed.**

Moderator: Scaling factor changes should be postponed, but other corrections can be considered.

**R4-2318285 CR for TS 38.176-2, Correction on scaling factor for IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.176-2 v17.6.0 CR-0035 rev Cat: A (Rel-17)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318286 CR for TS 38.176-2, Correction on scaling factor for IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.176-2 v18.2.0 CR-0036 rev Cat: A (Rel-18)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318287 CR for TS 38.115-2, Remove multi-band related content for repeater type 2-O**

*Type: CR For: Agreement  
 38.115-2 v17.3.0 CR-0009 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318288 Discussion on reference of PREFSENS**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2318289 CR for TS 38.141-1, Correction on reference of PREFSENS**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0378 rev Cat: F (Rel-16)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318290 CR for TS 38.141-1, Correction on reference of PREFSENS**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0379 rev Cat: A (Rel-17)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318291 CR for TS 38.141-1, Correction on reference of PREFSENS**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0380 rev Cat: A (Rel-18)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318292 CR for TS 38.141-2, Correction on title of Table 4.7.2.1-2 for test signal for BS type 2-O**

*Type: CR For: Agreement  
 38.141-2 v17.11.0 CR-0547 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Agreed.**

**R4-2318366 [NR\_RF\_FR1-Core] CR to TS 38.104 on correction of transmitter spurious emissions for protection of Band n20**

*Type: CR For: Agreement  
 38.104 v16.17.0 CR-0522 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct band number in table for protection of Band n20.

**Decision: Agreed.**

**R4-2318367 [NR\_RF\_FR1-Core] CR to TS 38.104 on correction of transmitter spurious emissions for protection of Band n20**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0523 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct band number in table for protection of Band n20.

**Decision: Agreed.**

**R4-2318368 [NR\_RF\_FR1-Core] CR to TS 38.104 on correction of transmitter spurious emissions for protection of Band n20**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0524 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct band number in table for protection of Band n20.

**Decision: Agreed.**

**R4-2318369 [NR\_unlic-Perf] CR to TS 38.141-1 on correction of table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0381 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102.

**Decision: Agreed.**

**R4-2318370 [NR\_unlic-Perf] CR to TS 38.141-1 on correction of table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0382 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102.

**Decision: Agreed.**

**R4-2318371 [NR\_unlic-Perf] CR to TS 38.141-1 on correction of table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0383 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table numbers for Local Area BS in-channel selectivity for bands n46, n96 and n102.

**Decision: Agreed.**

**R4-2318372 [NR\_n18-Core] CR to TS 36.104 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.104 v16.14.0 CR-4980 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318373 [NR\_n18-Core] CR to TS 36.104 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.104 v17.10.0 CR-4981 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318374 [NR\_n18-Core] CR to TS 36.104 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.104 v18.3.0 CR-4982 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318375 [NR\_n18-Perf] CR to TS 36.141 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.141 v16.17.0 CR-1367 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318376 [NR\_n18-Perf] CR to TS 36.141 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.141 v17.10.0 CR-1368 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318377 [NR\_n18-Perf] CR to TS 36.141 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 36.141 v18.2.0 CR-1369 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence and co-location tables for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318378 [NR\_n18-Perf] CR to TS 37.145-1 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 37.145-1 v16.14.0 CR-0328 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318379 [NR\_n18-Perf] CR to TS 37.145-1 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 37.145-1 v17.9.0 CR-0329 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318380 [NR\_n18-Perf] CR to TS 37.145-1 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 37.145-1 v18.3.0 CR-0330 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318381 [NR\_n18-Perf] CR to TS 38.141-1 on correction of table reference for Band n18 transmitter spurious emissions**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0384 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table reference for Band n18 transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318382 [NR\_n18-Perf] CR to TS 38.141-1 on correction of table reference for Band n18 transmitter spurious emissions**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0385 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table reference for Band n18 transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318383 [NR\_n18-Perf] CR to TS 38.141-1 on correction of table reference for Band n18 transmitter spurious emissions**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0386 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table reference for Band n18 transmitter spurious emissions.

**Decision: Revised to R4-2321192 (from R4-2318383).**

[**R4-2321192**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321192.zip) **[NR\_n18-Perf] CR to TS 38.141-1 on correction of table reference for Band n18 transmitter spurious emissions**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0386 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Correct table reference for Band n18 transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318384 [NR\_n18-Perf] CR to TS 38.141-2 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 38.141-2 v16.17.0 CR-0548 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318385 [NR\_n18-Perf] CR to TS 38.141-2 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 38.141-2 v17.11.0 CR-0549 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2318386 [NR\_n18-Perf] CR to TS 38.141-2 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0550 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Revised to R4-2321193 (from R4-2318386).**

[**R4-2321193**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321193.zip) **[NR\_n18-Perf] CR to TS 38.141-2 on correction of transmitter spurious emissions for protection of Band n18**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0550 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add Band n18 to coexistence table for transmitter spurious emissions.

**Decision: Agreed.**

**R4-2319168 Addition of 30 KHz SCS for Sync Raster for Band n53**

*Type: CR For: Agreement  
 38.104 v16.17.0 CR-0534 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

Moderator: This change was submitted to both BS and UE sessions, but it wasn’t noted in affected specifications. We should wait for the conclusion from the main session.

**R4-2319169 Addition of 30 kHz SCS for Sync Raster for Band n53**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0535 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2319420 CR to 37.141: Correction to method of test for GSM/EDGE requirements**

*Type: CR For: Agreement  
 37.141 v15.21.2 CR-1064 rev Cat: F (Rel-15)  
  
 Source: Ericsson*

**Abstract:**

The CS listed for GSM/EDGE AM suppression in Clause 7 does not match what is listed in the applicability tables in Section 5. The errors were previously introduced when new capability sets were added. There are in addition some related editorial errors.

**Decision: Agreed.**

**R4-2319421 CR to 37.141: Correction to method of test for GSM/EDGE requirements**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1065 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

The CS listed for some GSM/EDGE specific receiver requirements in Clause 7 do not match what is listed in the applicability tables in Section 5. The errors were previously introduced when new capability sets including GSM/EDGE were added. There are in add

**Decision: Revised to R4-2321154 (from R4-2319421).**

[**R4-2321154**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321154.zip) **CR to 37.141: Correction to method of test for GSM/EDGE requirements**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1065 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

The CS listed for some GSM/EDGE specific receiver requirements in Clause 7 do not match what is listed in the applicability tables in Section 5. The errors were previously introduced when new capability sets including GSM/EDGE were added. There are in add

**Decision: Agreed.**

**R4-2319422 CR to 37.141: Correction to method of test for GSM/EDGE requirements**

*Type: CR For: Agreement  
 37.141 v17.11.2 CR-1066 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

The CS listed for some GSM/EDGE specific receiver requirements in Clause 7 do not match what is listed in the applicability tables in Section 5. The errors were previously introduced when new capability sets including GSM/EDGE were added. There are in add

**Decision: Agreed.**

**R4-2319423 CR to 37.141: Correction to method of test for GSM/EDGE requirements**

*Type: CR For: Agreement  
 37.141 v18.3.1 CR-1067 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

The CS listed for some GSM/EDGE specific receiver requirements in Clause 7 do not match what is listed in the applicability tables in Section 5. The errors were previously introduced when new capability sets including GSM/EDGE were added. There are in add

**Decision: Agreed.**

**R4-2319681 [ MB\_MSR\_RF] CR to 37.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.104 v16.18.0 CR-1001 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321155 (from R4-2319681).**

[**R4-2321155**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321155.zip) **[ MB\_MSR\_RF] CR to 37.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.104 v16.18.0 CR-1001 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Postponed.**

**R4-2319682 [MB\_MSR\_RF] CR to 37.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.104 v17.10.0 CR-1002 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319683 [MB\_MSR\_RF] CR to 37.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.104 v18.3.0 CR-1003 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319684 [ MB\_MSR\_RF] CR to 37.141: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1069 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321156 (from R4-2319684).**

[**R4-2321156**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321156.zip) **[ MB\_MSR\_RF] CR to 37.141: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1069 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Postponed.**

**R4-2319685 [MB\_MSR\_RF] CR to 37.141: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.141 v17.11.2 CR-1070 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319686 [MB\_MSR\_RF] CR to 37.141: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 37.141 v18.3.1 CR-1071 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319687 [ MB\_MSR\_RF] CR to 38.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.104 v16.17.0 CR-0539 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321157 (from R4-2319687).**

[**R4-2321157**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321157.zip) **[ MB\_MSR\_RF] CR to 38.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.104 v16.17.0 CR-0539 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Postponed.**

**R4-2319688 [MB\_MSR\_RF] CR to 38.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0540 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319689 [MB\_MSR\_RF] CR to 38.104: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0541 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319690 [ MB\_MSR\_RF] CR to 38.141-1: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0393 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321158 (from R4-2319690).**

[**R4-2321158**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321158.zip) **[ MB\_MSR\_RF] CR to 38.141-1: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0393 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Postponed.**

**R4-2319691 [MB\_MSR\_RF] CR to 38.141-1: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0394 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319692 [MB\_MSR\_RF] CR to 38.141-1: clarification on requirements for BS capable of multi-band operation**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0395 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Withdrawn.**

**R4-2319693 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.141: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1072 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321159 (from R4-2319693).**

[**R4-2321159**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321159.zip) **[MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.141: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1072 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319694 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.141: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.141 v17.11.2 CR-1073 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319695 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.141: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.141 v18.3.1 CR-1074 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319696 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-1: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-1 v16.14.0 CR-0333 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321160 (from R4-2319696).**

[**R4-2321160**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321160.zip) **[MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-1: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-1 v16.14.0 CR-0333 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319697 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-1: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-1 v17.9.0 CR-0334 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319698 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-1: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-1 v18.3.0 CR-0335 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319699 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-1: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-2 v16.15.0 CR-0369 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321161 (from R4-2319699).**

[**R4-2321161**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321161.zip) **[MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-2: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-2 v16.15.0 CR-0369 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319700 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-2: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-2 v17.9.0 CR-0370 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319701 [MSR\_GSM\_UTRA\_LTE\_NR-Perf] CR to 37.145-2: Power allocation for NC operation**

*Type: CR For: Agreement  
 37.145-2 v18.3.0 CR-0371 rev Cat: A (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Agreed.**

**R4-2319801 CR to 37.104: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.104 v16.18.0 CR-1004 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Revised to R4-2321162 (from R4-2319801).**

[**R4-2321162**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321162.zip) **CR to 37.104: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.104 v16.18.0 CR-1004 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2319802 CR to 37.104: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.104 v17.10.0 CR-1005 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2319803 CR to 37.104: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.104 v18.3.0 CR-1006 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2319804 CR to 37.141: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1075 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Revised to R4-2321163 (from R4-2319804).**

[**R4-2321163**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321163.zip) **CR to 37.141: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.141 v16.19.2 CR-1075 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2319805 CR to 37.141: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.141 v17.11.2 CR-1076 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2319806 CR to 37.141: Correction to table note for band 66**

*Type: CR For: Agreement  
 37.141 v18.3.1 CR-1077 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

In the operating bands table, there is a reference to Note 7 for Band 66. There is no such note and the correct reference should be Note 3, which specifically concerns Band 66 only.

**Decision: Agreed.**

**R4-2320353 NR\_IAB-Core: CR to 38.174 Correction of the value of X in IAB-MT OTA receiver spurious emissions**

*Type: CR For: Agreement  
 38.174 v16.9.0 CR-0081 rev Cat: F (Rel-16)  
  
 Source: ZTE*

**Decision: Not pursued.**

[**R4-2321164**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321164.zip) **NR\_IAB-Core: CR to 38.174 Correction of the value of X in IAB-MT OTA receiver spurious emissions**

*Type: CR For: Agreement  
 38.174 v16.9.0 CR-0081 rev Cat: F (Rel-16)  
  
 Source: ZTE*

**Decision: Withdrawn.**

**R4-2320354 NR\_IAB-Core:CR to 38.174 Correction of the value of X in IAB-MT OTA receiver spurious emissions\_Rel17**

*Type: CR For: Agreement  
 38.174 v17.5.0 CR-0082 rev Cat: A (Rel-17)  
  
 Source: ZTE Corporation*

**Decision: Withdrawn.**

**R4-2320355 NR\_IAB-Core:CR to 38.174 Correction of the value of X in IAB-MT OTA receiver spurious emissions\_Rel18**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0083 rev Cat: A (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Withdrawn.**

**R4-2320451 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v13.16.0 CR-1374 rev Cat: F (Rel-13)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power. Note: the CR coversheet have a space in the WI code on the CR coversheet LTE\_LAA -Perf.

**Decision: Revised to R4-2320497.**

**R4-2320452 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v14.14.0 CR-1375 rev Cat: A (Rel-14)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Withdrawn.**

**R4-2320453 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v15.18.0 CR-1376 rev Cat: F (Rel-15)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Agreed.**

Moderator: This needs to be changed to Category F CR

**R4-2320454 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v16.17.0 CR-1377 rev Cat: A (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Agreed.**

**R4-2320455 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v17.10.0 CR-1378 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Agreed.**

**R4-2320456 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v18.2.0 CR-1379 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Agreed.**

**R4-2320497 [LTE\_LAA-Perf] CR to TS 36.141 on correction of transmitter OFF power for Band 46**

*Type: CR For: Agreement  
 36.141 v13.16.0 CR-1374 rev 1 Cat: F (Rel-13)  
  
 Source: Nokia, Nokia Shanghai Bell*

(Replaces R4-2320451)

**Abstract:**

Add carrier frequency 4.2GHz < f <= 6.0GHz in the transmitter OFF power.

**Decision: Not pursued.**

**R4-2320538 CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.174 v16.9.0 CR-0088 rev Cat: F (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O

**Decision: Not pursued.**

**R4-2320539 CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.174 v17.5.0 CR-0089 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O

**Decision: Withdrawn.**

**R4-2320540 CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0090 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

CR to align scaling factor for IAB-MT type I-O to IAB-DU type 1-O

**Decision: Withdrawn.**

**R4-2320659 Discussion on clean-up and improvements on BS conformance testing specifications**

*Type: other For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution describes issues in current BS specficiations which were identified together with ETSI and European Commission during the process of editing the harmonised standard.

**Decision: Noted.**

**R4-2320660 Proposal for checklist before submitting CR to BS conformance specifications**

*Type: other For: Discussion  
 Source: Ericsson*

**Abstract:**

This is a proposal for a checklist for CRs submitted for BS conformance test specifications

**Decision: Noted.**

**R4-2320661 Work plan on clean-up and improvement the BS specifications**

*Type: other For: Discussion  
 Source: Ericsson*

**Abstract:**

Way forward proposals to be approved and revised during the meeting

**Decision: Noted.**

### 4.3 UE/BS EMC requirements

**R4-2320500 CR to TS 37.113 on framework for EMC-specific manufacturer's declarations**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0130 rev Cat: F (Rel-18)  
  
 Source: Ericsson, Nokia, ZTE Corporation*

**Abstract:**

Introduce the framework of EMC-specific manufacturer's declarations

**Decision: Revised to R4-2321071 (from R4-2320500).**

[**R4-2321071**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321071.zip) **CR to TS 37.113 on framework for EMC-specific manufacturer's declarations**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0130 rev Cat: F (Rel-18)  
  
 Source: Ericsson, Nokia, ZTE Corporation*

**Abstract:**

Introduce the framework of EMC-specific manufacturer's declarations

**Decision: Agreed.**

**R4-2320501 CR to TS 38.113 on removing void clauses under 8.1 and 9.1**

*Type: CR For: Agreement  
 38.113 v15.19.0 CR-0065 rev Cat: F (Rel-15)  
  
 Source: Ericsson*

**Abstract:**

Remove void clauses, since they will not be used.

**Decision: Not pursued.**

Ericsson: According to drafting rules, we cannot remove void clauses as maintenance, but is it possible to remove them in the open release?

**R4-2320502 CR to TS 38.113 on removing void clauses under 8.1 and 9.1**

*Type: CR For: Agreement  
 38.113 v16.9.0 CR-0066 rev Cat: A (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

Remove void clauses, since they will not be used.

**Decision: Withdrawn.**

**R4-2320503 CR to TS 38.113 on removing void clauses under 8.1 and 9.1**

*Type: CR For: Agreement  
 38.113 v17.5.0 CR-0067 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Remove void clauses, since they will not be used.

**Decision: Withdrawn.**

**R4-2320504 CR to TS 38.113 on removing void clauses under 8.1 and 9.1**

*Type: CR For: Agreement  
 38.113 v18.0.0 CR-0068 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Remove void clauses, since they will not be used.

**Decision: Withdrawn.**

**R4-2320505 CR to TS 38.114 on correction of FR range to FR2-1**

*Type: CR For: Agreement  
 38.114 v17.3.0 CR-0009 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Add FR2-1 limitation in repeater EMC specification. Update the missing reference numbers.

**Decision: Agreed.**

[**R4-2321072**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321072.zip) **CR to TS 38.114 on correction of FR range to FR2-1**

*Type: CR For: Agreement  
 38.114 v17.3.0 CR-0009 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Add FR2-1 limitation in repeater EMC specification. Update the missing reference numbers.

**Decision: Withdrawn.**

**R4-2320506 CR to TS 38.175 on correction of FR range to FR2-1**

*Type: CR For: Agreement  
 38.175 v17.4.0 CR-0032 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Add FR2-1 limitation in IAB EMC specification.

**Decision: Agreed.**

[**R4-2321073**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321073.zip) **CR to TS 38.175 on correction of FR range to FR2-1**

*Type: CR For: Agreement  
 38.175 v17.4.0 CR-0032 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Add FR2-1 limitation in IAB EMC specification.

**Decision: Withdrawn.**

**R4-2320507 CR to TS 36.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 36.113 v15.5.0 CR-0089 rev Cat: F (Rel-15)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

Huawei: Not clear from which release this is needed.

**R4-2320508 CR to TS 36.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 36.113 v16.3.0 CR-0090 rev Cat: A (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

**R4-2320509 CR to TS 36.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 36.113 v17.1.0 CR-0091 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

**R4-2320510 CR to TS 37.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 37.113 v15.13.0 CR-0131 rev Cat: F (Rel-15)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

**R4-2320511 CR to TS 37.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 37.113 v16.4.0 CR-0132 rev Cat: A (Rel-16)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

**R4-2320512 CR to TS 37.113 on adding link between telecommunication port and wired network port**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0133 rev Cat: A (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Update reference of IEC 61000-6-3. Add note to telecommunication port.

**Decision: Agreed.**

**R4-2320824 [AAS\_BS\_LTE\_UTRA-Core, TEI18] CR to TS 37.114: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 37.114 v17.1.0 CR-0108 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2316933 during RAN4#108bis meeting (Xiamen), a formal CR is provided for the manufacturer declaration framework. This is not a CR for Rel-18 WI outcomes implementation.

**Decision: Revised to R4-2321074 (from R4-2320824).**

[**R4-2321074**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321074.zip) **[AAS\_BS\_LTE\_UTRA-Core, TEI18] CR to TS 37.114: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 37.114 v17.1.0 CR-0108 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2316933 during RAN4#108bis meeting (Xiamen), a formal CR is provided for the manufacturer declaration framework. This is not a CR for Rel-18 WI outcomes implementation.

**Decision: Agreed.**

**R4-2320826 [NR\_newRAT-Perf, TEI18] CR to TS 38.113: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 38.113 v18.0.0 CR-0069 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2313995 during RAN4#108 meeting (Toulouse), a formal CR is provided.

**Decision: Revised to R4-2321075 (from R4-2320826).**

[**R4-2321075**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321075.zip) **[NR\_newRAT-Perf, TEI18] CR to TS 38.113: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 38.113 v18.0.0 CR-0069 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2313995 during RAN4#108 meeting (Toulouse), a formal CR is provided.

**Decision: Agreed.**

**R4-2320827 [LTE-RF, TEI18] CR to TS 36.113: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 36.113 v17.1.0 CR-0092 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2313913 during RAN4#108 meeting (Toulouse), a formal CR is provided.

**Decision: Revised to R4-2321076 (from R4-2320827).**

[**R4-2321076**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321076.zip) **[LTE-RF, TEI18] CR to TS 36.113: framework for the EMC-specific manufacturer's declarations, Rel-18**

*Type: CR For: Agreement  
 36.113 v17.1.0 CR-0092 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2313913 during RAN4#108 meeting (Toulouse), a formal CR is provided.

**Decision: Agreed.**

**R4-2320829 [LTE-RF, TEI15] EMC test configurations specification simplification**

*Type: discussion For: Discussion  
 Source: Huawei, HiSilicon*

**Abstract:**

In this contribution we provide discussion on the potential simplification of the EMC test configurations.

**Decision: Noted.**

**R4-2320830 [LTE-RF, TEI15] Draft CR to TS 36.113: Example implementation of the draft CR for the test configurations specification simplification, Rel-15**

*Type: draftCR For: Endorsement  
 36.113 v15.5.0 CR- rev Cat: (Rel-15)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on related discussion paper, in this contribution we provide example implementation of the draft CR for the test configurations specification simplification.

**Decision: Not pursued.**

**R4-2320832 [RInImp9-RFmulti, TEI15] CR to TS 37.113: Test configurations correction for CS7, Rel-15**

*Type: CR For: Agreement  
 37.113 v15.13.0 CR-0134 rev Cat: F (Rel-15)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

CS7 was mistakenly overlooked in table 4.5-1 on test configurations for single-band Multi-RAT capable MSR BS.

**Decision: Agreed.**

Moderator: Should we refer to clause or sub-clause? These are used inconsistently

Huawei: We should not use sub-clause which has special meaning

**R4-2320833 [RInImp9-RFmulti, TEI15] CR to TS 37.113: Test configurations correction for CS7, Rel-16**

*Type: CR For: Agreement  
 37.113 v16.4.0 CR-0135 rev Cat: A (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

CS7 was mistakenly overlooked in table 4.5-1 on test configurations for single-band Multi-RAT capable MSR BS.

**Decision: Agreed.**

**R4-2320834 [RInImp9-RFmulti, TEI15] CR to TS 37.113: Test configurations correction for CS7, Rel-17**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0136 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

CS7 was mistakenly overlooked in table 4.5-1 on test configurations for single-band Multi-RAT capable MSR BS.

**Decision: Agreed.**

**R4-2320847 [NR\_IAB-Core] CR to TS 38.175 correction of EMC requirements applicability, Rel-16**

*Type: CR For: Agreement  
 38.175 v16.6.0 CR-0033 rev Cat: F (Rel-16)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Correction of EMC requirements applicability in a way that the IAB node is covered as a single entity (including MT and DU) not only for Emissions in section 7.1, but also for Immunity requirements in 7.2.

**Decision: Agreed.**

**R4-2320848 [NR\_IAB-Core] CR to TS 38.175 correction of EMC requirements applicability, Rel-17**

*Type: CR For: Agreement  
 38.175 v17.4.0 CR-0034 rev Cat: A (Rel-17)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Correction of EMC requirements applicability in a way that the IAB node is covered as a single entity (including MT and DU) not only for Emissions in section 7.1, but also for Immunity requirements in 7.2.

**Decision: Agreed.**

### 4.4 RRM requirements

### 4.5 Demodulation and CSI requirements

**R4-2318081 [NR\_L1enh\_URLLC-Perf] CR to TS38.101-4 Corrections to CQI Reporting tests with 1TX (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0419 rev Cat: F (Rel-16)  
  
 Source: MediaTek inc.*

**Decision:** The document was **withdrawn**.

**R4-2318082 [NR\_L1enh\_URLLC-Perf] CR to TS38.101-4 Corrections to CQI Reporting tests with 1TX (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0420 rev Cat: A (Rel-17)  
  
 Source: MediaTek inc.*

**Decision: Withdrawn.**

**R4-2318083 [NR\_L1enh\_URLLC-Perf] CR to TS38.101-4 Corrections to CQI Reporting tests with 1TX (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0421 rev Cat: A (Rel-18)  
  
 Source: MediaTek inc.*

**Decision: Withdrawn.**

**R4-2318084 [NR\_newRAT-Perf] CR to TS38.101-4 Corrections to test parameters for CSI test cases (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0422 rev Cat: F (Rel-16)  
  
 Source: MediaTek inc.*

**Decision:** The document was **withdrawn**.

**R4-2318085 [NR\_newRAT-Perf] CR to TS38.101-4 Corrections to test parameters for CSI test cases (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0423 rev Cat: A (Rel-17)  
  
 Source: MediaTek inc.*

**Decision: Agreed.**

**R4-2318086 [NR\_newRAT-Perf] CR to TS38.101-4 Corrections to test parameters for CSI test cases (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0424 rev Cat: A (Rel-18)  
  
 Source: MediaTek inc.*

**Decision: Agreed.**

**R4-2318091 [NR\_unlic] CR for 38.104: Removal of applicability rule (Rel-16, Cat F)**

*Type: CR For: Agreement  
 38.104 v16.17.0 CR-0519 rev Cat: F (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318092 [NR\_unlic] CR for 38.104: Removal of applicability rule (Rel-17, Cat A)**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0520 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318093 [NR\_unlic] CR for 38.104: Removal of applicability rule (Rel-18, Cat A)**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0521 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318737 [NR\_newRAT-Perf] CR to 38.101-4 Correction to report quantity for 1Tx CQI tests**

*Type: draftCR For: (not specified)  
 38.101-4 v16.14.0 CR- rev Cat: (Rel-16)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision:** The document was **withdrawn**.

**R4-2318738 CR to 38.101-4 Correction to report quantity for 1Tx CQI tests**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0426 rev Cat: F (Rel-16)  
  
 Source: Qualcomm Inc*

**Decision: Merged (with R4-2319124).**

**R4-2318797 [NR\_newRAT-Perf] CR for 38.101-4 on correction of wrong table number (Rel-15, Cat F)**

*Type: CR For: Agreement  
 38.101-4 v15.19.0 CR-0429 rev Cat: F (Rel-15)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318798 [NR\_newRAT-Perf] CR for 38.101-4 on correction of wrong table number (Rel-16, Cat A)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0430 rev Cat: A (Rel-16)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318799 [NR\_newRAT-Perf] CR for 38.101-4 on correction of wrong table number (Rel-17, Cat A)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0431 rev Cat: A (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318800 [NR\_newRAT-Perf] CR for 38.101-4 on correction of wrong table number (Rel-18, Cat A)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0432 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2318941 [NR\_HST] HST-SFN and HST-DPS model clarification**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0433 rev Cat: F (Rel-16)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321184 (from R4-2318941).**

Huawei: We still have a concern with this CR. Not ready to agree now.

[**R4-2321184**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321184.zip) **[NR\_HST] HST-SFN and HST-DPS model clarification**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0433 rev Cat: F (Rel-16)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321195 (from R4-2321184).**

[**R4-2321195**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321195.zip) **[NR\_HST] HST-SFN and HST-DPS model clarification**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0433 rev Cat: F (Rel-16)  
  
 Source: Qualcomm Inc.*

**Decision: Agreed.**

**R4-2318942 [NR\_HST] HST-SFN and HST-DPS model clarification-R17mirror**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0434 rev Cat: A (Rel-17)  
  
 Source: Qualcomm, Inc.*

**Decision: Agreed.**

**R4-2318943 [NR\_HST] HST-SFN and HST-DPS model clarification-R18mirror**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0435 rev Cat: A (Rel-18)  
  
 Source: Qualcomm, Inc.*

**Decision: Agreed.**

**R4-2319123 [NR\_L1enh\_URLLC-Perf] Report quantity parameter setting for CQI reporting with 1Tx**

*Type: other For: Approval  
 Source: Anritsu Corporation*

**Abstract:**

Discussion on the definition of the test parameter reportQuantity for CQI test with 1Tx.

**Decision: Noted.**

**R4-2319124 [NR\_L1enh\_URLLC-Perf] CR to Report quantity for CQI Reporting tests with 1Tx**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0436 rev Cat: F (Rel-16)  
  
 Source: Anritsu Corporation*

**Decision: Revised to R4-2321174 (from R4-2319124).**

[**R4-2321174**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321174.zip) **[NR\_L1enh\_URLLC-Perf] CR to Report quantity for CQI Reporting tests with 1Tx**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0436 rev Cat: F (Rel-16)  
  
 Source: Anritsu Corporation, MediaTek, Qualcomm*

**Decision: Agreed.**

**R4-2319125 [NR\_L1enh\_URLLC-Perf] CR to Report quantity for CQI Reporting tests with 1Tx**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0437 rev Cat: A (Rel-17)  
  
 Source: Anritsu Corporation*

**Decision: Agreed.**

**R4-2319126 [NR\_L1enh\_URLLC-Perf] CR to Report quantity for CQI Reporting tests with 1Tx**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0438 rev Cat: A (Rel-18)  
  
 Source: Anritsu Corporation*

**Decision: Agreed.**

**R4-2319261 Sidelink demodulation typo fixed**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0439 rev Cat: D (Rel-16)  
  
 Source: LG Electronics*

**Decision: Agreed.**

**R4-2321023 Sidelink demodulation typo fixed**

*Type: CR For: Agreement  
 38.101-4 v17.x.y CR-xxxx rev Cat: A (Rel-17)  
  
 Source: LG Electronics*

**Decision: Agreed.**

**R4-2321024 Sidelink demodulation typo fixed**

*Type: CR For: Agreement  
 38.101-4 v18.x.y CR-xxxx rev Cat: A (Rel-18)  
  
 Source: LG Electronics*

**Decision: Agreed.**

**R4-2319325 [NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0440 rev Cat: F (Rel-16)  
  
 Source: Samsung*

**Decision: Revised to R4-2321175 (from R4-2319325).**

[**R4-2321175**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321175.zip) **[NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0440 rev Cat: F (Rel-16)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2319815 [NR\_IAB-Perf] CR for 38.176-1: Removal of Square Brackets in IAB-MT Performance Requirements (Rel-17, Cat F)**

*Type: CR For: Agreement  
 38.176-1 v17.6.0 CR-0034 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2319816 [NR\_IAB-Perf] CR for 38.176-1: Removal of Square Brackets in IAB-MT Performance Requirements (Rel-18, Cat A)**

*Type: CR For: Agreement  
 38.176-1 v18.2.0 CR-0035 rev Cat: A (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320201 Corrections on test parameters for PDSCH test**

*Type: CR For: Agreement  
 38.101-4 v15.19.0 CR-0447 rev Cat: F (Rel-15)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321178 (from R4-2320201).**

[**R4-2321178**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321178.zip) **Corrections on test parameters for PDSCH test**

*Type: CR For: Agreement  
 38.101-4 v15.19.0 CR-0447 rev Cat: F (Rel-15)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320202 CR on 38.101-4 Correction on "HARQ ACK/NACK bundling" for PDSCH test (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0448 rev Cat: A (Rel-16)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320203 CR on 38.101-4 Correction on "HARQ ACK/NACK bundling" for PDSCH test (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0449 rev Cat: A (Rel-17)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320204 CR on 38.101-4 Correction on "HARQ ACK/NACK bundling" for PDSCH test (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0450 rev Cat: A (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320208 CR on 38.141: Correction on applicability rules for different bandwidth for PRACH with LRA=1151 and 571 (Rel-16)**

*Type: CR For: Agreement  
 38.141-1 v16.17.0 CR-0397 rev Cat: F (Rel-16)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320209 CR on 38.141: Correction on applicability rules for different bandwidth for PRACH with LRA=1151 and 571 (Rel-17)**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0398 rev Cat: A (Rel-17)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320210 CR on 38.141: Correction on applicability rules for different bandwidth for PRACH with LRA=1151 and 571 (Rel-18)**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0399 rev Cat: A (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320211 CR on 38.101-4 Correcting applicability for FR2 multi-slot repetition test case (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0453 rev Cat: F (Rel-16)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320212 CR on 38.101-4 Correcting applicability for FR2 multi-slot repetition test case (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0454 rev Cat: A (Rel-17)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320213 CR on 38.101-4 Correcting applicability for FR2 multi-slot repetition test case (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0455 rev Cat: A (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320655 [NR\_L1enh\_URLLC-Perf] CR to TS38.101-4 Corrections to CQI Reporting tests with 1TX (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0456 rev Cat: F (Rel-16)  
  
 Source: MediaTek inc.*

**Decision: Merged (with R4-2319124).**

**R4-2320656 [NR\_newRAT-Perf] CR to TS38.101-4 Corrections to test parameters for CSI test cases (Rel-16)**

*Type: CR For: Agreement  
 38.101-4 v16.14.0 CR-0457 rev Cat: F (Rel-16)  
  
 Source: MediaTek inc.*

**Decision: Agreed.**

### 4.6 OTA and TRP/TRS test aspects

### 4.7 Rel-15/16 TEI

### 4.8 Moderator summary and conclusions (for Agenda 4)

## 5 Rel-17 maintenance for LTE and NR

**Guidance for maintenance agendas (AI 4, AI 5 and AI 6)**

The following guidance are provided for AI 4, AI5 and AI6:

- For maintenance agenda AI 4 (up to Rel-16), AI 5 (Rel-17) and AI 6 (Rel-18), formal CRs are expected and multiple formal CRs per company in the lowest agenda are allowed. For tracking the changes easily, it expected that one batch of CRs (Cat-F/A/…) will just cover a single topic/WI rather than multiple topics/WIs and Cat-F CR with corresponding Cat-A CRs needs be submitted under the same agenda.

- When submitting contributions to AI 4, AI 5 and AI 6, please add [WI\_code] in the beginning of titles for both discussion files and CRs to facilitate moderators and session chairs handling.

- When reserving the tdoc number, please use the correct WI code rather than simply using TEI and fill the column of “Related WIs” in your reservation spreadsheet. If you submit a CR with TEI as WI code, please inform session chair.

### 5.1 Rel-17 spectrum related WI maintenance

### 5.2 Rel-17 non-spectrum related WI maintenance

#### 5.2.1 UE RF requirements

#### 5.2.2 BS RF requirements and BS conformance testing

**R4-2318293 CR for TS 38.108, Correction on out-of-band emissions**

*Type: CR For: Agreement  
 38.108 v17.5.0 CR-0044 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Revised to R4-2321165 (from R4-2318293).**

[**R4-2321165**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321165.zip) **CR for TS 38.108, Correction on out-of-band emissions**

*Type: CR For: Agreement  
 38.108 v17.5.0 CR-0044 rev Cat: F (Rel-17)  
  
 Source: CATT, China Telecom, NEC, Ericsson*

**Decision: Agreed.**

**R4-2318294 CR for TS 38.108, Correction on out-of-band emissions**

*Type: CR For: Agreement  
 38.108 v18.0.0 CR-0045 rev Cat: A (Rel-18)  
  
 Source: CATT, China Telecom, NEC, Ericsson*

**Decision: Agreed.**

**R4-2318295 CR for TS 38.181, Correction on out-of-band emissions**

*Type: CR For: Agreement  
 38.181 v17.2.0 CR-0011 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Revised to R4-2321166 (from R4-2318295).**

[**R4-2321166**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321166.zip) **CR for TS 38.181, Correction on out-of-band emissions**

*Type: CR For: Agreement  
 38.181 v17.2.0 CR-0011 rev Cat: F (Rel-17)  
  
 Source: CATT, China Telecom, NEC, Ericsson*

**Decision: Agreed.**

**R4-2318296 CR for TR 38.863, Correction on interfering signal power for out-of-band blocking**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0008 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision:** The document was **withdrawn**.

**R4-2318297 Discussion on out-of-band emission and out-of-band blocking interfering signal power for FR1 NTN SAN**

*Type: other For: Approval  
 Source: CATT*

**Decision:** The document was **withdrawn**.

**R4-2318306 CR for TR 38.863, Correction on Satellite and UE Antenna and beam forming pattern modelling**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0009 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Revised to R4-2321167 (from R4-2318306).**

[**R4-2321167**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321167.zip) **CR for TR 38.863, Correction on Satellite and UE Antenna and beam forming pattern modelling**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0009 rev Cat: F (Rel-17)  
  
 Source: CATT*

**Decision: Agreed.**

Huawei: During this meeting we should focus on closure of Rel-18, but many documents not related to Rel-18 closure.

**R4-2318542 Correction to TR 38.852**

*Type: CR For: Agreement  
 38.852 v17.2.0 CR-0005 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects - coordinated deployment

**Decision:** The document was **withdrawn**.

**R4-2318543 Correction to TR 38.853**

*Type: CR For: Agreement  
 38.853 v17.2.0 CR-0005 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects: coordinated deployment.

**Decision:** The document was **withdrawn**.

**R4-2318562 Removal of RMR Wide Area BS type 1-C output power limits**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0527 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Removal of RMR Wide Area BS type 1-C output power limits

**Decision:** The document was **withdrawn**.

**R4-2318563 Removal of RMR Wide Area BS type 1-C output power limits**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0390 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Removal of RMR Wide Area BS type 1-C output power limits

**Decision:** The document was **withdrawn**.

**R4-2319308 [NR\_cov\_enh-Perf] CR for configuration of FR1 PUSCH TBoMS demodulation requirement**

*Type: CR For: Agreement  
 38.141-2 v17.11.0 CR-0554 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

correction on aTDW value for FDD

**Decision: Postponed.**

**R4-2319309 [NR\_cov\_enh-Perf] CR for TS38.141-2 correction on configuration in FDD (Rel-18 CAT A)**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0555 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

correction on aTDW value for FDD

**Decision: Withdrawn.**

**R4-2320159 CR to 38.141-2: Measurement uncertainty for OBW in FR2-2 (Rel-17)**

*Type: CR For: Agreement  
 38.141-2 v17.11.0 CR-0559 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Not pursued.**

**R4-2320160 CR to 38.141-2: Measurement uncertainty for OBW in FR2-2 (Rel-18)**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0560 rev Cat: A (Rel-18)  
  
 Source: NEC*

**Decision: Withdrawn.**

**R4-2320161 Discussion on terminologies “transmitter OFF state” and “transmitter ON state” in the repeater specifications**

*Type: discussion For: Discussion  
 Source: NEC*

**Decision: Noted.**

**R4-2320162 CR to 38.106: Correction of terminologies for NR repeaters (Rel-17)**

*Type: CR For: Agreement  
 38.106 v17.6.0 CR-0043 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Revised to R4-2321168 (from R4-2320162).**

[**R4-2321168**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321168.zip) **CR to 38.106: Correction of terminologies for NR repeaters (Rel-17)**

*Type: CR For: Agreement  
 38.106 v17.6.0 CR-0043 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Agreed.**

**R4-2320163 CR to 38.106: Correction of terminologies for NR repeaters (Rel-18)**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0044 rev Cat: A (Rel-18)  
  
 Source: NEC*

**Decision: Agreed.**

**R4-2320164 CR to 38.115-1: Correction of terminologies for NR repeaters (Rel-17)**

*Type: CR For: Agreement  
 38.115-1 v17.3.0 CR-0021 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Revised to R4-2321169 (from R4-2320164).**

[**R4-2321169**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321169.zip) **CR to 38.115-1: Correction of terminologies for NR repeaters (Rel-17)**

*Type: CR For: Agreement  
 38.115-1 v17.3.0 CR-0021 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Agreed.**

**R4-2320165 CR to 38.115-1: Correction of terminologies for NR repeaters (Rel-18)**

*Type: CR For: Agreement  
 38.115-1 v18.2.0 CR-0022 rev Cat: A (Rel-18)  
  
 Source: NEC*

**Decision: Agreed.**

**R4-2320166 CR to 38.115-2: Correction of terminologies for NR repeaters**

*Type: CR For: Agreement  
 38.115-2 v17.3.0 CR-0010 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Revised to R4-2321170 (from R4-2320166).**

[**R4-2321170**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321170.zip) **CR to 38.115-2: Correction of terminologies for NR repeaters**

*Type: CR For: Agreement  
 38.115-2 v17.3.0 CR-0010 rev Cat: F (Rel-17)  
  
 Source: NEC*

**Decision: Agreed.**

**R4-2320263 CR to TS 38.106 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.106 v17.6.0 CR-0046 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320264 CR to TS 38.106 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0047 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Revised to R4-2321171 (from R4-2320264).**

[**R4-2321171**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321171.zip) **CR to TS 38.106 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0047 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320265 CR to TS 38.114 with update to manufacturer declaration and references**

*Type: CR For: Agreement  
 38.114 v17.3.0 CR-0008 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320266 CR to TS 38.115-1 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.115-1 v17.3.0 CR-0023 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320267 CR to TS 38.115-1 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.115-1 v18.2.0 CR-0024 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320268 CR to TS 38.174 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0079 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320269 CR to TS 38.174 with correction of co-location requirements**

*Type: CR For: Agreement  
 38.174 v17.5.0 CR-0080 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320270 CR to TS 38.176-1 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.176-1 v18.2.0 CR-0036 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320271 CR to TS 38.176-1 with correction of co-location requirements**

*Type: CR For: Agreement  
 38.176-1 v17.6.0 CR-0037 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320272 CR to TS 38.176-2 with correction of co-existence and co-location requirements**

*Type: CR For: Agreement  
 38.176-2 v18.2.0 CR-0039 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320273 CR to TS 38.176-2 with correction of co-existence requirements**

*Type: CR For: Agreement  
 38.176-2 v17.6.0 CR-0040 rev Cat: F (Rel-17)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Agreed.**

**R4-2320532 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.174 v17.5.0 CR-0086 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320533 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0087 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320534 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.176-1 v17.6.0 CR-0039 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320535 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.176-1 v18.2.0 CR-0040 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320536 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.176-2 v17.6.0 CR-0042 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320537 CR to update FR2 range in IAB specification**

*Type: CR For: Agreement  
 38.176-2 v18.2.0 CR-0043 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

CR to update FR2 range in IAB specification

**Decision: Agreed.**

**R4-2320705 Correction to TR 38.852**

*Type: CR For: Agreement  
 38.852 v17.2.0 CR-0006 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects - remove uncoordinated deployment.

**Decision: Revised to R4-2321172 (from R4-2320705).**

[**R4-2321172**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321172.zip) **Correction to TR 38.852**

*Type: CR For: Agreement  
 38.852 v17.2.0 CR-0006 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects - remove uncoordinated deployment.

**Decision: Agreed.**

**R4-2320706 Correction to TR 38.853**

*Type: CR For: Agreement  
 38.853 v17.2.0 CR-0006 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects: remove uncoordinated deployment.

**Decision: Revised to R4-2321173 (from R4-2320706).**

[**R4-2321173**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321173.zip) **Correction to TR 38.853**

*Type: CR For: Agreement  
 38.853 v17.2.0 CR-0006 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Correction to section 9 Deployment aspects: remove uncoordinated deployment.

**Decision: Agreed.**

**R4-2320710 Removal of RMR Wide Area BS type 1-C rated output power limits**

*Type: CR For: Agreement  
 38.104 v17.11.0 CR-0545 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Removal of RMR Wide area BS type 1-C output power limits

**Decision: Postponed.**

**R4-2320712 Removal of RMR Wide Area BS type 1-C rated output power limits**

*Type: CR For: Agreement  
 38.141-1 v17.11.0 CR-0401 rev Cat: F (Rel-17)  
  
 Source: Union Inter. Chemins de Fer*

**Abstract:**

Removal of RMR Wide Area BS type 1-C rated output power limits

**Decision: Postponed.**

#### 5.2.3 RRM requirements

#### 5.2.4 Demodulation and CSI requirements

**R4-2318740 CR to 38.101-4 Correction to report quantity for 1Tx CQI tests (Rel 17 - Cat A)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0427 rev Cat: A (Rel-17)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision: Withdrawn.**

**R4-2319220 CR to 38.101-5: Correction on the reference measurement channel for NTN PDSCH requirement**

*Type: CR For: Agreement  
 38.101-5 v17.5.0 CR-0043 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

Correct FRC for NTN PDSCH requirements

**Decision: Agreed.**

**R4-2319221 CR to 38.101-5: Correction on the reference measurement channel for NTN PDSCH requirement**

*Type: CR For: Agreement  
 38.101-5 v18.3.0 CR-0044 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Correct FRC for NTN PDSCH requirements

**Decision: Agreed.**

**R4-2319326 [NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0441 rev Cat: A (Rel-17)  
  
 Source: Samsung*

**Decision: Revised to R4-2321176 (from R4-2319326).**

[**R4-2321176**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321176.zip) **[NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0441 rev Cat: A (Rel-17)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2319327 [NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0442 rev Cat: A (Rel-18)  
  
 Source: Samsung*

**Decision: Revised to R4-2321177 (from R4-2319327).**

[**R4-2321177**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321177.zip) **[NR\_newRAT-Perf, NR\_redcap-Perf] CR on 38.101-4 general applicablity of requirements (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0442 rev Cat: A (Rel-18)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2319328 [NR\_ext\_to\_71GHz-Perf] CR on 38.101-4 general applicablity of requirements (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0443 rev Cat: F (Rel-17)  
  
 Source: Samsung*

**Decision: Revised to R4-2321179 (from R4-2319328).**

[**R4-2321179**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321179.zip) **[NR\_ext\_to\_71GHz-Perf] CR on 38.101-4 general applicablity of requirements (Rel-17)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0443 rev Cat: F (Rel-17)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2319329 [NR\_ext\_to\_71GHz-Perf] CR on 38.101-4 general applicablity of requirements (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0444 rev Cat: A (Rel-18)  
  
 Source: Samsung*

**Decision: Revised to R4-2321180 (from R4-2319329).**

[**R4-2321180**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321180.zip) **[NR\_ext\_to\_71GHz-Perf] CR on 38.101-4 general applicablity of requirements (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0444 rev Cat: A (Rel-18)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2319708 [NR\_ext\_to\_71GHz-Perf] CR to 38.141-2: 71 GHz Extension BS performance test PRACH offset correction R17**

*Type: CR For: Agreement  
 38.141-2 v17.11.0 CR-0556 rev Cat: F (Rel-17)  
  
 Source: Keysight Technologies UK Ltd*

**Decision: Agreed.**

**R4-2319709 [NR\_ext\_to\_71GHz-Perf] CR to 38.141-2: 71 GHz Extension BS performance test PRACH offset correction R18**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0557 rev Cat: A (Rel-18)  
  
 Source: Keysight Technologies UK Ltd*

**Decision: Agreed.**

**R4-2319737 Correction of CSI FR1 RMC table foramt for CQI table 1**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0445 rev Cat: F (Rel-17)  
  
 Source: Ericsson*

**Abstract:**

This CR corrects the CSI RMC table.

**Decision: Agreed.**

**R4-2319738 Correction of CSI FR1 RMC table foramt for CQI table 1**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0446 rev Cat: A (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This CR corrects the CSI RMC table.

**Decision: Agreed.**

**R4-2320205 Maintenance on test parameters on FR2-2 PDSCH tests**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320206 CR on 38.101-4 Correction on test paramters for FR2-2 PDSCH test with 480kHz**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0451 rev Cat: F (Rel-17)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321181 (from R4-2320206).**

[**R4-2321181**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321181.zip) **CR on 38.101-4 Correction on test paramters for FR2-2 PDSCH test with 480kHz**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0451 rev Cat: F (Rel-17)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320207 CR on 38.101-4 Correction on some parameters for FR2-2 UE test (Rel-18)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0452 rev Cat: A (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Agreed.**

**R4-2320785 CR to align Rank on TDD Redcap CQI Tests - [Rel.17 Cat.F]**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0458 rev Cat: F (Rel-17)  
  
 Source: Qualcomm Inc.*

**Abstract:**

Note: The change request number on CR cover for TDoc R4-2320785 does not have correct value: 0458.

**Decision: Revised to R4-2321182 (from R4-2320785).**

[**R4-2321182**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321182.zip) **CR to align Rank on TDD Redcap CQI Tests - [Rel.17 Cat.F]**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0458 rev Cat: F (Rel-17)  
  
 Source: Qualcomm Inc.*

**Abstract:**

Note: The change request number on CR cover for TDoc R4-2320785 does not have correct value: 0458.

**Decision: Agreed.**

**R4-2320786 CR to align Rank on TDD Redcap CQI Tests - [Rel.18 Cat.A]**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0459 rev Cat: A (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Agreed.**

**R4-2320878 [NR\_NTN\_solutions-Perf] CR to 38.101-5 Clarify test condition for NR NTN**

*Type: CR For: Agreement  
 38.101-5 v17.5.0 CR-0050 rev Cat: F (Rel-17)  
  
 Source: Qualcomm Inc*

**Decision: Not pursued.**

Chair: This document was moved to AI 12.1

**R4-2320882 [NR\_HST\_FR1\_enh] HST-DPS model clarification (CA)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0461 rev Cat: F (Rel-17)  
  
 Source: QUALCOMM Europe Inc. - Spain*

**Abstract:**

Note: The release for the reserved CR is 3GU but the CR coversheet is Rel-16.

**Decision:** The document was **withdrawn**.

**R4-2320883 [NR\_HST\_FR1\_enh] HST-DPS model clarification (CA)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0462 rev Cat: A (Rel-18)  
  
 Source: QUALCOMM Europe Inc. - Spain*

**Decision: Agreed.**

**R4-2320890 [LTE\_NBIoT\_eMTC\_NTN\_req] CR to 36.102 Clarify test condition for IoT NTN**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0026 rev Cat: F (Rel-18)  
  
 Source: Qualcomm Inc*

**Abstract:**

**Decision: Revised to R4-2321034 (from R4-2320890).**

[**R4-2321034**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321034.zip) **[LTE\_NBIoT\_eMTC\_NTN\_req] CR to 36.102 Clarify test condition for IoT NTN**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0026 rev Cat: F (Rel-18)  
  
 Source: Qualcomm Inc*

**Abstract:**

**Decision: Revised to R4-2321062 (from R4-2321034).**

R&S: Tdoc number on cover sheet is incorrect

[**R4-2321062**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321062.zip) **[LTE\_NBIoT\_eMTC\_NTN\_req] CR to 36.102 Clarify test condition for IoT NTN**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0026 rev Cat: F (Rel-18)  
  
 Source: Qualcomm Inc*

**Abstract:**

**Decision: Agreed.**

**R4-2320950 [NR\_HST\_FR1\_enh] HST-DPS model clarification (CA)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0463 rev Cat: F (Rel-17)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321185 (from R4-2320950).**

**[R4-2321185](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321185.zip) [NR\_HST\_FR1\_enh] HST-DPS model clarification (CA)**

*Type: CR For: Agreement  
 38.101-4 v17.10.0 CR-0463 rev Cat: F (Rel-17)  
  
 Source: Qualcomm Inc.*

**Decision: Agreed.**

#### 5.2.5 OTA and TRP/TRS test aspects

**R4-2318978 CR to TS 38.161 on Applicability rules and test configurations**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0021 rev Cat: F (Rel-17)  
  
 Source: vivo*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh

**Decision: Revised to R4-2321109 (from R4-2318978).**

**[R4-2321109](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321109.zip) CR to TS 38.151 on test configurations**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0021 rev Cat: F (Rel-17)  
  
 Source: vivo*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh

**Decision: Agreed.**

**R4-2319271 CR on introduction of applicability rules for MIMO OTA requirements**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0022 rev Cat: F (Rel-17)  
  
 Source: Samsung*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh.

**Decision: Revised to R4-2321110 (from R4-2319271).**

[**R4-2321110**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321110.zip) **CR on introduction of applicability rules for MIMO OTA requirements**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0022 rev Cat: F (Rel-17)  
  
 Source: Samsung, Apple, Qualcomm, CAICT*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh.

**Decision: Agreed.**

**R4-2320596 CR to TS 38.151 on FR2 channel model validation pass/fail limits**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0023 rev Cat: F (Rel-17)  
  
 Source: CAICT*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh

.

**Decision: Agreed.**

**R4-2320597 On MIMO OTA Doppler validation pass fail limits**

*Type: other For: Approval  
 Source: CAICT*

**Abstract:**

Note: This contribution will be treated under [109][336] NR\_MIMO\_OTA\_enh.

**Decision: Noted.**

### 5.3 Rel-17 TEI

### 5.4 Moderator summary and conclusions (for Agenda 5)

**R4-2318207 Topic summary for [109][315] Demod\_Maintenance**

*Type: other For: Information  
 Source: Moderator (Nokia)*

**Abstract:**

[109][300] BDaT Session AI 4.5, 5.2.4

**Decision: Noted.**

[**R4-2321112**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321112.zip) **Ad-hoc meeting minutes on [109][315] Demod\_Maintenance**

*Type: other For: Information  
 Source: Nokia*

**Decision: Noted.**

Concerning OCNG transmission, RAN4 agrees: Transmit OCNG in first symbol for slot without PDCCH for 480kHz SCS to ensure the constant power in one slot and follow the tradition of RAN4 test setup.

**R4-2318225 Topic summary for [109][333] OTA\_Maintenance (placeholder)**

*Type: other For: Information  
 Source: Moderator (Keysight)*

**Abstract:**

[109][300] BDaT Session AI 4.6, 5.2.5

**Decision: Withdrawn.**

## 6 Rel-18 maintenance for LTE and NR

**Guidance for maintenance agendas (AI 4, AI 5 and AI 6)**

The following guidance are provided for AI 4, AI5 and AI6:

- For maintenance agenda AI 4 (up to Rel-16), AI 5 (Rel-17) and AI 6 (Rel-18), formal CRs are expected and multiple formal CRs per company in the lowest agenda are allowed. For tracking the changes easily, it expected that one batch of CRs (Cat-F/A/…) will just cover a single topic/WI rather than multiple topics/WIs and Cat-F CR with corresponding Cat-A CRs needs be submitted under the same agenda.

- When submitting contributions to AI 4, AI 5 and AI 6, please add [WI\_code] in the beginning of titles for both discussion files and CRs to facilitate moderators and session chairs handling.

- When reserving the tdoc number, please use the correct WI code rather than simply using TEI and fill the column of “Related WIs” in your reservation spreadsheet. If you submit a CR with TEI as WI code, please inform session chair.

**R4-2320867 CR to 38.101-4 Correction to report quantity for 1Tx CQI tests (Rel 18 - Cat A)**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0460 rev Cat: A (Rel-18)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision: Withdrawn.**

### 6.1 Rel-18 spectrum related WI maintenance

### 6.2 Rel-18 non-spectrum related WI maintenance

#### 6.2.1 UE RF requirements

#### 6.2.2 BS RF requirements

#### 6.2.3 RRM requirements

#### 6.2.4 Other dedicated Rel-18 Wis

##### 6.2.4.1 NB-IoT/eMTC core & perf. requirements for NTN

###### 6.2.4.1.1 SAN RF requirement and conformance testing

**R4-2318443 CR on Unwanted emission requirement for IoT NTN**

*Type: CR For: Agreement  
 36.181 v18.1.0 CR-0008 rev Cat: F (Rel-18)  
  
 Source: China Telecom, NEC*

**Decision: Revised to R4-2321113 (from R4-2318443).**

[**R4-2321113**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321113.zip) **CR on Unwanted emission requirement for IoT NTN**

*Type: CR For: Agreement  
 36.181 v18.1.0 CR-0008 rev Cat: F (Rel-18)  
  
 Source: China Telecom, NEC, Thales, CATT*

**Decision: Agreed.**

**R4-2320158 CR to 36.108: Out-of-band emissions requirements**

*Type: CR For: Agreement  
 36.108 v18.3.0 CR-0017 rev Cat: F (Rel-18)  
  
 Source: NEC, China Telecom*

**Decision: Revised to R4-2321189 (from R4-2320158).**

**[R4-2321189](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321189.zip) CR to 36.108: Out-of-band emissions requirements**

*Type: CR For: Agreement  
 36.108 v18.3.0 CR-0017 rev Cat: F (Rel-18)  
  
 Source: NEC, China Telecom, Thales, CATT, Ericsson*

**Decision: Agreed.**

###### 6.2.4.1.2 UE RF requirement

###### 6.2.4.1.3 RRM requirement

###### 6.2.4.1.4 Demodulation requirements

**R4-2318060 CR on TS 36.181 for SAN Demodulation (Rel 18, Cat F)**

*Type: CR For: Agreement  
 36.181 v18.1.0 CR-0007 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

removal of []

**Decision:** The document was **withdrawn**.

**R4-2318080 CR to TS36.102 Addition of downlink physical channels for connection set-up for Cat NB1 and NB2**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0020 rev Cat: F (Rel-18)  
  
 Source: MediaTek inc.*

**Decision:** The document was **withdrawn**.

**R4-2318509 CR on TS 36.181 for SAN Demodulation (Rel 18, Cat F)**

*Type: CR For: Agreement  
 36.181 v18.1.0 CR-0009 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Updates of SNR values following alignment

**Decision: Postponed.**

**R4-2319735 Completion of eMTC SAN demodulation requirements**

*Type: CR For: Agreement  
 36.108 v18.3.0 CR-0015 rev Cat: F (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This CR cleanup the values to finalized the SAN demodulatation requirements for IoT-NTN.

**Decision: Postponed.**

**R4-2319736 Correction of FRC for eMTC UE demodulation requirements**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0024 rev Cat: F (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This CR corrects the FRC used for Cat-M1 UE demodulatation requirements for IoT-NTN.

**Decision: Agreed.**

**R4-2319848 Simulation results for eMTC and NB-IoT over NTN**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319849 [LTE\_NBIOT\_eMTC\_NTN\_req-Perf]CR on SAN demodulation requirements for NB-IoT over NTN**

*Type: CR For: Agreement  
 36.108 v18.3.0 CR-0016 rev Cat: F (Rel-18)  
  
 Source: Samsung*

**Abstract:**

Note: The CR coversheet has the incorrect CR number -0016

**Decision:** The document was **withdrawn**.

**R4-2320227 [LTE\_NBIOT\_eMTC\_NTN\_req-Perf] CR on IOT NTN demodulation performance requirements (TS36.181, Rel-18)**

*Type: CR For: Agreement  
 36.181 v18.1.0 CR-0010 rev Cat: F (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Postponed.**

**R4-2320228 Simulation results on SAN demodulation requirements for LTE NTN IOT**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320654 CR to TS36.102 Addition of downlink physical channels for connection set-up for Cat NB1 and NB2**

*Type: CR For: Agreement  
 36.102 v18.3.0 CR-0025 rev Cat: F (Rel-18)  
  
 Source: MediaTek*

**Decision: Agreed.**

##### 6.2.4.2 In-Device Co-existence (IDC) enhancements for NR and MR-DC

### 6.3 Rel-18 TEI

### 6.4 Moderator summary and conclusions

**R4-2318193 Topic summary for [109][301] BSRF\_Maintenance**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 4.2, 5.2.2, 6.2.2

**Decision: Noted.**

**R4-2318206 Topic summary for [109][314] IoT\_NTN\_SANRF**

*Type: other For: Information  
 Source: Moderator (Huawei)*

**Abstract:**

[109][300] BDaT Session AI 6.2.4.1.1, 9.6.3

**Decision: Withdrawn.**

## 7 Rel-18 on-going spectrum related WIs for NR

## 8 Rel-18 on-going non-spectrum related work items and study items for NR

### 8.1 Study on simplification of band combination specification for NR and LTE

### 8.2 Study on NR FR2 OTA testing enhancements

#### 8.2.1 General aspects

**R4-2319922 TP to TR38.871 for test procedure of UE RF multi-Rx**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: OPPO*

**Decision: Revised to R4-2321102 (from R4-2319922).**

[**R4-2321102**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321102.zip) **TP to TR38.871 for test procedure of UE RF multi-Rx**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: OPPO, Samsung*

**Decision: Approved.**

**R4-2319923 TP to TR 38.871 for UE coordinate system**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: OPPO*

**Decision: Revised to R4-2321101 (from R4-2319923).**

[**R4-2321101**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321101.zip) **TP to TR 38.871 for UE coordinate system**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: OPPO*

**Decision: Approved.**

**R4-2320390 TP to TR 38.871 on draft summary and editorial changes**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Agreed.**

**R4-2320391 3GPP TR 38.871 v0.6.0**

*Type: draft TR For: Agreement  
 38.871 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision:** For email approval.

**R4-2320408 TP on TR 38.871 on RRM Measurement uncertainty**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Capture agreed MU assessment as the baseline in RAN4#108bis

**Decision: Merged (with R4-2320389).**

**R4-2320409 TP on TR 38.871 for RRM test method**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Abstract:**

Capture an example of Time and Frequency multiplexed downlink transmission for Category 2 scenario with 3 probes

**Decision: Merged (with R4-2320387).**

#### 8.2.2 Test methods for RF requirements

**R4-2318838 On Multi-RX UE RF Testing and Positioning Topics**

*Type: other For: Approval  
 Source: Keysight Technologies UK Ltd*

**Decision: Noted.**

**R4-2318986 Discussion on FR2 multi-Rx RF test method**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2319268 Discussion on 2AoA spherical coverage measurement grid and test procedure**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319917 Discussion on the re-positioning for multi-Rx**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2319918 Further discussion on Multi-Rx test procedure**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320382 Views on RF test method for FR2 multi-Rx UE**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320386 TP to TR 38.871 on step size of measurement grid**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Revised to R4-2321103 (from R4-2320386).**

[**R4-2321103**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321103.zip) **TP to TR 38.871 on step size of measurement grid**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Approved.**

**R4-2320411 Discussion on Test method for UE RF**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.2.3 Test methods for RRM requirements

**R4-2320383 Views on RRM test method for FR2 multi-Rx UE**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320387 TP to TR 38.871 on RRM test method**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Revised to R4-2321104 (from R4-2320387).**

[**R4-2321104**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321104.zip) **TP to TR 38.871 on RRM test method**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated, Huawei*

**Decision: Approved.**

**R4-2320410 Discussion on Test method for UE RRM**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.2.4 Test methods for Demodulation requirements

**R4-2318837 On Multi-RX UE Demod Isolation MU**

*Type: other For: Approval  
 Source: Keysight Technologies UK Ltd*

**Decision: Noted.**

**R4-2320384 Views on demodulation test method for FR2 multi-Rx UE**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320388 TP to TR 38.871 on Demodulation test method**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Revised to R4-2321105 (from R4-2320388).**

**[R4-2321105](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321105.zip) TP to TR 38.871 on Demodulation test method**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Approved.**

#### 8.2.5 Test uncertainty assessments

**R4-2318987 Preliminary MU assessment for multi-Rx RF testing**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2320385 MU assessment for FR2 multi-Rx UE test methodology**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320389 TP to TR 38.871 on MU assessment**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Revised to R4-2321106 (from R4-2320389).**

**[R4-2321106](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321106.zip) TP to TR 38.871 on MU assessment**

*Type: pCR For: Approval  
 38.871 v0.5.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated, Huawei, vivo*

**Decision: Approved.**

#### 8.2.6 Moderator summary and conclusions

**R4-2318226 Topic summary for [109][334] FS\_NR\_FR2\_OTA\_enh**

*Type: other For: Information  
 Source: Moderator (Qualcomm)*

**Abstract:**

[109][300] BDaT Session AI 8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5

**Decision: Noted.**

[**R4-2321093**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321093.zip) **Ad-hoc meeting minutes for [109][334] FS\_NR\_FR2\_OTA\_enh**

*Type: other For: Information  
 Source: Qualcomm*

**Decision: Noted.**

**Issue 1-1-1: Step size of the measurement grid**

* Proposals
  + Proposal 1 (Qualcomm): RAN4 to adopt 10deg as the step size of measurement grid for multi-Rx UE RF testing.
  + Proposal 2 (Samsung, Huawei): RAN4 to adopt 15deg as the step size of measurement grid for multi-Rx UE RF testing.
* Recommended WF
  + RAN4 to adopt [15deg] as the step size of measurement grid for multi-Rx UE RF testing.

Discussion:

Qualcomm: We are OK with proposal 2.

Agreements: (agreed online)

* + RAN4 to adopt 15deg as the step size of measurement grid for multi-Rx UE RF testing.

**Issue 1-2-1: Starting of UE orientations for multi-Rx UE RF testing**

**Agreements: (agreed online)**

* + Fix 0°≤ ≤180° in the testing and add following additional alignment option should be considered on top of UE alignments and orientations in Table 1.2.2-1. The total starting UE orientations is 12.
  + The starting of UE alignments should be declared by UE vendor for the testing.
  + ~~FFS on the naming of UE orientations.~~
  + Include the current figure into the TP with a note that the figure will be updated in maintenance. The figure can then be updated in the next meeting.

Online:

Keysight: We have an idea already of the naming

R&S: We cannot complete the figure by the end of the week. Can we have the TP for post meeting email approval?

Oppo: We can confirm the name this week even without the figure.

Keysight: We need to have the figure so there is no misunderstanding among companies for simulations next meeting. We can include the figure from Keysight. We should not agree to a TP w/o a figure.

Qualcomm: Include the current figure into the TP with a note that the figure will be updated in maintenance. The figure can then be updated in the next meeting.

**Issue 1-2-2 Positioner blocking**

* Agreements: (agreed online)
  + RAN4 to adopt re-positioning for multi-Rx measurement to avoid AoA blockage. The following Alt 1 could be considered as the baseline.
    - Alt 1: The initial positioner/UE orientation is selected to be (-90° - ½ angular separation). The minimum angular separation between positioner and probe(s) are listed below.

|  |  |
| --- | --- |
| **Declared Angular Separation [°]** | **Min Angular Separation between Positioner and Probe(s) [°]** |
| 30 | 75 |
| 60 | 60 |
| 90 | 45 |
| 120 | 30 |
| 150 | 15 |

* + - Details of re-positioning concept are TBD

Online:

Keysight: The repositioning concept for multi-Rx needs further discussion. Alt1 is only about initial position.

Qualcomm: We can capture this high level in the TR. Detailed figures can be added later.

**Issue 1-3-1: Test procedure**

* + Proposal 2 (OPPO, Samsung): Introduces the 2-DL MIMO signals with TRP1&TRP2 simultaneously

A screenshot of a computer program

Description automatically generated

Figure 1.2.3-2: The test procedure of proposal 2

Agreements: (agreed online)

* + Proposal 2 is agreed as the baseline. Capture the test procedure in TR 38.871.

**Issue 2-1-1: Measurement setup for Dual DCI switching (i.e., Category 2)**

* Proposals
  + Proposal 1 (Qualcomm): To update test procedure as follows: In the period of T1, DUT connects TCI state 0 via Probe#1. In the period of T2, DUT measures the SSBs from Probe 2 and Probe 3 while keeping the connection from Probe 1. And then DUT simultaneously switches from Probe 1 to Probe 2 and 3.

A diagram of a satellite

Description automatically generated

Figure 2.2.1-1: Illustration of measurement setup for Dual TCI switching

* + Proposal 2 (Huawei): Consider the measurement setup below as baseline for Dual TCI switching

A diagram of different colored squares

Description automatically generated

Figure 2.2.1-2: Illustration of test procedure for Dual TCI switching

* Recommended WF
  + Proposal 1 and proposal 2 are agreed as the measurement setup for Dual TCI switching
  + To capture both two proposals in TR 38.871.

Discussion:

Anritsu: clarifications on the test procedure: Is it possible to have dual DCIs connecting in T1 with three probes.

* Agreements (agreed online)
  + Proposal 1 and proposal 2 are agreed as the measurement setup for Dual TCI switching
  + To capture both two proposals in TR 38.871.
  + The illustration of test procedure shown in Figure 2.2.1-1 is an example. It is not precluded for other test procedure based on 3 probe measurement setup.

**Issue 2-1-2: Side condition for Dual TCI switching**

* Proposals
  + Proposal 1 (Qualcomm): In the period of T1, the candidate test direction is selected from legacy EIS spherical coverage. In the period of T2, the candidate test directions (AoA pairs) are selected from multi-Rx spherical coverage requirements defined in UE RF session.
* Recommended WF
  + Proposal 1 is agreed
* Agreements (agreed online)
  + Proposal 1 is agreed

**Issue 3-1-1: Minimum isolation**

* Proposals
  + Proposal 1 (Qualcomm): RAN4 recommends setting the MU introduced by non-ideal minimum isolation within 1dB. The final minimum isolation and MU values should be determined by RAN5.
  + Proposal 2 (Keysight): Limit the minimum isolation of 12 dB for FR2 4x4 multi-RX demod testing.
  + Proposal 3: (Keysight): More discussions between the SI delegates (working on the testability) and WI delegates (working on the requirements) are necessary in RAN4 to determine the next steps unless this discussion is deferred to RAN5.

Agreements: (agreed online)

* Keep -[12dB] as the starting point for the min. isolation requirements in RAN4.
* RAN4 recommended the target of SNR delta, i.e., MU due to non-ideal isolation is 1dB.
* The final minimum isolation and corresponding MU defer the discussion to RAN5.
* OEMs are encouraged to provide simulation results for the number of feasible AoA pair with different min. isolation assumptions.

Online:

Qualcomm: Can we consider -15dB for min isolation instead of -12dB?

Keysight: Cannot agree. Can OEM’s guarantee UE’s will always provide 15 dB without intervention from TE vendor?

Oppo: Is the -15 dB isolation a requirement for the UE or for the call box?

R&S: It is a side condition for the test to be performed. We need to find an orientation where 15 dB can be met.

Samsung: QC’s concern on -12 dB is reasonable. A similar situation exists with legacy UE. The same approach could be reused.

Qualcomm: For 2x2, simulations showed -12 dB was sufficient so we didn’t need to search for anything better. But in this case, -12 dB results in 4 dB MU. We have provided simulations that -15 dB based on UE RF. The TE vendor can further improve on this with special techniques.

Keysight: Even 15 dB isolation does not give us target SNR delta of 1 dB. We cannot sign up to 15 dB with TE vendor helping out. We may eventually conclude this is untestable test case in RAN5 because of the high MU.

**Issue 4-1-1: The value of X%**

* Proposals
  + Proposal 1 (vivo): ~~For OR combining,~~ ~~take the X% = 6% as starting point, and~~ For arithmetic mean combining, take X% = 4% as starting point.
  + Proposal 2 (Qualcomm): For arithmetic mean combining with adjacent modules, X%=9.3% as the starting point
* Recommended WF
  + Need more discussion.

Online:

Vivo: In RF session, it was agreed only arithmetic mean will be used

**Issue 4-1-2: The value of Y%**

* Proposals
  + Proposal 1 (vivo): Take the Y% = 3.5% as the starting point.
  + Proposal 2 (Qualcomm): Table Y% = 1.1% as the starting point
* Recommended WF
  + Need more discussion.

Online:

Vivo: Agree an average value of 2.3% as the starting point

### 8.3 Further RF requirements enhancement for NR and EN-DC in FR1

#### 8.3.1 UE RF requirements

#### 8.3.2 RRM performance requirements

##### 8.3.2.1 RLM test cases to support 8Rx

#### 8.3.3 Demodulation and CSI requirements

##### 8.3.3.1 8Rx UE demodulation and CSI

**R4-2319705 8Rx for CPE/FWA/vehicle/industrial devices: Demodulation requirements**

*Type: discussion For: Discussion  
 Source: QUALCOMM Europe Inc. - Spain*

**Abstract:**

8Rx single carrier PDSCH simulation results, a proposal on margin enhancment.

**Decision: Noted.**

**R4-2320412 8Rx for CPE/FWA/vehicle/industrial devices: Demodulation requirements**

*Type: discussion For: Discussion  
 Source: QUALCOMM Europe Inc. - Spain*

**Abstract:**

Updated proposals of span and margin for 8Rx requirements.

**Decision: Noted.**

###### 8.3.3.1.1 General aspects

**R4-2318043 Discussion on 8Rx general demodulation aspects**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This document extends the discussion on the 8Rx UE demodulation and CSI requirements

**Decision: Noted.**

**R4-2318049 Introduction of 8Rx Applicability Rule**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Inclusion of 8Rx Applicability Rule

**Decision: Noted.**

Moderator: The content of this draft CR is included in other draft CR’s for single carrier and CA

**R4-2318671 Further Discussion on General Aspects of 8Rx Requirements in FR1**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2319227 Left open issues on general aspects for 8Rx in FR1**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the applicability rule for 8Rx.

**Decision: Noted.**

**R4-2319332 discussion on 8Rx general aspects requirements**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319534 Discussion on 8Rx UE demodulation requirements for CA**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

###### 8.3.3.1.2 PDSCH requirements

**R4-2318044 Discussion on PDSCH Demodulation Requirements for 8Rx**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia’s views on the open issues related to the 8Rx UE PDSCH demodulation.

**Decision: Noted.**

**R4-2318045 Supporting Simulation results for PDSCH demodulation for 8Rx**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this contribution, we provide the simulation results for 8 Rx PDSCH UE demodulation requirements. Discussion, observations, and proposals will be made in our companion Tdoc.

**Decision: Noted.**

**R4-2318050 Introduction of 8Rx CA Performance Requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Introduction of 8Rx CA Performance Requirements

**Decision: Revised to R4-2321198 (from R4-2318050).**

[**R4-2321198**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321198.zip) **Introduction of 8Rx CA Performance Requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Introduction of 8Rx CA Performance Requirements

**Decision: Endorsed.**

**R4-2318663 Discussion on PDSCH requirements for 8Rx UE**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318668 Draft CR to 38.101-4 Reference measurement channels for 8Rx CA PDSCH requirements (FDD, 8 layers)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: MediaTek inc.*

**Decision: Endorsed.**

**R4-2318672 On the PDSCH Demodulation Requirements for 8Rx UEs in FR1**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318675 Summary of Simulation Results for 8Rx Demodulation Requirements**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318676 draftCR on FRC for 8Rx UEs TDD 2 layers in CBW 5MHz to 30MHz**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: For email endorsement**

Apple: The delegate is not feeling well and has not been able to update the document. We request to consider this document for post-meeting email approval.

**R4-2318677 draftCR on FRC for 8Rx UEs TDD 2 layers in CBW 40MHz to100MHz**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: For email endorsement**

Apple: The delegate is not feeling well and has not been able to update the document. We request to consider this document for post-meeting email approval.

**R4-2319226 Simulation results collection for 8 Rx UE demodulation requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This contribution collects the simulation results from all interested companies.

**Decision: Noted.**

**R4-2319228 Draft CR to 38.101-4 for FRC for FDD 8 layers (30MHz,35MHz,40MHz, 45MHz, 50MHz)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides new FRC for FDD 8 layers

**Decision: Endorsed.**

**R4-2319229 Draft CR to 38.101-4 for FRC for TDD 8 layers (5MHz,10MHz,15MHz,20MHz,25MHz,30MHz)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides new FRC for TDD 8 layers

**Decision: Endorsed.**

**R4-2319230 Draft CR to 38.101-4 for FRC for FDD 2 layers (5MHz, 10MHz, 15MHz,20MHz,25MHz)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides new FRC for FDD 2 layers

**Decision: Endorsed.**

**R4-2319330 Draft CR on 8Rx PDSCH demodulation requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: Endorsed.**

**R4-2319331 Draft CR on FRC for TDD 8 layers (40-100MHz)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: Endorsed.**

**R4-2319333 discussion and simulation results on 8Rx PDSCH requirements**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319388 Draft CR on 8Rx PDSCH CA requirements FRC for FDD 2 layers**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: China Telecom*

**Decision: Revised to R4-2321197 (from R4-2319388).**

[**R4-2321197**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321197.zip) **Draft CR on 8Rx PDSCH CA requirements FRC for FDD 2 layers**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: China Telecom*

**Decision: Endorsed.**

**R4-2319389 Discussion on PDSCH CA requirements for UE with 8Rx: Simulation results**

*Type: discussion For: Discussion  
 Source: China Telecom*

**Decision: Noted.**

**R4-2319390 Discussion on PDSCH CA requirements for UE with 8Rx**

*Type: discussion For: Discussion  
 Source: China Telecom*

**Decision: Noted.**

**R4-2319535 Simulation results for PDSCH demodulation requirements for 8Rx CA**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320189 Discussions on remain issues on 8Rx PDSCH requirements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320190 Simulation results on 8Rx PDSCH requirements**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320191 CR on 38.101-4 Introduction of applicability rules for 8Rx CA requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

###### 8.3.3.1.3 SDR requirements

**R4-2318046 Discussion on SDR Demodulation Requirements for 8Rx**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia’s views on the open issues related to the 8Rx UE SDR demodulation.

**Decision: Noted.**

**R4-2318673 Discussion on SDR Requirements for 8Rx Ues**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

###### 8.3.3.1.4 CQI reporting requirements

**R4-2318047 Discussion on CQI Demodulation Requirements for 8Rx**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we present Nokia’s view on the impact to demodulation requirements.

**Decision: Noted.**

**R4-2318048 Supporting Simulation results for CQI demodulation for 8Rx**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper we provide CQI simulation results to support the 8Rx CQI discussions.

**Decision:** The document was **withdrawn**.

**R4-2318674 Discussion on CSI Requirements for 8Rx Ues**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

##### 8.3.3.2 4Tx BS demodulation

**R4-2318051 Disucssion on 4Tx Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this contribution we provide simulation results for 4Tx BS demodulation, based upon the parameters agreed at previous RAN4 meetings.

**Decision: Noted.**

**R4-2319317 Big CR for 38.104 on 4Tx PUSCH demodulation requirements**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0537 rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Big CR based on big draftCR after 108bis

**Decision: Agreed.**

**R4-2319528 CR to TS 38.141-1 for supporting of 4Tx in R18**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0392 rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision:** The document was **withdrawn**.

**R4-2319710 Correction on draft BtoigCR 38.141-1 NR\_ENDC\_RF\_FR1\_enh2-Perf 4Tx demod**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: (Rel-18)  
  
 Source: Keysight Technologies UK Ltd*

**Decision: Revised to R4-2321135 (from R4-2319710).**

[**R4-2321135**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321135.zip) **Correction on draft BigCR 38.141-1 NR\_ENDC\_RF\_FR1\_enh2-Perf 4Tx demod**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: (Rel-18)  
  
 Source: Keysight Technologies UK Ltd, NEC*

**Decision: Endorsed.**

**R4-2319812 CR to TS 38.141-1 for supporting of 4Tx in R18**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0396 rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Not pursued.**

[**R4-2321121**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321119.zip) **Draft CR to TS 38.141-1 for supporting of 4Tx in R18**

*Type: draftCR For: Endorsement  
 38.141-1 CR- rev Cat: (Rel-18)  
  
 Source: ZTE*

**Decision: Endorsed.**

**R4-2319850 Big CR for TS 38.141-2 on 4Tx demodulation requirements**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0558 rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Abstract:**

Note: The CR coversheet is missing CR number value 0558.

**Decision:** The document was **withdrawn**.

**R4-2320157 Draft CR to TS 38.141-1: FRC table for 4Tx PUSCH demodulation requirement**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Merged (with R4-2319710).**

#### 8.3.4 Moderator summary and conclusions

**R4-2318208 Topic summary for [109][316] RF\_FR1\_enh2\_Demod**

*Type: other For: Information  
 Source: Moderator (Huawei)*

**Abstract:**

[109][300] BDaT Session AI 8.3.3.1.1, 8.3.3.1.2, 8.3.3.1.3, 8.3.3.1.4, 8.3.3.2

**Decision: Noted.**

[**R4-2321038**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321038.zip) **Offline meeting minutes for [109][316] RF\_FR1\_enh2\_Demod**

*Type: other For: Information  
 Source: MediaTek*

**Abstract:**

**Decision: Revised to R4-2321100 (from R4-2321038).**

[**R4-2321100**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321100.zip) **Offline meeting minutes for [109][316] RF\_FR1\_enh2\_Demod**

*Type: other For: Information  
 Source: MediaTek*

**Abstract:**

**Decision: Noted.**

Chair: To be revised to capture further offline

**Issue 1-1-1: Test applicability rules**

*Background: In WF R4-2316914, RAN4 agreed to define the following 8Rx CA demodulation performance tests:*

* + *Rank 8 for 8Rx+8Rx, Rank 2 for 2Rx+8Rx and 4Rx+8Rx*
    - *Rank 8 + Rank 8 for 8Rx+8Rx for UE supporting Rank 8 for 8Rx*
    - *Rank 2 + Rank 2 for 4Rx+8Rx*
    - *Rank 2 + Rank 2 for 2Rx+8Rx*
* Proposals
  + Option 1: If a 8Rx capable UE supports both hybrid Rx band combination (4Rx+8Rx, 2Rx+8Rx) with Rank 2 and 8Rx+8Rx band combination with Rank 8, CA test for 8Rx+8Rx with Rank 8 should be selected for testing, otherwise Rank 2 CA test should be applied (Huawei, Samsung)
  + Other option.
* Recommended WF
  + Option 1 is agreeable?

Agreement: Agreed online

* Option 1 agreed

**Issue 1-1-2: Applicability rules for CA configurations selection**

**Moderator observation:**

As per the proposals from all interesting companies, all companies are fine to extend

Table 5.1.1.7.2-1 in TS 38.101-4 to include new 8Rx CA tests to be defined in section 5.2A.4.1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tests** | **CA capability where the tests apply** | **CA configuration from the selected CA capability where the tests apply** | **CA Bandwidth combination to be tested in priority order** | **PCell CC configuration** |
| Test 1 in Clause 5.2A.2.1, 5.2A.3.1 and 5.2A.4.1 | CA\_C, CA\_N, CA\_AX | Table 5.1.1.7.2-2 | Largest aggregated CA bandwidth combination | Any of CCs |
| Test 2 in Clause 5.2A.2.1, 5.2A.3.1 and 5.2A.4.1 | CA\_C, CA\_N, CA\_AX | Table 5.1.1.7.2-2 | Largest aggregated CA bandwidth combination | Any of CCs |
| Test 3 in Clause 5.2A.2.1, 5.2A.3.1 and 5.2A.4.1 | CA\_AX | Table 5.1.1.7.2-2 | Largest aggregated CA bandwidth combination | TDD CC if supported, otherwise FDD CC |
| Test 4 in Clause 5.2A.2.1 and 5.2A.3.1 (NOTE 2) | CA\_AX | Table 5.1.1.7.2-2 | Largest aggregated CA bandwidth combination | Any of CCs |
| Test 5 in Clause 5.2A.2.1 and 5.2A.3.1 (NOTE 3) | CA\_AX | Table 5.1.1.7.2-2 | Largest aggregated CA bandwidth combination | 15 kHz CC if supported, otherwise 30 kHz CC |
| NOTE 1: In case CA\_AX with different number of X is supported then one or two CA configurations are selected based on procedure from Table 5.1.1.7.2-2.  NOTE 2: These scenarios are only tested for UEs which are not verified with Test 3 in Clause 5.2A.2.1 and 5.2A.3.1.  NOTE 3: These scenarios are only tested for UEs which are not verified with Test 2 in Clause 5.2A.2.1 and 5.2A.3.1. | | | | |

But for the selection of CA configurations, whether to directly reuse the rules defined in Table 5.1.1.7.2-2, there are different views.

* **Proposals for the selection of CA configurations**
  + Option 1 (Nokia, Apple, Ericsson, Samsung, CTC, ZTE)
    - Reuse Table 5.1.1.7.2-2 in TS 38.101-4

Tentative Agreement:

* Option 1 agreed

Online

Huawei: We don’t need this agreement. We only need the agreement to option2 below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA capability | Step 1 | Step 2 | Step 3 | Step 4 |
| CA\_C or CA\_N | **OPTION 1**  Select the CA configurations with the maximum number of CCs, for which the supported maximum number of MIMO layers is not lower than 2. | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 1. | N/A | N/A |
| CA\_AX | Select the CA configurations with the maximum number of CCs, for which the supported maximum number of MIMO layers is not lower than 2. | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 1. | Select the CA configurations with the largest number of bands and with the maximum number of CCs, for which the supported maximum number of MIMO layers is not lower than 2. | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 3. |
| NOTE 1: For CA\_AX capability, if CA configuration from step 2 is CA configuration with the largest number of bands then Step 3 and Step 4 are skipped. Otherwise, the two CA configurations selected from Step 2 and Step 4 are used for testing.  NOTE 2: Maximum supported data rate for Step 2 and Step 4 is calculated based clause 4.1.2 of TS 38.306 [14].  NOTE 3: Tested data rate for Step 2 and Step 4 is calculated based on the equation and FRCs used in the test. | | | | |

* + Option 2 (Huawei)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA capability | Step 1 | Step 2 | Step 3 | Step 4 |
| CA\_C or CA\_N | If the UE support CA configuration that for each CC, supported maximum number of Rx and maximum number of MIMO layers is 8:   * Select the CA configurations with the maximum number of CCs, for which the supported maximum number of Rx and MIMO layers is 8.   Otherwise:   * Select the CA configurations with the maximum number of CCs, conditioned that at least for one CC the supported maximum number of Rx is 8 and for each CC the supported maximum number of MIMO layers is not lower than 2 | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 1. | N/A | N/A |
| CA\_AX | If the UE support CA configuration that for each CC, supported maximum number of Rx and maximum number of MIMO layers is 8:   * Select the CA configurations with the maximum number of CCs, for which the supported maximum number of Rx and MIMO layers is 8.   Otherwise:   * Select the CA configurations with the maximum number of CCs, conditioned that at least for one CC the supported maximum number of Rx is 8 and for each CC the supported maximum number of MIMO layers is not lower than 2 | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 1. | If the tested UE support CA configuration that for each CC, supported maximum number of Rx and maximum number of MIMO layers is 8:   * Select the CA configurations with the largest number of bands and with the maximum number of CCs, for which the supported maximum number of Rx and MIMO layers is 8.   Otherwise:   * Select the CA configurations with the largest number of bands and with the maximum number of CCs, conditioned that at least for one CC the supported maximum number of Rx is 8 and for each CC the supported maximum number of MIMO layers is not lower than 2 | Select any one of CA configurations, which contain CA bandwidth combination with the largest aggregated channel bandwidth and supported maximum data rate is not lower than the tested date rate, among all the selected CA configurations from Step 3. |
| NOTE 1: For CA\_AX capability, if CA configuration from step 2 is CA configuration with the largest number of bands then Step 3 and Step 4 are skipped. Otherwise, the two CA configurations selected from Step 2 and Step 4 are used for testing. | | | | |

* Recommended WF
  + This is the specific test applicability rules description that can be captured in the specification.
  + This issue is related to Issue 1-1-1 and can be discussed after finalization of Issue 1-1-1.

Discussion:

* Nokia: Option 2 is fine to us
* Huawei: Table is for 8RX UE

Tentative agreement: Agreed online

* Option 2 is agreed

**Issue 1-1-3: Applicability rules for different number of RX antenna ports for CA demodulation requirements**

* Proposals
  + Option 1 (Apple, Ericsson, Samsung, CTC, ZTE, Huawei)
    - Within the CA configuration if any of the PCell and/or the SCells is a 2Rx supported RF band, 2 out of the 8Rx should be connected with data source from system simulator, depending on UE’s declaration and AP configuration. Requirements from Clause 5.2A.2.1 are applied.
    - Within the CA configuration if any of the PCell and/or the SCells is a 4Rx supported RF band, 4 out of the 8Rx should be connected with data source from system simulator, depending on UE’s declaration and AP configuration. Requirements from Clause 5.2A.3.1 are applied.
    - Within the CA configuration if any of the PCell and/or the SCells is a 8Rx supported RF band, all 8Rx should be connected with data source from system simulator. Requirements from Clause5.2A.4.1 are applied.
    - For 8Rx capable UEs, the 2Rx supported RF bands, 4Rx supported RF bands and 8Rx supported RF bands are up to UE’s declaration.
  + Option 2 (Nokia)
    - Within the CA configuration if any of the PCell and/or the SCells is a 2Rx supported RF band, 2 out of the 8Rx should be connected with data source from system simulator, depending on UE’s declaration and AP configuration. Requirements from Clause 5.2A.2.1 are applied.
    - Within the CA configuration if any of the PCell and/or the SCells is a 4Rx supported RF band, 4 out of the 8Rx should be connected with data source from system simulator. Requirements from Clause5.2A.3.1 are applied.
    - Within the CA configuration if any of the PCell and/or the SCells is a 8Rx supported RF band, 8 out of the 8Rx should be connected with data source from system simulator. Requirements from Clause5.2A.4.1 are applied.
    - For 8Rx capable UEs, the 2Rx supported RF bands, 4Rx supported RF bands and 8Rx supported RF bands are up to UE’s declaration.
* Recommended WF
  + Option 1 is agreeable?

Tentative agreement: Agreed online

* Option 1 is agreed

Sub-topic 1-2 Antenna correlation for 8Rx

**Issue 1-2-1: Antenna correlation for 8Rx**

*Background: As per WF R4-2316914, RAN4 agreed to configure the propogation condition and antenna configuration for 8Rx tests:*

* *Rank 2, 2x8, MCS 19: TDLC300-100 ULA Medium B (α = 0.3, β = 0.005154)*
* *Rank 4, 4x8, MCS 17: TDLA30-10 Low*
* *Rank 8, 8x8, MCS 17: TDLA30-10 Low*

Observation and Proposal from Apple:

* **Observation #1:** Current work in this work item has heavily leveraged the precedent of LTE 8Rx discussion, including applicability rules and how demodulation requirements have been defined based on previous requirements.
* **Observation #2:** Under current 8Rx applicability rules, an 8Rx UE is still subject to provide 2Rx and 4Rx functionality for proper conformance testing, in addition to 8Rx functionality.
* **Observation #3:** Under current PDSCH performance requirements, the antenna correlation for 8Rx is chosen to be ULA Low. Even though the WI assumes a CPE type of device, this may impose severe restrictions to potential small form factor 8Rx UEs that may be manufactured in the future, and such low antenna correlation may not be always achieved in practice.
* **Proposal #3:** RAN4 to discuss during the last session of this WI how to improve the technical fundamentals of the specification of 8Rx requirements based on Observations #1 to #3.

Moderator: There are long discussion about the selection of antenna correlation among ULA Low, ULA Medium A and Medium B for 8Rx test during RAN4#106 meeting. Some companies raised the higher antenna correlation should be considered even for CPE/FWA/vehicle/industrial devices with the antenna number increased from 2 to 8, but at the same time, company think that low rank is mostly scheduled for Medium A/B of higher antenna correlation, as last test for Rank 2 with Medium B is agreed.

* Proposals
  + Option 1: Further discuss the Medium antenna correlation selection for Rank 4 and Rank 8 for 8Rx test (Apple)
  + Option 2: No needed.
* Recommended WF
  + TBD.

Discussion:

* Apple: We have concern how realistic low antenna correlation is. This is mainly for future work.
* Apple: We would like to consider requirements as device agnostic.
* MediaTek: Can we have different channel conditions in different CC? Could we align channel conditions in CA?
* Huawei: We think channel conditions can differ in different CC
* Huawei: Many companies have already provided results with Rank2 TDLC assumption
* Nokia: There are also results using Rank2 TDLA assumption. We need to check how many results we already have for TDLA and TDLC.
* Huawei: Companies should present technical justification to revisit channel condition for Rank2 CA
* Qualcomm: It seems that the default configuration is unclear to companies
* Huawei: We should reuse single carrier simulations

New proposals to clarify previous email discussions:

* Option 1: Revisit Rank 2 to TDLA for CA (Nokia, Apple, MediaTek)
* Option 2: Keep TDLC for Rank 2 for CA (Huawei, Samsung, Nokia, ZTE, Apple, MediaTek)
* Need further discussion

Tentative agreement:

* Option 2 is agreed, no further discussion under this WI
* Note, [further discuss the Medium antenna correlation selection for Rank 4 and Rank 8 for 8Rx test for future work]

Apple: In the future, we may need to relax requirements for different device types

Huawei: Work is contribution driven. We don’t need the note.

ZTE: What type of relaxation is Apple considering? The same number of Rx ports with fewer MIMO layers? Or fewer Rx ports?

Apple: We need to think about whether requirements are band agnostic and device agnostic

Huawei: Demod requirements are generally band agnostic and device agnostic, but we have applicability to separate if needed

**Issue 2-1-1: K1 value**

Observation 3 (Huawei): It has been agreed that PDSCH is not scheduled in special slot, so for the existing k1 values table for CA test, the k1 value for special slot for TDD SCell for TDD Pcell + TDD Scell configuration should be removed.

* Proposals
  + Option 1: Use the following updated K1 value for 8Rx CA test (Huawei)

|  |  |  |  |
| --- | --- | --- | --- |
| * The number of slots between PDSCH and corresponding HARQ-ACK information | | CCs with the same duplex mode and SCS with Pcell | CCs with different duplex mode and/or SCS with Pcell |
| FDD 15 kHz +  TDD 30 kHz CA | FDD PCell | {2} | {2} |
| TDD PCell | For CC with Rank 2 {8,7,6,5,5,4,3,11}  For CC with Rank 8 {8,7,6,5,5,4,3} | {7,5,4,11,9} |
| FDD 15 kHz +  FDD 15 kHz CA | FDD PCell | {2} | N/A |
| TDD 30 kHz +  TDD 30 kHz CA | TDD PCell | For CC with Rank 2  {8,7,6,5,5,4,3,2}  For CC with Rank 8  {8,7,6,5,5,4,3} | N/A |

* + Other options.
* Recommended WF
  + TBA

Tentative agreement:

* Option 1 is agreed

Huawei: IF we agree 8 HARQ processes, then the K1 value needs to be double-checked for Rank 2 FDD+TDD

**Issue 2-1-2: Number of HARQ process**

* Proposals
  + Option 1: Use the following updated number of HARQ process for 8Rx CA test (Huawei)

|  |  |  |  |
| --- | --- | --- | --- |
| HARQ process number | | CCs with the same duplex mode & SCS with Pcell | CCs with different duplex mode / SCS with Pcell |
| FDD 15 kHz +  TDD 30 kHz CA | FDD PCell | 4 | 8 |
| TDD PCell | For CC with Rank 2: 10  For CC with Rank 8: 8 | 8 |
| FDD 15 kHz +  FDD 15 kHz CA | FDD PCell | 4 | N/A |
| TDD 30 kHz +  TDD 30 kHz CA | TDD PCell | 8 | N/A |

* + Other option
* Recommended WF
  + TBA

Discussion:

* Samsung/Apple/Nokia: Why need 10 For CC with Rank 2 instead of 8?
* Huawei: We need to consider special slots

Tentative Agreement:

* Use the following updated number of HARQ process for 8Rx CA test

|  |  |  |  |
| --- | --- | --- | --- |
| HARQ process number | | CCs with the same duplex mode & SCS with Pcell | CCs with different duplex mode / SCS with Pcell |
| FDD 15 kHz +  TDD 30 kHz CA | FDD PCell | 4 | 8 |
| TDD PCell | [8] | 8 |
| FDD 15 kHz +  FDD 15 kHz CA | FDD PCell | 4 | N/A |
| TDD 30 kHz +  TDD 30 kHz CA | TDD PCell | 8 | N/A |

Huawei: Need to check the table together with the K1 value

**Issue 2-2-1: How to align the ideal results alignment**

* Proposals
  + Option 1: Remove the farthest outlier from the average results (assumption from NR BS Rel-15)
  + Option 2: Set the max allowed span to 3dB (QC)
* Recommended WF
  + TBA

Qualcomm: We don’t have a solution on how to align the results, but removing outliers is not the solution

Apple: There may be underlying assumptions that had been overlooked

Nokia: Within BS alignment, we do remove outliers

Moderator: In Rel-17 issue, we acknowledged different UE implementations leading to large span. In that case, we increased the margin.

**Issue 2-2-2: Additional margin to be added on top of the averaged impairment results for requirements derivation**

* Proposals
  + Option 1: 0.8 for 64QAM (assumption from NR UE Rel-15)
  + Option 2: Increase the current margin 0.8dB used in the impairment results (MTK)
    - Option 2a: 1.5dB (QC)
* Recommended WF
  + TBA

MTK: We would like to increase the margin to enable different implementation options. There is a large span among companies.

Huawei: We should discuss the alignment first

Apple: Same view as MTK and QC. There are two groups of results – from network vendors and UE vendors. The assumptions from network vendors may be overly optimistic on UE implementation. We need to either align or revisit technical assumptions.

Qualcomm: 8Rx is different from 2Rx and 4Rx, the processing loss is higher. Due to large variation in results, we think 1.5 dB is justified.

Huawei: We don’t see any technical reason to increase margin. For LTE we used 0.8 dB (option 1), we are working on CPE device here which should be able to accommodate more complex implementation.

CTC: We prefer option 1. Alignment of results should be addressed in the previous issue, not by adding margin here. Is this additional margin for all the 8Rx requirements including CA and single CC? We already agreed single CC.

ZTE: What is the impairment that causes additional 0.7 dB relaxation? We would like to understand the details. Remind this is for CPE, not smartphone.

Qualcomm: Without disclosing implementation details, we see a large variation. For 8Rx rank4 it is not the same as 8Rx rank 8.

Nokia: Even if we increase the margin according to option 2a, some results are still not sufficient. We need to focus on alignment first.

Huawei: The topic has been discussed for a year and we already discussed UE assumptions.

Sub-topic 3-1 SDR and CQI requirements

**Issue 3-1-1: Agenda items for SDR and CQI**

* Proposals
  + Option 1: No more open issues for 8Rx SDR and CQI tests, the corresponding agenda item should be closed (Nokia, Apple)
  + Other option.
* Moderator: As per the current work progress, no more open issues are left for 8Rx SDR and CQI test. Before the WI is closed, even the AI is kept in the meeting agenda, it doesn’t mean that companies must have contributions on that.
* Recommended WF
  + Confirm no more open issues for 8Rx SDR and CQI tests.
  + No further contributions are expected for these AI’s
  + ~~The agenda items for 8Rx SDR and CQI tests can be closed~~

[**R4-2321199**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321199.zip) **WF on UE 8Rx performance requirements**

*Type: other For: Approval  
 Source: Huawei, MediaTek*

**Decision: Approved.**

[**R4-2321132**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321132.zip) **Big CR for TS 38.101-4 Introduction of 8Rx performance requirements**

*Type: CR For: Agreement  
 38.101-4 v18.x.0 CR- rev Cat: B (Rel-1x)  
  
 Source: Huawei, HiSilicon*

**Decision: For email approval**

[**R4-2321133**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321133.zip) **Big CR for TS 38.141-2 on 4Tx demodulation requirements**

*Type: CR For: Agreement  
 38.141-2 v18.x.0 CR- rev Cat: B (Rel-1x)  
  
 Source: Samsung*

**Decision: For email approval**

[**R4-2321134**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321134.zip) **Big CR for TS 38.141-1**

*Type: CR For: Agreement  
 38.141-1 v18.x.0 CR- rev Cat: B (Rel-1x)  
  
 Source: Huawei, HiSilicon*

**Decision: For email approval**

### 8.4 NR Channel raster enhancement

### 8.5 Low NR band 4Rx for handheld UE and 3Tx for inter-band UL CA and EN-DC

### 8.6 NR RF requirements enhancement for FR2, Phase 3

#### 8.6.1 General aspects (TR/big CR)

#### 8.6.2 UL 256QAM (resubmitted CR)

#### 8.6.3 Beam correspondence requirements for RRC\_INACTIVE and initial access

#### 8.6.4 BS demodulation requirements

##### 8.6.4.1 UL 256QAM performance requirements

**R4-2318052 Discussion on UL 256 QAM BS Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we present Nokia’s view on the open issues of 256QAM UL demodulation for discussion at RAN4#109.

**Decision: Endorsed.**

**R4-2318053 Supporting Simulations for 256QAM UL Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we present Nokia’s simulation results for 256QAM UL demodulation.

**Decision: Noted.**

**R4-2318233 Introduction of 256 QAM PUSCH Requirements to TS 38.104**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Introduction of 256 QAM PUSCH Requirements to TS 38.104

**Decision: Endorsed.**

**R4-2318877 Discussion on BS PUSCH demodulation performance for 256 QAM**

*Type: discussion For: Discussion  
 Source: Xiaomi*

**Decision: Noted.**

**R4-2319318 Discussion FR2-1 PUSCH 256QAM demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Remaining configurations for PUSCH 256QAM equirements in FR2-1

**Decision: Noted.**

**R4-2319319 Simulation results for FR2 PUSCH 256QAM requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

Simulation results with impairments for FR2 PUSCH 256QAM

**Decision: Noted.**

**R4-2319320 [NR\_RF\_FR2\_req\_Ph3-Perf] Draft CR for 38.141-2 FR2-1 PUSCH 256QAM requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR for 38.141-2 FR2-1 PUSCH 256QAM requirements

**Decision: Revised to R4-2321190 (from R4-2319320).**

[**R4-2321190**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321190.zip) **[NR\_RF\_FR2\_req\_Ph3-Perf] Draft CR for 38.141-2 FR2-1 PUSCH 256QAM requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR for 38.141-2 FR2-1 PUSCH 256QAM requirements

**Decision: Endorsed.**

**R4-2319526 Draft CR to 38.104 FRC for FR2-1 UL 256QAM**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321152 (from R4-2319526).**

[**R4-2321152**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321152.zip) **Draft CR to 38.104 FRC for FR2-1 UL 256QAM**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

**R4-2319527 Draft CR to 38.141-2 FRC for FR2-1 UL 256QAM**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321153 (from R4-2319527).**

[**R4-2321153**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321153.zip) **Draft CR to 38.141-2 FRC for FR2-1 UL 256QAM**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

**R4-2319529 Discussion on demodulation for FR2-1 UL 256QAM**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319530 Simulation results for FR2-1 UL 256QAM**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319707 UL256QAM demod SNR limit and test feasibility**

*Type: discussion For: Discussion  
 Source: Keysight Technologies UK Ltd*

**Decision: Noted.**

**R4-2319842 Discussion and simulation results on BS demodulation requirements for FR2 256QAM**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320214 [NR\_RF\_FR2\_req\_Ph3-Perf] Draft CR on introducing propagation condition for FR2 UL256QAM demodulation performance requirements (TS38.104, Rel-18)**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

**R4-2320215 Discussion on FR2 UL 256QAM performance requirements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320216 Simulation results on FR2 UL 256QAM performance requirements**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320217 Simulation summary for 256 QAM UL BS Demodulation**

*Type: other For: Information  
 Source: Huawei ,HiSilicon, Nokia, Nokia Shanghai Bell, Ericsson, Samsung, NTT Docomo, Xiaomi, ZTE*

**Decision: Noted.**

#### 8.6.5 Moderator summary and conclusions

**R4-2318209 Topic summary for [109][317] NR\_RF\_FR2\_req\_Ph3\_Demod**

*Type: other For: Information  
 Source: Moderator (Nokia)*

**Abstract:**

[109][300] BDaT Session AI 8.6.4.1

**Decision: Noted.**

[**R4-2321054**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321054.zip) **Offline meeting minutes for [109][317] NR\_RF\_FR2\_req\_Ph3\_Demod**

*Type: other For: Information  
 Source: Nokia*

**Abstract:**

**Decision: Noted.**

**Issue 1-1: 60 kHz SCS and corresponding carrier BW**

* Proposals:
* Option 1: 60 kHz SCS, 50 MHz (Nokia, Xiaomi, Ericsson)
* Option 2: Do not define 60kHz requirements (ZTE, Huawei, Samsung)
* Samsung: we do not believe it’s necessary and it may be more challenging with 120 kHz
* Nokia: We understand the views and we couldn’t agree in previous cases, as this is not deployment the requirements should be defined such that if this is deployed the requirements exist.
* Recommended WF
* For discussion at meeting

**Offline Tentative Approach:** for discussion in online.

Online:

Chair: Including requirements for 60 kHz was also discussed in thread [XXX] where views were presented but agreement could not be reached. It is expected the same views are held here as well, so it is not necessary to repeate.

Samsung: For 256QAM, the phase noise impact is very large for 120 kHz which is the worst case. We should focus on 120 kHz.

ZTE: 60 kHz is not a typical deployment

Nokia: Since there is a phase noise impact between 60 kHz and 120 kHz, this may motivate more interest in 60 kHz. We should define requirements for both.

Moderator: There is ~0.3 dB difference between 60 kHz and 120 kHz.

**Issue 1-3: SNR Limit**

* Proposals:
* Follow previous RAN4 agreement SNR limit = 20 dB on BS OTA demod for FR2. Propose not to re-open this study for UL256QAM demod testing (Keysight)

**Discussion**

* Keysight : 20 dB is a RAN4 agreement, unless something new keeping the same limit makes sense. Would like to see if simulation result is slightly over 20dB
* Nokia: In rel-15 we have agreement and way forward for 20dB, our understanding is if below we do not need to discuss, but if above we can discuss. If we align manually then we can bring to 20.0 dB from a Nokia perspective.
* Ericsson: It’s ok, as in this case we are using LOS channel so the margin could be larger than NLOS, therefore we think that it would be ok with the SNR just above 20 dB.
* Samsung: Based on rel-15 discussion it’s ok, based on simulation the results are high maybe the margin could be reduced.
* Huawei: 20 dB is fine to keep for us. Ericsson to Huawei (clarification above 20 dB)
* Keysight: The other direction is to redefine noise definition for the calculation of 20 dB (defined with 15dB noise offset for AWGN.)
* Nokia: for xx work item we can redefine already and that is done.
* Keysight: That is not a mandatory restriction, in this case we can reduce noise level and thus overall power level, with a statement to that effect.
* Nokia: Propose to add another note that if test “SNR is above 20 dB the noise value to change wording.
* Keysight: for SNRs above 20dB reduce the overall noise power offset.
* New Note (6) Option (ex Table 8.2.1.4.2-2) *if agreed*:
  + Option 1: If SNR test is above 20dB we need to adjust the AWGN offset by between 15 and 3 dB
  + Option 2: If above 20 dB then reduce the AWGN offset by at least test requirement – 20dB
  + Option 3 : Combination of 1 and 2, in addition to option 2 states that the minimum possible is 3 rather than 0 dB.
* Nokia: Do we limit this note to 256 QAM? We believe this is easiest.
* Keysight: The one that already exists should not be set. From now on would like to apply the same method. Could perhaps agree that from now on we would follow the new approach.
* Nokia: Introduce note in way forward.
* Ericsson: We already have some tests above 21 dB, with a note saying we can adjust the AWGN value.
* Nokia: We understand Ericsson position that the current note can handle this, but understand that from a TE perspective we would not like to change this, and would like it as mandatory. Nokia would be happy with new note or adjust current note.
* Keysight: We would like to see this as mandatory.
* Ericsson: If this is mandatory it should affect legacy cases.
* Keysight: We are ok that a new rule does not affect legacy cases
* Ericsson : We are happy to check on old note.
* Options on note in tables relating to AWGN offset:
  + New Note
  + Old Note with adjusted (impact on previous test cases)
  + Old Note with adjusted (no impact on previous test cases)
  + Old Note unchanged

**Offline WF**

* Follow previous RAN4 agreement SNR limit = 20 dB on BS OTA demod for FR2.
* Companies to check views on notes ahead of online.

Online:

R&S: SNR limit of 20 dB is agreeable. The limit comes from the max power of the TE. Reduce the AWGN level to get the higher SNR instead of increasing Tx power. We are limiting the SNR wrt to a fixed AWGN in the spec.

Ericsson: The existing note is fine since we don’t want to mandate the TE to lower the AWGN level if it’s not needed.

Samsung: We observed this in Rel-17. We aren’t sure whether a new note is needed or not. The existing note may be sufficient.

Nokia: A new note would be helpful for clarification. There are already existing test cases with SNR > 20 dB, and concerned about how these might be impacted.

R&S: Can further discuss how to handle legacy requirements, but prefer a new note that mandates a reduction in AWGN. If we don’t mandate, then we may have inconsistent results from different TE vendors who implement or do not implement reduction in AWGN

Keysight: Same view as R&S

Nokia: Do we need to limit only in fading channels? For AWGN channel, we don’t need fading margin.

Keysight: The previous analysis was based on OTA link budget, but other factors are also impacted.

Moderator: There is agreement that some clarification is beneficial.

WF: A new note to mandate AWGN offset reduction should be considered for clarification, but the wording is FFS. The note is not intended to have impact on legacy requirements.

[**R4-2321060**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321060.zip) **WF on [109][317] NR\_RF\_FR2\_req\_Ph3\_Demod**

*Type: other For: Approval  
 Source: Nokia*

**Decision: Approved.**

### 8.7 Requirement for NR FR2 multi-Rx chain DL reception

#### 8.7.1 UE RF requirements for simultaneous DL reception with up to 4 layer MIMO

#### 8.7.2 RRM core requirements for simultaneous DL reception from different directions

#### 8.7.3 RRM performance requirements

#### 8.7.4 Demodulation performance and CSI requirements

**R4-2318569 Summary of simultion results for Multi-RX demod and CSI**

*Type: discussion For: Information  
 Source: Apple*

**Decision: Noted.**

**R4-2318733 Simulation results summary for FR2 multi-Rx performance requirements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2318767 Draft CR to include the FR2 multi-rx correlation model in the specification**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision: Revised to R4-2321206 (from R4-2318767).**

[**R4-2321206**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321206.zip) **Draft CR to include the FR2 multi-rx correlation model in the specification**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision: Endorsed.**

**R4-2321016 Draft Big CR on UE demodulation and CSI performance requirements for FR2 multi-Rx**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm India Pvt Ltd*

**Decision: Not pursued.**

Qualcomm: We intend to bring draft CR’s in the next meeting

##### 8.7.4.1 General aspects

**R4-2318549 Discussion on general aspects of FR2 multiRX DL**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318570 On General aspects for Multi-RX in FR2 requirements**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318730 Views on General Aspects for FR2 Multi-Rx Performance Requirements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2318790 On MultiRx Demodulation performance and CSI requirements - General aspects**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's view on the open issues with relation to the general aspects for MultiRx Demodulation performance.

**Decision: Noted.**

**R4-2320233 Discussion on general issues for UE demodulation requirements for NR FR2 multi-Rx chain DL reception**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.7.4.2 PDSCH requirements

**R4-2318550 Discussion on PDSCH requirements of FR2 multiRX DL**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318551 Simulation results of PDSCH requirements of FR2 multiRX DL**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318571 Simulation results for PDSCH with multi-RX in FR2**

*Type: discussion For: Information  
 Source: Apple*

**Decision: Noted.**

**R4-2318572 DraftCR on PDSCH demod requirements for mDCI fully-overlapping with multi-RX in FR2**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Apple*

**Decision: Revised to R4-2321207 (from R4-2318572).**

[**R4-2321207**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321207.zip) **DraftCR on PDSCH demod requirements for mDCI fully-overlapping with multi-RX in FR2**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Apple*

**Decision: Endorsed.**

**R4-2318573 On PDSCH demod requirements with multi-RX in FR2**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318731 Views on PDSCH Aspects for FR2 Multi-Rx Performance Requirements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2318732 Simulation Results on PDSCH Performance Requirements for FR2 Multi-Rx**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2318791 On MultiRx Demodulation performance and CSI requirements - PDSCH**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's view on the open issues with relation definition of PDSCH requirements for MultiRx Demodulation performance.

**Decision: Noted.**

**R4-2318792 On MultiRx Demodulation performance and CSI requirements - Simulation Results**

*Type: discussion For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's simulation results for MultiRx

**Decision: Noted.**

**R4-2318794 DraftCR on Minimum requirements and Reference Channel for mDCI non-overlapping**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

DraftCR for introduction of minimum requiremenst and Reference Channel for mDCI non-overlappping.

**Decision: Revised to R4-2321208 (from R4-2318794).**

[**R4-2321208**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321208.zip) **DraftCR on Minimum requirements and Reference Channel for mDCI non-overlapping**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

DraftCR for introduction of minimum requiremenst and Reference Channel for mDCI non-overlappping.

**Decision: Endorsed.**

**R4-2319743 PDSCH demodulation requirements for FR2 UE multi-Rx reception**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the open issue on UE demodulation requirements for FR2 Multi-Rx reception.

**Decision: Noted.**

**R4-2319744 Simulation results for FR2 UE multi-Rx reception**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This contribution discusses the open issue on UE demodulation requirements for FR2 Multi-Rx reception.

**Decision: Noted.**

**R4-2320235 Draft CR on Minimum requirements and FRC definition for sDCI SDM (TS38.101-4, Rel-18)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321205 (from R4-2320235).**

**[R4-2321205](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321205.zip) Draft CR on Minimum requirements and FRC definition for sDCI SDM (TS38.101-4, Rel-18)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

##### 8.7.4.3 PMI reporting requirements

**R4-2318552 Discussion on PMI requirements of FR2 multiRX DL**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318553 Simulation results of PMI requirements of FR2 multiRX DL**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318554 Draft CR to 38.101-4 PMI requirements of FR2 multiRX DL**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: MediaTek inc.*

**Decision: Endorsed.**

**R4-2318555 Draft CR to 38.101-4 PMI reference measurement channel of FR2 multiRX DL**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: MediaTek inc.*

**Decision: Endorsed.**

**R4-2318574 On PMI reporting requirements with multi-RX in FR2**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318793 On MultiRx Demodulation performance and CSI requirements - PMI**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's view on the open issues with relation definition of PMI requirements for MultiRx Demodulation performance.

**Decision: Noted.**

**R4-2319745 PMI reporting requirements for FR2 UE multi-Rx reception**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the open issue on PMI reporting requirements for FR2 Multi-Rx reception.

**Decision: Noted.**

**R4-2320234 Discussion on UE CSI reporting requirements for NR FR2 multi-Rx chain DL reception**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.7.5 Moderator summary and conclusions

**R4-2318136 Topic summary for [109][130] FR2\_multiRx\_UERF\_part1**

*Type: other For: Information  
 Source: Moderator (Qualcomm)*

**Abstract:**

[109][100] Main Session AI 8.7.1

**Decision: Noted.**

**R4-2318210 Topic summary for [109][318] NR\_FR2\_multiRX\_DL\_Demod**

*Type: other For: Information  
 Source: Moderator (Qualcomm)*

**Abstract:**

[109][300] BDaT Session AI 8.7.4.1, 8.7.4.2, 8.7.4.3

**Decision: Noted.**

[**R4-2321111**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321111.zip) **Ad-hoc meeting minutes on [109][318] NR\_FR2\_multiRX\_DL\_Demod**

*Type: other For: Information  
 Source: Qualcomm*

**Decision: Noted.**

**Issue 1-1-2: Receiver assumption for mDCI non overlapping case.**

* Proposals:
* Option 1 (Ericsson):
  + - Define single PDSCH demodulation requirements assuming separate processing for multi-DCI based non-overlapping scheme.
  + Option 2 (MediaTek):
    - Consider joint processing receiver assumption for non-overlapping to (2+2) scenarios if UE capability for joint processing is introduced.
* Recommended WF:
  + Encourage comments if any.

Online:

Nokia: Our previous comment was only for 1+1, not 2+2. “Certain level of isolation we can do separate processing. It may fail at higher cross-talk. Separate processing may leave some gains.” For 1+1, the separate processing receiver works well, but in 2+2 with low crosstalk will also work to some degree, but with high crosstalk, we don’t expect separate processing receiver will work well. In a common scenario, we would expect high crosstalk to more likely. For the UE not supporting joint processing, its usefulness will be restricted in 2+2 with medium to high crosstalk scenarios.

Ericsson: Ok with the agreement for Rel-18. Joint processing can be considered in a future release subject to agreement at RAN plenary for a new WI. We prefer to capture some information in the TR to avoid repeating the same discussion at RAN plenary.

MTK: Ok for Rel-18, but agree with Nokia that 2+2 is not feasible separate processing UE for practical crosstalk values.

Qualcomm: TR update is in issue 1-1-12.

Nokia, Ericsson: We would like more time to discuss. Expect to come back this meeting.

**Issue 1-1-3: Receiver assumption for sDCI SDM case.**

* Proposals:
* Option 1 (Nokia):
  + - * Introduce joint processing receiver requirements for the sDCI SDM case.
        + Option 1b (MediaTek): Consider joint processing for only 2+2 scenario if UE capability is introduced.
* Option 2 (Huawei, Qualcomm):
  + - * Define requirements based on separate processing for FR2 multi-Rx sDCI SDM case in Rel-18.
        + Option 2b (MediaTek, Apple): Consider separate processing for only 1+1 scenario.

Online:

Moderator: We propose

* Consider separate processing for sDCI SDM in Rel-18.
* RAN4 may consider joint processing in future releases.

Nokia: Co-located is expected for sDCI. The cross talk will be even higher than for mDCI. For sDCI there is only one ACK/NAK so 4 layers are impacted rather than just 2 layers.

Apple: The feature is only feasible under certain conditions, i.e., group based reporting. If these conditions are not met, then we don’t expect the feature would be enabled. Network would not schedule unless favorable conditions are available. We don’t think joint processing is a precondition to have mDCI functional in a real deployment. Joint processing expected to be declaration rather than signaled. So the network will use other information than the UE architecture of joint vs. separate to make the scheduling decisions.

Huawei: We support the moderator proposal

Qualcomm: We don’t fully agree with Nokia that co-located restricts the angle of arrival. There hasn’t been any concern on OTA discussion on sDCI having more crosstalk issues.

MTK: Same view as Apple and Qualcomm. We agree with the moderator proposal for both mDCI and sDCI.

Nokia: We aren’t saying separate is not feasible, but it is limiting.

Tentative agreement:

* Consider separate processing for sDCI SDM in Rel-18.
* RAN4 may consider joint processing in future releases.

**Issue 2-1-1: PT-RS EPRE Ratio**

* Proposals
* Option 1 (Qualcomm, MediaTek): Define EPRE-Ratio state ‘0’ for FR2 multi-panel RX simulation assumptions.
* Recommended WF:
  + Option 1

agreement: (agreed online)

* + Option 1

**Issue 2-1-2: Number of DMRS CDM groups without data**

* Proposals
  + Option 1 (Qualcomm):
    - Confirm that the number of CDM groups without data is 2 for DMRS configuration for mDCI.
* Recommended WF:
  + Encourage comments if any.

Agreement: (agreed online)

* + Option 1 including clarification “for mDCI”

Online:

Apple: sDCI does not allow multiplexing of PDSCH and DMRS

**Issue 2-1-3: Time/frequency offsets for sDCI SDM**

* Proposals
  + Option 1 (Apple):
* 1+1 – MCS 17, FO/TO for TRP2: 600 Hz, -0.0625us
  + Option 2 (Ericsson):
    - 1+1, MCS17, ρ=-6dB, FO/TO=600Hz/-0.0625us
    - 2+2, MCS13, ρ=-12dB, FO/TO=0Hz/0.25us

Agreement: (agreed online)

* + 600 Hz, -0.0625us

**Issue 2-1-4: Time/frequency offsets for mDCI fully overlapping.**

* Observations
* Observation 1 (Nokia):
  + - When separate processing is used, crosstalk interference can significantly reduce the demodulation performance for the mDCI fully-overlapping scenario for both 1+1 and 2+2 scenarios already from ρ = -12dB.
    - The simulation results obtained without the added impairments of time and frequency offset and with the addition of corresponding time and frequency offset combinations of (-0.0625us, 600Hz) and (0.25us, 0Hz) are identical for the agreed simulation configurations of mDCI fully-overlapping Rank 1+1 with MCS17 and Rank 2+2 with MCS13 using separate processing.
* Proposals
  + Option 1 (Nokia, Apple): -0.0625us, 600Hz.
    - Option 1a (Apple): for 1+1 – MCS 17
  + Option 2 (Ericsson): 0.25us, 0Hz

agreement: (agreed online)

* + 600 Hz, -0.0625us

**Issue 2-1-5: Time/frequency offsets for mDCI non overlapping.**

* Observations
* Observation 1 (Nokia):
  + - The effect of crosstalk interference on the demodulation performance is still measurable for the mDCI non-overlapping scenario, but with much lower impact. To include the effect of the cross-talk for requirement definition a higher value of ρ can be selectedProposals
* Proposals
  + Option 1 (Nokia, Ericsson): -0.0625us, 600Hz

agreement: (agreed online)

* 0.25us, 0Hz

**Issue 2-1-6: General PDSCH/PDCCH configuration for mDCI**

* Observations
* Observation 1 (Apple):
  + Prior to Rel-18, UE is not expected to receive PDCCH associated with different coresetPoolIndex simultaneously.
* Proposals
  + Option 1 (Apple):
    - Configure PDCCH from each TRP non-overlapping in time for mDCI transmission mode.
    - PDCCH from TRP1 is transmitted on symbol 0 and PDCCH from TRP2 is transmitted on symbol 1 of the slot.
    - PDSCH transmission starts from symbol 2

agreement: (agreed online)

* + Option 1 (No of PDSCH symbols is 12).

**Issue 2-1-7: General PDSCH/PDCCH configuration for sDCI SDM**

* Observations
* Observation 1 (Apple):
  + Prior to Rel-18, UE is not expected to receive PDCCH associated with different coresetPoolIndex simultaneously.
* Proposals
  + Option 1 (Apple):
    - For sDCI SDM transmission scheme, PDCCH is transmitted on symbol 0 and PDSCH is transmitted from symbol 1.

Agreement: (agreed online)

* + Option 1. PDSCH from symbol 1

**Issue 3-1-2: Receiver assumption for PMI Reporting**

* Proposals
  + - * Option 1 (Apple): Consider separate processing for PMI reporting with sDCI SDM transmission with -9dB crosstalk power ratio.
      * Option 2 (MediaTek): Open to consider joint processing receiver assumption for PMI reporting requirements if UE capability for joint processing is introduced.

Agreement: (agreed online)

* + Consider separate processing for PMI reporting with sDCI SDM.

**Issue 3-1-3: MCS**

* Proposals
  + Option 1 (Ericsson): MCS11 with 2+2.
  + Option 2 (MediaTek, Huawei): MCS13 with 1+1.

Moderator’s note: It was agreed to only consider 1+1 case for PMI reporting with sDCI SDM (RAN4#106-bis-e)

Agreement: (agreed online)

* + Option 2 (MCS13 with 1+1).

**Issue 3-1-4: Time/frequency offsets for PMI reporting**

* Proposals
  + Option 1 (Ericsson): Set FO=0Hz and TO=0us for PMI reporting test.

Agreement: (agreed online)

* + Option 1

**Issue 3-1-5: Performance Metric**

* Proposals
  + Set test metric as γ=t\_ue/t\_rnd , where t\_ue is [X] % of the maximum throughput obtained at SNR\_ue using the precoders configured according to the UE reports, and t\_rnd is the throughput measured at SNR\_ue with random precoding.
    - Option 1 (Huawei): X=70%
    - Option 2 (Ericsson, MediaTek, Huawei): X=90%

Agreement: (agreed online)

* + X=[90%]

**Issue 3-1-6: Throughput ratio (γ) value**

* Proposals
  + Option 1 (Huawei): Consider γ = 1.3.

WF: (agreed online)

* + Consider γ = [1.3] in the next meeting, other values are not precluded. Consider some margin(to be discussed).

Online:

Nokia: This is more of a WF than an agreement.

Huawei: We should keep a value, i.e., 1.3

MTK: We have very limited results so couldn’t discuss the gamma value and margin. Encourage more results from interested companies.

Ericsson: Agree with MTK. Only 2 companies provided results in this meeting.

**TxEVM**

Qualcomm: We had previous agreement that if we as common assumption consider EVM, we will assume 6% for 64QAM.

Nokia: If a company wants to consider TxEVM in their impairment results, they are free to consider 6%

Huawei: We should consider TxEVM, otherwise, the requirement will be tightened. This is how other requirements are defined.

Nokia: Our compromise proposal is that companies can decide on their own. We believe the correct number is 3%.

R&S: This was discussed for non-colocated for FR1. This is FR2. A lower TxEVM will result in a lower testable SNR in the TE.

Nokia: RAN4 should set the requirement, and RAN5 should set the uncertainty.

[**R4-2321140**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321140.zip) **WF on [109][318] NR\_FR2\_multiRX\_DL\_Demod**

*Type: other For: Approval  
 Source: Qualcomm*

**Decision: Approved.**

Chair: Suggest to indicate TxEVM as FFS

### 8.8 Even Further RRM enhancement for NR and MR-DC

### 8.9 Further enhancements on NR and MR-DC measurement gaps and measurements without gaps

### 8.10 Completion of specification support for bandwidth part operation without restriction in NR

### 8.11 Support of intra-band non-collocated EN-DC/NR-CA deployment

#### 8.11.1 UE RF architecture and RF requirements

#### 8.11.2 RRM Core requirement

#### 8.11.3 RRM performance requirements

#### 8.11.4 Demodulation performance requirements

**R4-2318350 Discussion on UE Demodulation for non-colocated FR1 intra-band NR-CA**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2318351 Simulations for UE Demodulation for non-colocated FR1 intra-band NR-CA**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2318352 BigCR for 38.101-4: Type 2 UE NonCol NR-CA PDSCH demodulation requirements**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0425 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: For email approval**

**R4-2318556 Discussion on Intra-Band Non-Collocated NR-CA**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318557 Simulation results of Intra-Band Non-Collocated NR-CA**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318679 PDSCH Demodulation Requirements for Type-2 UEs in Intra-band Non-contiguous Non-collocated NR Carrier Aggregation**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2319525 Draft CR to 38.101-4 demodulation requirements for non-collocated NR-CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321094 (from R4-2319525).**

[**R4-2321094**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321094.zip) **Draft CR to 38.101-4 demodulation requirements for non-collocated NR-CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

**R4-2319531 Discussion on demodulation requirement for intra-band non-collocated NR-CA**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319532 Simulation results for intra-band non-collocated NR-CA**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319739 UE demodulation requirements for non-colocated NR-CA deployment scenario**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the UE demodulation requirements for non-colocated NR-CA deployment scenario.

**Decision: Noted**

**R4-2319740 Summary of simulation results for UE demodulation requirements for non-colocated NR-CA deployment scenario**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This spreadsheet summarizes the simulation results for UE demodulation requirements for non-colocated NR-CA deployment scenario.

**Decision: Revised to R4-2321053 (from R4-2319740).**

[**R4-2321053**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321053.zip) **Summary of simulation results for UE demodulation requirements for non-colocated NR-CA deployment scenario**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This spreadsheet summarizes the simulation results for UE demodulation requirements for non-colocated NR-CA deployment scenario.

**Decision: Noted.**

**R4-2320192 Discussions on demodulation requirements for intra-band EN-DC/NR-CA**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320193 Simulation results on demodulation requirements for intra-band EN-DC/NR-CA**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320194 Draft CR on introduction of performance requirements for intra-band EN-DC/NR-CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321096 (from R4-2320194).**

[**R4-2321096**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321096.zip) **Draft CR on introduction of performance requirements for intra-band EN-DC/NR-CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

**R4-2320795 Discussion paper on demod tests for Intraband noncol NR-CA**

*Type: discussion For: Approval  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320796 Simulation results for Intraband noncol NR-CA**

*Type: other For: Information  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320797 draftCR on FRC for Non-colocated Intraband CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321095 (from R4-2320797).**

**[R4-2321095](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321095.zip) draftCR on FRC for Non-colocated Intraband CA**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Endorsed.**

#### 8.11.5 Moderator summary and conclusions

**R4-2318211 Topic summary for [109][319] NonCol\_intraB\_ENDC\_NR\_CA\_Demod**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 8.11.4

**Decision: Noted.**

**Issue 1-1-1: Tx EVM assumption**

* Proposals (Nokia):
  + RAN4 shall not consider TE TxEVM for the derivation of final requirement SNR values. A value of 2% TE TxEVM shall be considered in FR1 and independently of the modulation order, to limit the MCS choice to stay below 1dB degradation (when assuming testing using a TE with such an innate TxEVM value).
  + Add the following note to the final agreements concerning TxEVM:

|  |
| --- |
| Since Rel-15 is has been common practice to assume TE TxEVM in impaired simulations, with values commonly chosen as 6% at QPSK, 6% at 16QAM, 6% at 64QAM, 3% at 256QAM, and 2.5% at 1024QAM. The intent was to allow requirements to be testable with any TE that meets or exceeds the TxEVM assumption, as TxEVM results in a SNR dependent degradation and limitation of the effective baseband SNR at the receiver. Additionally, the TE TxEVM assumptions are used to limit the SNR, and therefore MCS, usable during tests by self-imposing a 1dB SNR degradation/relaxation limit when adding TxEVM.  RAN5 does not require a specific TxEVM in the test configuration and the TE does not add additional TxEVM on top of its innate TxEVM performance. RAN5 does set a Maximum Test System Uncertainty, which is chosen such that the noise from the Test system is sufficiently below that required for the UE to demodulate the signal with the required success rate. Adding TE TxEVM in RAN4 requirement derivation leads to a SNR relaxation for the DUT at the higher end of the SNR range, when using a TE with better than the assumed TxEVM performance.  In the meantime, experience with TE's on the market has shown that the Rel-15 TE TxEVM assumptions were too conservative. The TEs' actual TxEVM limits are much lower than the commonly chosen values, and it is not needed to add TE TxEVM in the requirement derivation. Additionally, unlike for transmissions from UEs/BSs, the TE TxEVM is independent from the used modulation order (assuming same power), as no crest factor reduction is employed. |

* Recommended WF
  + Discuss the proposal.
  + Moderator: For information, RAN4 has been setting the NR UE demodulation requirements with the following methodology from Rel-15.
    - Confirm the span of companies’ alignment results are small enough (e.g., 2.5dB). Alignment results are derived from the simulation without UE Rx impairments, however RAN4 had agreed to add gNB Tx EVM (e.g., 6% up to 64QAM, 3% of 256QAM, and 2.5% for 1024QAM) to derive alignment results.
    - If the span is small enough, set the final requirement by adding the common margin (e.g., 0.5dB for QPSK/16QAM, 0.8dB for 64QAM/256QAM, 1dB for 1024QAM) to the average of impairment results. Impairment results are provided by companies adding UE Rx impairment margin, where added margin is up to companies.

Online:

Nokia: We have taken TxEVM for granted since Rel-15 which will limit achievable performance at high SNR. The TxEVM is intended to capture test equipment limitation, but we expect TE performs better. We are therefore introducing an unintended relaxation of SNR. We would like to reopen this discussion now if we want to reconsider TxEVM and what should be the value. TE vendors have indicated we should not consider TxEVM of the TE. We propose

1. Do not use TxEVM in UE requirement derivation
2. To use a more realistic value of TxEVM to decide MCS range

Apple: What is the impact on MCS range? What reasonable values of TxEVM to use? This could apply to other WI’s, but we would like to understand the impact to this WI for now.

Keysight: We would like to keep the existing RAN4 TxEVM values. Do not agree with Nokia’s proposals.

R&S: RAN5 has taken the values 6%, 3% to use as a guideline that the TE should not exceed. The actual values are better than this, but need further offline discussion among TE vendors.

Huawei: Share the same view as Keysight to keep the existing values for TxEVM.

Qualcomm: More work is needed. The proposal to use the TxEVM value for MCS selection, but not the performance doesn’t make sense.

Nokia: To Apple, our sims show ~1 dB impact at high SNR/high power cell. It would lower the SNR. To Keysight, we should not use the old way of working. Why would TE have different TxEVM for different modulation orders? To Qualcomm, RAN5 sets MU but we can predict the issue and limit the MCS so RAN5 test can be achievable. Especially for 6%, we would lose visibility of potentially 1 dB.

Apple: We should focus on this WI. To avoid TxEVM issue, we can choose lower MCS’s for both PCell and SCell. Then we won’t have the ~1 dB impact and we can focus on this WI instead of TxEVM which is a broader issue.

Keysight: EVM impacted by other factors, so might not be independent of modulation. Cannot agree to the value in Nokia’s contribution, but willing to discuss with other TE vendors to come up with a different proposed value.

R&S: Agree with Keysight. 2% or 2.5% is too low. 1024QAM hasn’t been tested or deployed, so not been verified whether these values are achievable.

Qualcomm: There is relationship between TxEVM assumption and BS performance.

Nokia: TxEVM is relevant to this WI because of the 25 dB difference which drives a very high SNR to the SCell. We had a prior agreement to go much below 0 dB SNR for the PCell, so may not be able to use Apple proposal to avoid TxEVM impact.

Apple: For this WI, we have 2 Rx chains in the UE so 25 dB is not expected to be a constraint. The lower limit for PCell is -1 dB, so we still have room to lower the MCS.

R&S: 3% for 256QAM can also be assumed for all modulations up to 256QAM

Nokia: There is no intention to revisit legacy requirements

**Issue 1-1-2: MCS pair**

* Proposals:
  + (Apple): Align results submitted by interested companies and decide the best MCS pair to guarantee a SNR difference of no more than 25dB, considering the confidence interval given by the computed spans.
  + Companies’ proposals on MCS pair (Nokia, MediaTek, ZTE, Ericsson, Huawei):

|  |  |  |
| --- | --- | --- |
| **MCS for SCell (Lower SNR)** | **MCS for PCell (Higher SNR)** | **Supporting companies** |
| Table 1, MCS4 | Table 2, MCS22 | MediaTek, ZTE, Ericsson, Huawei, Qualcomm |
| Table 1, MCS4 | Table 2, MCS23 |  |
| Table 1, MCS4 | Table 2, MCS24 | Nokia |
| Table 1, MCS4 | Table 2, MCS25 |  |
| Table 1, MCS5 | Table 2, MCS22 | ZTE, Huawei |
| Table 1, MCS5 | Table 2, MCS23 | MediaTek, ZTE |
| Table 1, MCS5 | Table 2, MCS24 |  |
| Table 1, MCS5 | Table 2, MCS25 |  |

* Recommended WF
  + Collect impairment results first in R4-2319740.
  + Decide MCS pair based on the average of impairment results so that the SNR difference of PScell and SCell does not exceed 25dB.

Online:

Moderator: MCS5 + MCS22 is proposed

Qualcomm: We could also consider MCS4 + MCS21 to address the TxEVM concern

Apple: The issue here is power imbalance, not about SNR range. We don’t have simulation results for MCS4+MCS21 or MCS3+MCS20, we would need to come back next meeting for those.

Nokia: We need to derive the SNR values in the end, and as part of that, will need to agree on what TxEVM to assume.

Huawei:

Ericsson: This is the last meeting for performance part. We would like to conclude the MCS.

KDDI: Support the moderator comment.

Nokia: We can agree the pair now. We are ok with QC proposal, write the CR, and leave the SNR values as TBD. At MCS 22, we run in to the risk that TE cannot meet the necessary EVM.

MTK: Ok with QC proposal. We would have all the simulation results already available for MCS5 + MCS22.

Qualcomm: Even for MCS5 + MCS22 simulation results, it is unclear what the EVM assumptions were. They were likely not aligned. We suggest to consider both 4+21 and 5+22 in the next meeting.

Apple: Suggest MCS values in square brackets, and SNR values TBD.

Nokia: The value of SNR can vary by up to 1 dB depending on TxEVM assumption. We would prefer to keep it TBD.

Qualcomm: Agree with Nokia

Nokia: We prefer to complete to work item, but indicate simulations are still running

Apple: We would prefer to extend the completion date to March.

Qualcomm: Most of the work is completed, we are just missing a number. A value in square bracket or TBD is not much different. We prefer to have TBD instead of a number we aren’t sure about. We support completion of the work item in December.

Ericsson: We support completion in December, even with one value as TBD.

KDDI: We support completion in December.

Huawei: We support the proposal from the moderator. We prefer to have a value in square bracket rather than TBD.

Qualcomm: We can have a value for low MCS w/o square bracket. For the high MCS, we can put TBD.

Chair: Can we have simulation results by this Friday? Multiple companies indicated willingness

Nokia: But we need to have an agreement on TxEVM. We propose 2.5%.

Qualcomm: 3% is a candidate

Apple: 3% is ok for the purpose of simulation and requirements for completing this WI

Nokia: We would like to discuss offline with TE vendors about 2.5%

Huawei: We are ok for 3%, but not sure we can have results by Friday.  
R&S: 3% is ok, but cannot commit to lower value in this week.

Anritsu: Same view as R&S.

WF: Assume 3% TxEVM for the purpose of simulation for MCS4 + MCS21 to complete the requirement this week and close the WI. The MCS pair and SNR value corresponding to the higher MCS will be in square bracket, subject to reviewing the simulation results.

Nokia: We would like to capture as part of a WF that RAN4 for this WI will assume for purpose of simulation all TxEVM from TE no higher than 3% for modulation orders up to 256QAM.

**Issue 1-1-3: Applicability**

* Proposals: The following applicability rule should be considered.
  + Proposal 1 (Huawei): The requirements are only applicable for UE supporting TDD-TDD intra-band Non-Collocated NR-CA [*intraBandNonColocatedCA-r18*].
  + Proposal 2 (Huawei): The requirements apply only in case modulation order configured for each CC doesn’t exceed UE per CC capability on supported maximum modulation order.
    - The requirements apply on in case the UE indicates support of 256QAM modulation scheme for PDSCH for FR1 (*pdsch-256QAM-FR1*)
  + Proposal 3 (Apple): Discuss how to capture this side condition such that the requirement will only be applicable to bands that are separated by 80MHz+BWanother/2.
* Recommended WF
  + Discuss these proposals.
  + Moderator: For proposal 3, RAN4 has already sent LS to RAN5 (R4-2316951) in RAN4#109bis to inform RF conformance test should consider the frequency separation 80MHz+BWanother/2.

Online:

Apple: if a UE does not support 256QAM, do we have a requirement? Is 256QAM mandatory?

Ericsson: 256QAM is a release 15 feature that is mandatory for FR1

Apple: If the LS is already sent and RAN5 is ok, then we are fine. We would like to keep this open until we receive confirmation from RAN5. We would like to check with our RAN5 delegates.

Huawei: The LS from RAN4 should be enough because frequency separation is a RAN4 issue. There will be no official response or confirmation from RAN5. This is simply internal delegate coordination.

**Issue 1-1-4: Configuration parameters**

* Proposal (Huawei): The following test setup should be considered.
  + During the demod test, the new RRC signaling to be introduced by RAN2 should be configured to guarantee the tested UE is operating on type2 architecture.
* Recommended WF
  + Discuss whether this proposal is agreed.
  + Note RAN2 will implement new RRC signaling in RAN2#124 (November 2023) meeting.

Online:

Ericsson: RAN plenary decision is to introduce the RRC signaling, but RAN2 is still implementing this signaling

**Issue 1-1-5: CA combinations**

Moderator: Draft CR R4-2319525 specifies the CA combinations TDD 30 kHz + TDD 30 kHz, TDD 15 kHz + TDD 30 kHz, and TDD 15 kHz + TDD 30 kHz. RAN4 has agreed to specify with CBW=40MHz only, but not discussed the SCS.

* Proposals:
  + Option 1: Specify TDD 30 kHz + TDD 30 kHz, TDD 15 kHz + TDD 30 kHz, and TDD 15 kHz + TDD 30 kHz.
  + Option 2: Specify TDD 30kHz + TDD 30kHz only.
  + Option 3: Others
* Recommended WF
  + This WI limits to 2 CC intra-band CA with n77/n78. Considering the carrier frequency around 4.0GHz and intra-band CA, the moderator thinks Option 2 is the reasonable option.

Online:

[**R4-2321052**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321052.zip) **WF on [109][319] NonCol\_intraB\_ENDC\_NR\_CA\_Demod**

*Type: other For: Approval  
 Source: Ericsson*

**Decision: Approved.**

### 8.12 Enhanced NR support for high speed train scenario in frequency range 2

#### 8.12.1 RRM core requirement maintenance

#### 8.12.2 RRM performance requirements

#### 8.12.3 Demodulation performance requirements

##### 8.12.3.1 General and channel modelling

**R4-2319823 On Poporgation Conditions in HST FR2 Enahced deployments**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2319839 Draft CR for channel model on Rel-18 FR2 HST demodulation requirement**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: Endorsed.**

**R4-2319840 Draft big CR for TS 38.101-4 on Rel-18 FR2 HST demodulation requirement**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: For email approval**

**R4-2319841 Simulation results summary for Rel-18 FR2 HST demodulation requirement**

*Type: other For: Information  
 Source: Samsung*

**Decision: Noted.**

##### 8.12.3.2 PDSCH requirements with CA

**R4-2319741 draft CR: FRC of PDSCH demodulation requirements for FR2 HST**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides the FRCs used for UE demodulation requirements in FR2 HST.

**Decision: Endorsed.**

**R4-2319837 Simulation results for PDSCH with CA**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320226 Simulation results on UE CA demodulation requirements for HST FR2**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320579 HST FR2 Enhanced: UE Demodulation PDSCH Requirements with Carrier Aggregation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our views on Issues related to HST FR2 with Carrier Aggregation

**Decision: Noted.**

**R4-2320580 Simulation Results on HST FR2 Enhanced with Carrier Aggregation**

*Type: other For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our simulation results on HST FR2 with Carrier Aggregation

**Decision: Noted.**

**R4-2320583 Draft CR On HST FR2 PDSCH with CA for 38.101-4**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Adding new section for requirements for HST FR2 PDSCH with CA. Furthermore, the corresponding reference measurement channels are added as 2 new tables in the corresponding Appendix.

**Decision: Revised to R4-2321188 (from R4-2320583).**

[**R4-2321188**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321188.zip) **Draft CR On HST FR2 PDSCH with CA for 38.101-4**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Adding new section for requirements for HST FR2 PDSCH with CA. Furthermore, the corresponding reference measurement channels are added as 2 new tables in the corresponding Appendix.

**Decision: Endorsed.**

**R4-2320787 Simulation results for Intraband CA**

*Type: other For: Information  
 Source: Qualcomm Inc.*

**Decision: Noted.**

##### 8.12.3.3 PDSCH requirements with multi-Rx Chain DL reception

**R4-2319742 UE demodulation requirements for FR2 HST multi-Rx reception**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the open issues on UE demodulation requirements for simultaneous multi-Rx reception scenario in FR2 HST.

**Decision: Noted.**

**R4-2319838 Discussion and simulation results for PDSCH requirements with multi-Rx reception**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320224 Discussion on UE multi-Rx demodulation requirements for HST FR2**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320225 Draft CR on PDSCH requirement with multi-Rx reception (TS38.101-4, Rel-18)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Postponed.**

Moderator: Needs update on test parameters and test procedures agreed in this meeting

**R4-2320581 HST FR2 Enhanced: UE Demodulation PDSCH Requirements with Multi-Rx Chain DL Reception**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our views on Issues related to HST FR2 with Multi-RX chain DL reception

**Decision: Noted.**

**R4-2320582 Simulation Results on HST FR2 Enhanced with Multi-Rx Chain DL Reception**

*Type: other For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our simulation results on HST FR2 with Multi-RX chain DL reception

**Decision: Noted.**

**R4-2320788 Simulation results for Simultaneous RX**

*Type: other For: Information  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320789 FR2 HST UE Demod Requirements with multiRX Chain Reception**

*Type: discussion For: Approval  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320790 draftCR on applicability rules for multiRX FR2 HST UE Demod requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321200 (from R4-2320790).**

**[R4-2321200](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321200.zip) draftCR on applicability rules for multiRX FR2 HST UE Demod requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Endorsed.**

##### 8.12.3.4 Demodulation aspects for tunnel deployment scenario

#### 8.12.4 Moderator summary and conclusions

**R4-2318212 Topic summary for [109][320] NR\_HST\_FR2\_enh\_Demod**

*Type: other For: Information  
 Source: Moderator (Samsung)*

**Abstract:**

[109][300] BDaT Session AI 8.12.3.1, 8.12.3.2, 8.12.3.3, 8.12.3.4

**Decision: Noted.**

**Issue 1-1-1: Whether need to include two different propagation conditions for HST FR2 PC 6 UE performance evaluation with simultaneous two-panel reception**

* Agreement in previous meetings
  + No need to model the relative propagation delay from the visible RRH into the channel modelling
  + Do not consider the relative power profile modelling based on FR2 HST UE location for HST FR2 scenario to specify PDSCH requirement with multi-Rx simultaneous reception
  + Introduce RTD in the FR2 HST PDSCH requirement between the different RX panels. Discuss RTD value based on evaluation.
  + Define two different fixed MCS values per each Panels for PDSCH requirement with multi-Rx reception with fixed FRC
* Observations
  + Observation 1 (Nokia):
    - Agreed Doppler profiles for HST FR2 deployment with simultaneous two-panel reception are dynamic (i.e., Doppler offset is changing with time) and assume the change of the RRHs, however, the value of RTD and SNR difference defining MCSs are selected based on the fixed UE position in the deployment.
* Proposals
  + Option 1 (Nokia):
    - RAN4 to consider introducing two different propagation conditions for HST FR2 PC 6 UE performance evaluation with simultaneous two-panel reception
      * With dynamic Doppler profile as agreed before
      * With the fixed values of Doppler offset per panel matching the RTD and SNR difference, if the corresponding test is found to be needed
* Recommended WF
  + Moderator note: For FR2 HST with multi-Rx reception, separate processing was agreed for each panel. The intention of involving two different fixed MCS is to reflect the power difference of two transmitted PDSCH received by each Panel. And the intention of involving RTD is to reflect the relative timing difference of two received PDSCH and to verify FR2 PC6 with multi-Rx reception simultaneously. From moderator perspective, RAN4 has discussed the channel modelling with several meetings, to move forward, suggest to keep the previous agreements as
    - Channel Modelling
      * No need to model the relative propagation delay from visible RRH into the channel modelling
      * Do not consider the relative power profile modelling based on FR2 HST UE location for HST FR2 scenario to specify PDSCH requirement with multi-Rx simultaneous reception
    - Requirement introduced
      * Introduce RTD in the FR2 HST PDSCH requirement between the different RX panels. Discuss RTD value based on evaluation.
      * Define two different fixed MCS values per each Panels for PDSCH requirement with multi-Rx reception with fixed FRC

Online:

Nokia: We agreed dynamic doppler profile, but we should not merge everything into a single model.

Qualcomm: Fixed doppler doesn’t test anything. Doppler tracking is the most challenging aspect and should be tested.

Nokia: We can split the test case to add Doppler offset

Samsung: For HST, we need to verify UE can track doppler. We prefer to keep the previous agreement.

Qualcomm: Splitting the test creates unnecessary test w/o additional coverage.

Ericsson: Prefer variable doppler with fixed RTD and receive power imbalance. Prefer to keep the previous agreement.

Nokia: We don’t have an agreement yet. We still have a concern that we have incompatible assumptions.

Qualcomm: A UE that passes a dynamic doppler profile should also pass fixed doppler

**Issue 3-1-1: Test requirement to be defined**

* WF in the last meeting
  + Option 1: one case with RTD larger than CP
  + Option 2: two cases based on UE declaration on supported baseband processing with RTD larger than CP or not
    - Case 1: RTD =1.0 CP
    - Case 2: RTD larger than CP
* Observations
  + Observation 1 (Ericsson, Samsung): For FR2 HST deployment scenario B, RTD > 1.0x CP for 46% of the test time
  + Observation 2 (Nokia): RRM has agreed to consider maximum RTD of 8us
  + Observation 3 (QC):
    - RAN4 has agreed to introduce RTD in the test parameters, to test the correct implementation of TO compensation at the FR2 HST UE
    - FR2 HST CPE are expected to handle large RTD (RTD>CP) in the agreed deployment scenario and should be tested accordingly;
    - According to the agreed deployment model, RTD between TRP serving different panels can be maximum 2.5\*CP and is expected to exceed CP for ~50% of the time;
* Proposals
  + Option 1 (Samsung, Ericsson, Nokia, QC): one case with RTD larger than CP
    - Samsung: Introduce PDSCH requirements with RTD larger than CP, the PDSCH requirement is only applied for UE supporting simultaneousReceptionFR2HST-r18 capability
    - Ericsson: Define PDSCH demodulation requirements for FR2 HST simultaneous multi-Rx reception case with the assumption UE is capable of the separate FFT processing per TRP
    - Nokia: For test requirements, RAN4 to consider RTD larger than CP.
    - QC:
      * RAN4 should not consider PDSCH requirements that consider RTD smaller or equal to CP, as there is no deployment under consideration designed with constraint
      * RAN4 should introduce PDSCH requirement to test correct FR2 HST UE baseband processing setting RTD=2.5CP, limit case computed according to the agreed deployment scenario
* Recommended WF
  + Moderator note: Based RRM Core requirement for FR2 HST based on deployment, Rel-18 FR2 PC6 UE should support simultaneous data reception from two panels with MRTD more than the CP length

|  |
| --- |
| **Issue 1-2-1: The impact to MRTD requirements**   * Agreement from Thursday Ad-Hoc Session:   + For Rel-18 FR2 PC6 UE, the new MRTD requirement shall be defined for simultaneous reception from two panels:     - MRTD = [8]us |

Meanwhile, in order to support simultaneous data reception from two panels with MRTD more than the CP length, a new UE capability introduce to indicate support of simultaneous multi-panel reception for Rel-18 FR2 PC6 UE as

|  |
| --- |
| **Issue 1-2-1: Whether need to define a new or reuse the existing (simultaneousReceptionDiffTypeD-r16) capability for multi-panel simultaneous reception**   * Agreement:   + Define a new UE capability [simultaneousReceptionFR2HST-r18] to indicate support of simultaneous multi-panel reception for Rel-18 FR2 PC6 UE |

To follow the core requirement, the following WF is recommended

* + Introduce PDSCH requirement with only considering RTD larger than CP. The PDSCH requirement is only applied for UE supporting [simultaneousReceptionFR2HST-r18] capability

Online:

Huawei: We do not think we should limit the requirements to RTD > CP. We should consider both cases.

Samsung: For HST, all requirements are based on this deployment scenario. Do we introduce RTD < CP w/o capability?

Huawei: RTD < CP as basic functionality and > CP based on capability

Samsung: For HST, unclear which is the basic functionality and which should be based on capability

Nokia: If the UE passes RTD > CP, it will also pass the requirement for < CP

Qualcomm: Agree with Nokia

Huawei: There should be RRM requirements for > CP, but from demod point of view it is not necessary. We don’t want to limit UE implementations.

**Issue 3-1-2: UE processing assumption for FFT window**

* + The following WF is recommended
    - Define PDSCH demodulation requirements for FR2 HST multi-Rx reception simultaneously with the baseline assumption of independent FFT UE processing

Online:

Huawei: Simulation results have been provided for both single FFT and two FFT. The performance difference is more than 1 dB. We can compromise to define the requirements according to simulations, but not to explicitly specify whether we use one or two FFT’s. We think the simulations can proceed according to each company’s assumption.

Nokia: Can Huawei accept even with large CP as high as 2.5 CP?

Huawei: Ok with 1.2 CP

Qualcomm: Huawei’s simulations suggest the impact of 1FFT vs. 2FFT is not large even for 2.5 CP. Other companies results show a larger difference between 1FFT and 2FFT.

Samsung: Propose 2.5 CP but do not specify 1FFT vs. 2FFT

Huawei: RTD is also related to power imbalance and MCS selection. RAN4 should define minimum requirements which should not limit implementation and deployment scenarios.

[**R4-2321063**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321063.zip) **WF on [109][320] NR\_HST\_FR2\_enh\_Demod**

*Type: other For: Approval  
 Source: Samsung*

**Decision: Approved.**

### 8.13 Air-to-ground network for NR

#### 8.13.1 General aspects (TR/big CR)

#### 8.13.2 FR1 co-existence evaluation for ATG network

#### 8.13.3 UE RF requirements

#### 8.13.4 BS RF requirements

**R4-2318303 Discussion on 1024QAM for ATG BS**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2320089 CR for TS 38.104 on adding RF requirements for ATG BS**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0543 rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321028 (from R4-2320089).**

**[R4-2321028](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321028.zip) CR for TS 38.104 on adding RF requirements for ATG BS**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0543 rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation, CMCC, CATT*

**Decision: Agreed.**

#### 8.13.5 BS RF conformance testing requirements

**R4-2318304 Draft CR for TS 38.141-1, On ATG BS requirements**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: CATT*

**Decision: Revised to R4-2321027 (from R4-2318304).**

**[R4-2321027](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321027.zip) Draft CR for TS 38.141-1, On ATG BS requirements**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: CATT*

**Decision: Endorsed.**

**R4-2318932 Discussion on BS RF conformance testing requirements**

*Type: discussion For: Decision  
 Source: CMCC*

**Decision: Noted.**

**R4-2319650 ATG BS conformance**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Test model coverage

**Decision: Noted.**

**R4-2320086 Further discussion on the ATG BS conformance test**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320087 Draft CR for TS 38.141-1 on adding RF requirements for ATG BS**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Merged (with R4-2321027).**

**R4-2320088 Draft CR for TS 38.141-2 on adding RF requirements for ATG BS**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321196 (from R4-2320088).**

**[R4-2321196](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321196.zip) Draft CR for TS 38.141-2 on adding RF requirements for ATG BS**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

#### 8.13.6 RRM core requirements

#### 8.13.7 RRM performance requirements

#### 8.13.8 Demodulation performance requirements

##### 8.13.8.1 General aspects

**R4-2318905 Summary of simulation results for ATG UE and BS demodulation requirements**

*Type: other For: Information  
 Source: CMCC*

**Decision: Noted.**

**R4-2319546 Discussion on ATG general aspects**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320220 Discussion on NR ATG demodulation requirements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.13.8.2 UE demodulation performance and CSI requirements

**R4-2318906 Discussion on UE demodulation and CSI requirements for ATG scenario**

*Type: discussion For: Decision  
 Source: CMCC*

**Decision: Noted.**

**R4-2318907 Simulation results for ATG PDSCH demodulation**

*Type: discussion For: Information  
 Source: CMCC*

**Decision: Noted.**

**R4-2319231 Draft CR to 38.101-4 for FRC for PDSCH requirement for ATG network**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides the RMC for ATG PDSCH requirements

**Decision: Revised to R4-2321122 (from R4-2319231).**

[**R4-2321122**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321122.zip) **Draft CR to 38.101-4 for FRC for PDSCH requirement for ATG network**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR provides the RMC for ATG PDSCH requirements

**Decision: Endorsed.**

Moderator: We need to add the new TDD pattern

**R4-2319232 On PDSCH requirements for ATG network**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the 1024QAM for ATG PDSCH requirements

**Decision: Noted.**

**R4-2319233 Updated simulation results for ATG PDSCH demodulation requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This contribution submits our impairment results for ATG PDSCH

**Decision: Noted.**

**R4-2319547 Discussion on ATG UE demodulation**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319548 Simulation results for ATG UE demodulation**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320218 [NR\_ATG-Perf] Draft CR on ATG PDSCH demodulation performance requirements (TS38.101-4, Rel-18)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321123 (from R4-2320218).**

[**R4-2321123**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321123.zip) **[NR\_ATG-Perf] Draft CR on ATG PDSCH demodulation performance requirements (TS38.101-4, Rel-18)**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

Moderator: FRC values can be added to use legacy

**R4-2320222 Simulation results on NR UE ATG demodulation requirements**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320791 ATG PDSCH Simulation Results**

*Type: other For: Information  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320792 UE Demodulation Requirements for ATG**

*Type: discussion For: Approval  
 Source: Qualcomm Inc.*

**Decision: Noted.**

**R4-2320793 draftCR on applicability rules for ATG UE Demod Requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Revised to R4-2321124 (from R4-2320793).**

Moderator: Tables and section numbers are not aligned

[**R4-2321124**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321124.zip) **draftCR on applicability rules for ATG UE Demod Requirements**

*Type: draftCR For: Endorsement  
 38.101-4 v18.1.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Inc.*

**Decision: Endorsed.**

##### 8.13.8.3 BS demodulation performance requirements

**R4-2319321 Discussion on ATG BS Demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Remaining issues

**Decision: Noted.**

**R4-2319322 Simulation results on ATG BS Demodulation requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

Simulation results with impairments

**Decision: Noted.**

**R4-2319323 [NR\_ATG-Perf] Draft CR for TS38.141-1 PUSCH requirements and FRC tables**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR for TS38.141-1 PUSCH requirements and FRC tables

**Decision: Revised to R4-2321125 (from R4-2319323).**

Samsung: FRC number is not aligned across specs

[**R4-2321125**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321125.zip) **[NR\_ATG-Perf] Draft CR for TS38.141-1 PUSCH requirements and FRC tables**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR for TS38.141-1 PUSCH requirements and FRC tables

**Decision: Endorsed.**

**R4-2319549 Simulation results for ATG BS demodulation requirements**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319550 Draft CR to TS38141-2 the introduction of applicablity of PUSCH,PUCCH and PRACH for ATG performance requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321126 (from R4-2319550).**

[**R4-2321126**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321126.zip) **Draft CR to TS38141-2 the introduction of applicablity of PUSCH,PUCCH and PRACH for ATG performance requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

Moderator: What is the view on declaration for TDD pattern?

CMCC: Ok for us

Ericsson: Declaration is not necessary since basestation is allowed to support or not support new pattern depending on deployment need. The TDD pattern is just a note.

Samsung: Same view as Ericsson.

ZTE: If the BS supports the new TDD pattern, it should be tested against it and not tested against the legacy. This is the reason for declaration.

Ericsson: Our understanding is the support of new TDD pattern allows you to skip the legacy, but doesn’t mandate the BS to skip the legacy

CMCC: There is no TDD pattern declaration for BS. Different operators may deploy different configurations, so not necessary to have this declaration.

ZTE: We can compromise to remove the declaration.

**R4-2319551 Draft CR to TS38141-2 the introduction of PUSCH requirements and FRCs for ATG performance requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321127 (from R4-2319551).**

[**R4-2321127**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321127.zip) **Draft CR to TS38141-2 the introduction of PUSCH requirements and FRCs for ATG performance requirements**

*Type: draftCR For: Endorsement  
 38.141-2 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

Moderator: Need to align FRC values across BS specs

**R4-2319835 Discussion and simulation results for BS demodulation requirements for Rel-18 ATG**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319836 Draft CR on manufacturer and applicability rule of BS demodulation requirements for Rel-18 ATG**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: Revised to R4-2321128 (from R4-2319836).**

[**R4-2321128**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321128.zip) **Draft CR on manufacturer and applicability rule of BS demodulation requirements for Rel-18 ATG**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Samsung*

**Decision: Endorsed.**

**R4-2320219 [NR\_ATG-Perf] Draft CR on ATG PUSCH demodulation performance requirements and FRC definition (TS38.104, Rel-18)**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Revised to R4-2321129 (from R4-2320219).**

[**R4-2321129**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321129.zip) **[NR\_ATG-Perf] Draft CR on ATG PUSCH demodulation performance requirements and FRC definition (TS38.104, Rel-18)**

*Type: draftCR For: Endorsement  
 38.104 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei,HiSilicon*

**Decision: Endorsed.**

Moderator: FRC number and TDD pattern note and others

**R4-2320221 Simulation results on NR BS ATG demodulation requirements**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.13.9 Moderator summary and conclusions

**R4-2318194 Topic summary for [109][302] NR\_ATG\_BSRF**

*Type: other For: Information  
 Source: Moderator (ZTE)*

**Abstract:**

[109][300] BDaT Session AI 8.13.4, 8.13.5

**Decision: Noted.**

**Issue 1-1:** **Whether or not support 1024QAM for ATG BS.**

* Option 1: No, the requirements/ conformance testing related to 1024QAM in TS 38.104/TS38.141-1 and TS38.141-2 should be ruled out (R4-2320086, R4-2318303)
* Option 2: Yes, the requirements in TS 38.104 could be reused (R4-2318932, R4-2319650 )
* Recommended WF
  + TBA.

***Moderator note: In the subclause 7.2.2.2 in*** ***TR38.876, the supported modulation schemes are:***

***Modulation quality***

*It is agreed to specify QPSK, 16QAM, 64QAM and 256QAM for ATG, for the supported modulation order is up to the vendor’s declaration.*

Online:

Ericsson: 1024QAM has already been standardized, we already have requirements so no specification work is needed. Link budget supports 1024QAM due to LOS to the aircraft. Why would we want to exclude it?

CMCC: Agree with Ericsson, over 30 dB SNR can be achieved based on our link budget study. Existing requirements can be used and based on declaration.

CATT: 1024QAM requires 30 dB SNR, but cannot achieve in real world

ZTE: Over 30 dB can be achieved by link budget, but power backoff is not acceptable by the operator due to coverage loss. Other UE requirements haven’t been discussed yet in UE RF session. Channel conditions for demod also need consideration. As compromise, we propose 1024QAM is not precluded and can be discussed in future release.

Ericsson: Performance part of demod still has time. UE RF is only max input power. 1024QAM is not precluded and based on declaration, the spec is already available. Perhaps one way is to include a note about link budget considerations.

Proposal to be further discussed offline: 1024QAM is supported by the specifications under vendor declaration basis, but add a note to indicate actual deployment may require additional consideration of link budget …

**R4-2318213 Topic summary for [109][321] NR\_ATG\_Demod**

*Type: other For: Information  
 Source: Moderator (CMCC)*

**Abstract:**

[109][300] BDaT Session AI 8.13.8.1, 8.13.8.2, 8.13.8.3

**Decision: Noted.**

**Issue 1-1: Tx EVM for new incremental PUSCH requirements**

* Agreement
  + Option 1: For the Tx EVM, 3% for MCS Table 2 and 6% for MCS Table 1 needs to be considered in ideal results

Online:

Qualcomm: This should be PDSCH

CMCC: Yes, typo

**Issue 1-2: Special Slot Configuration of 30D4S6U**

* Proposals
  + Option 1: S=14G

Online:

Ericsson: Support option 1, we also used this in our draft CR

**Issue 1-3: Other parameters which not discussed before**

* Agreement
  + Option 1: For the other parameters which not discussed before, for example, the SSB configuration, TRS configurations and so on, reuse the legacy common configuration, as in Table 5.2-1 in TS 38.101-4. (CMCC)

Online:

**Issue 1-4: Whether to introduce 1024QAM for new incremental PDSCH requirements**

Online:

Moderator: In the BS discussion, it was agreed not to preclude the possibility of 1024 QAM, but we need to decide whether to define UE demodulation requirements.

Ericsson: Our link budget studies show 1024QAM is feasible for <30km TDD and <50km FDD. SNR is ~24dB for 95% max throughput. So we think 1024QAM is feasible for ATG. The link budget study did not consider UE MPR.

Qualcomm: Even if feasible, is the requirement necessary? The cell size is much larger than the 50 km, and this is optional for ATG UE.

ZTE: Link budget is not the limiting factor, so other factors such as power backoff need to be studied. We should wait for UE RF session.

CMCC: To Qualcomm, if we have the whole package for 1024 including BS, UE RF, can we also have UE demod?

Qualcomm: We don’t necessarily need to have the requirement. Is it worth to have the requirement based on expected occasional usage.

Huawei: We should consider the 1024QAM

Ericsson: Compared to TN, the ATG may have greater opportunity to use 1024 QAM due to LOS channel, higher antenna gain

Qualcomm: We’d like more time to check and see the outcome of the UE RF session. This is quite late in the WI.

Moderator: BS requirements are available for 1024QAM and whether BS supports 1024QAM is up to declaration, in UE RF session the agreed CR does not capture a requirement for 1024QAM maximum input power, but we would like to understand how to proceed for UE demod requirements.

Ericsson: We prefer to continue the discussion in future meetings in maintenance for UE RF

Huawei: We are ok to further discussion in future meetings

Agreement: We can continue to discuss 1024QAM UE demodulation requirements in future meetings.

**Issue 1-5: Test scope for PDCCH**

***Agreement in last meeting:***

* *To consider legacy PDCCH requirements for ATG PDCCH requirements to cover all AL.*
* *The following test cases are for down-selection: (if necessary)*
  + *1T2R FDD: Test number 1, 3 and 5 in 5.3.2.1.1*
  + *2T2R FDD: Test number 3 in 5.3.2.1.2*
  + *1T2R TDD: All test cases in 5.3.2.2.1*
  + *2T2R TDD: All test cases in 5.3.2.2.2*
  + *1T4R FDD: Test number 1, 3 and 5 in 5.3.3.1.1*
  + *2T4R FDD: Test number 3 in 5.3.3.1.2*
  + *1T4R TDD: All test cases in 5.3.3.2.1*
  + *2T4R TDD: All test cases in 5.3.3.2.2*
* Agreeement
  + Do not do further down-selection based on the given test cases set from last meeting’s agreement

**Issue 2-1: How to introduce new TDD pattern configuration 30D4S6U in ATG PUSCH requirements**

Online:

Samsung: Both options 3 and 4 are ok for us. We agreed to use a note last meeting.

Ericsson: Same view as Samsung

ZTE: We are ok with option 3 or 4. We should remove FDD in option 4 because of different doppler, so we prefer option 3.

Agreement: Option 3. NOTE 1: The same requirements are applicable to TDD with different UL-DL pattern, e.g., 30D4S6U, S=40G for 30kHz SCS.

### 8.14 NR support for dedicated spectrum less than 5MHz for FR1

#### 8.14.1 System parameter maintenance (resubmitted CR)

#### 8.14.2 UE RF requirement maintenance (resubmitted CR)

#### 8.14.3 BS RF requirement maintenance (resubmitted CR)

**R4-2318393 Draft CR to TS 38.141-1 on introduction of 3 MHz channel bandwidth in clauses 4.1, 6.3 and 6.6**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Required changes to support 3 MHz channel bandwidth in clauses 4.1, 6.3 and 6.6.

**Decision: Endorsed.**

**R4-2318394 Big CR to TS 38.141-1 on introduction of 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0388 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, ZTE Corporation, Ericsson, Huawei*

**Abstract:**

Required changes to support 3 MHz channel bandwidth.

**Decision: Agreed.**

[**R4-2321025**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321025.zip) **Big CR to TS 38.141-1 on introduction of 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0388 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, ZTE Corporation, Ericsson, Huawei*

**Abstract:**

Required changes to support 3 MHz channel bandwidth.

**Decision: Withdrawn.**

**R4-2318474 Discussion on Tx intermodulation requirements maintenance in certain region**

*Type: discussion For: Discussion  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Noted.**

**R4-2318475 [NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for Tx intermodulation core requirements in certain region**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0526 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Revised to R4-2321049 (from R4-2318475).**

[**R4-2321049**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321049.zip) **[NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for Tx intermodulation core requirements in certain region**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0526 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Agreed.**

**R4-2318476 [NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for Tx intermodulation requirements in certain region**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0389 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Revised to R4-2321050 (from R4-2318476).**

[**R4-2321050**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321050.zip) **[NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for Tx intermodulation requirements in certain region**

*Type: CR For: Agreement  
 38.141-1 v18.3.0 CR-0389 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Agreed.**

**R4-2318477 [NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for OTA Tx intermodulation requirements in certain region**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0552 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Revised to R4-2321051 (from R4-2318477).**

[**R4-2321051**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321051.zip) **[NR\_FR1\_lessthan\_5MHz\_BW-Core] CR for OTA Tx intermodulation requirements in certain region**

*Type: CR For: Agreement  
 38.141-2 v18.3.0 CR-0552 rev Cat: F (Rel-18)  
  
 Source: NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten mobile, Inc*

**Decision: Agreed.**

**R4-2318566 CR to TS 38.104 on clarification of applicable SS raster entries for 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0528 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, ZTE Corporation, Ericsson*

**Abstract:**

Delete the undefined term 'DCH'.

**Decision: Agreed.**

**R4-2319198 Draft CR to TS38.141-1: Introduction of 3 MHz channel bandwidth with NB-IoT support**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

**R4-2319581 Spectrum less than 5 MHz - BS RF conformance considerations**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

This contribution discusses some issues found drafting the BS RF conformance spec and make proposals to address them

**Decision: Noted.**

**R4-2319582 Draft CR to TS 38.141-1 - Introduction of 3 MHz channel bandwidth**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR is our contribution to the introduction of 3 MHz channel bandwidth, according to the work split agreed for TS 38.104.

**Decision: Endorsed.**

**R4-2319583 CR to TS 37.141 - Consideration of NR 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 37.141 v18.3.0 CR-1068 rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This CR considers the introduction of NR 3 MHz channel bandwidth

**Decision:** The document was **revised to R4-2320415**.

**R4-2319750 CR to TS 38.104 on support of NB-IoT operation in NR in-band for 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 38.104 v18.3.0 CR-0542 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, ZTE Corporation, Ericsson*

**Abstract:**

Required changes to support NB-IoT operation in NR in-band for 3 MHz channel bandwidth.

**Decision: Agreed.**

**R4-2320151 Draft CR to TS 38.141-1: Operating band unwanted emissions for 3 MHz channel bandwidth**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Noted.**

**R4-2320415 CR to TS 37.141 - Consideration of NR 3 MHz channel bandwidth**

*Type: CR For: Agreement  
 37.141 v18.3.0 CR-1068 rev 1 Cat: B (Rel-18)  
  
 Source: Ericsson*

(Replaces R4-2319583)

**Abstract:**

This CR considers the introduction of NR 3 MHz channel bandwidth

**Decision: Agreed.**

**R4-2320844 Draft CR to TS 38.141-1: in-band blocking requirements for 3 MHz channel bandwidth (7.4.2) including in-band NB-IoT, Rel-18**

*Type: draftCR For: Endorsement  
 38.141-1 v18.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the work-split in R4-2305901, conducted in-band blocking test requirements are provided in this Draft CR for NR BS operation in 3MHz channel bandwidth, updated with the NB-IoT support.

**Decision: Endorsed.**

#### 8.14.4 RRM core requirement

#### 8.14.5 RRM performance requirements

#### 8.14.6 Demodulation performance requirements

##### 8.14.6.1 UE demodulation performance and CSI requirements

**R4-2318665 Discussion on UE demodulation requirements for less than 5MHz BW**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision:** The document was **withdrawn**.

**R4-2318680 UE demodulation performance and CSI requirements for NR support for dedicated spectrum less than 5MHz for FR1**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318788 On Lessthan5MHz UE demod perf and CSI requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper present Nokia's view on the different aspects of UE demodulation performance and CSI requirements for new topic <5MHz including proposals on where to focus for requirement definition.

**Decision: Noted.**

**R4-2318789 On Lessthan5MHz UE demod perf and CSI requirements - Simulations**

*Type: discussion For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper present Nokia's initial simuation results with focus on impact of puncturing PDCCH and PBCH

**Decision: Noted.**

**R4-2319419 Discussion on UE demodulation requirements for dedicated spectrum less than 5MHz**

*Type: discussion For: Discussion  
 Source: Samsung Shenzhen*

**Decision: Noted.**

**R4-2319541 Discussion on NR support for dedicated spectrum less than 5MHz for FR1 demodulation performance requirements**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319542 Simulation results for UE demodulation performance and CSI requirements for less than 5MHz**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319746 Discussion on UE demodulation and CSI reporting requirements for NR less than 5MHz**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the UE demodulation and CSI reporting requirements for WI NR less than 5MHz.

**Decision: Noted.**

**R4-2320197 Discussions on UE demodulation and CSI requirements for dedicated sprectrum less than 5MHz for FR1**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320198 Simulation results for PBCH requirements with 3MHz bandwidth**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320704 Discussion on UE demodulation requirements for less than 5MHz BW**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2320794 UE Demodulation for less than 5MHz**

*Type: discussion For: Approval  
 Source: Qualcomm Inc.*

**Decision: Noted.**

##### 8.14.6.2 BS demodulation performance requirements

**R4-2318041 Discussion on BS Demodulation on Less than 5 MHz**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In the following contribution we will provide Nokia’s view on the background and scope for RAN4 to specify BS demodulation performance requirements related to less than 5MHz CBW.

**Decision: Noted.**

**R4-2318042 Supporting Simulations for BS Demodulation on Less than 5 MHz**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In the following contribution we will provide simulation results to support Nokia’s view on the background and scope for RAN4 to specify BS demodulation requirements related to less than 5MHz CBW.

**Decision: Noted.**

**R4-2319315 Discussion on NR less than 5MHz BS demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

scope on PUSCH/PUCCH, applicability rule

**Decision: Noted.**

**R4-2319316 Simualtion results for NR less than 5MHz BS demodulation requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

Comparing simulations for 3MHz and 5MHz on PUSCH/PUCCH

**Decision: Noted.**

**R4-2319543 Discussion on BS demodulation performance requirements for less than 5MHz**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319544 Simulation results for BS demodulation performance for less than 5MHz.**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319844 Discussion and initial results for BS demodulation requirement for less than 5MHz**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320199 Discussions on BS requirements for dedicated sprectrum less than 5MHz for FR1**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.14.7 Moderator summary and conclusions

**R4-2318195 Topic summary for [109][303] NR\_FR1\_lessthan\_5MHz\_BW\_BSRF**

*Type: other For: Information  
 Source: Moderator (Nokia)*

**Abstract:**

[109][300] BDaT Session AI 8.14.3

**Decision: Noted.**

**Issue 1-1: R4-2318474, R4-2318475, R4-2318476, R4-2318477 (Tx intermodulation requirements maintenance in certain region)**

* Proposals: Add additional requirement tables for band n26 and n28 in Japan as follows,

**Table 4 for BS type 1-C**

Table 6.7.2.2-2 Interfering and wanted signals for the additional transmitter intermodulation requirement for Band n26 and n28 (5 MHz and over channel bandwidth)

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Wanted signal | NR single carrier |
| Interfering signal type | NR signal of 5 MHz *channel bandwidth* |
| Interfering signal level | Rated total output power in the operating band – 30 dB |
| Interfering signal centre frequency offset from the lower/upper carrier centre frequency of the wanted signal | ± 2.5 MHz  ± 7.5 MHz  ± 12.5 MHz |

**Table 5 for BS type 1-H**

Table 6.7.3.3-2 Interfering and wanted signals for the additional transmitter intermodulation requirement for Band n26 and n28 (5 MHz and over channel bandwidth)

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Wanted signal | NR single carrier |
| Interfering signal type | NR signal of 5 MHz *channel bandwidth* |
| Interfering signal level | *Rated total output power* per *TAB connector* (Prated,t,TABC) in the *operating band* – 30 dB |
| Interfering signal centre frequency offset from the lower/upper carrier centre frequency of the wanted signal | ± 2.5 MHz  ± 7.5 MHz  ± 12.5 MHz |

**Table 6 for BS type 1-O**

Table 9.8.3-1: Interfering and wanted signals for  
the OTA transmitter intermodulation requirement for n26 and n28 (5 MHz and over channel bandwidth)

| Parameter | Value |
| --- | --- |
| Wanted signal | NR single carrier |
| Interfering signal type | NR signal of 5 MHz *channel bandwidth* |
| Interfering signal power level | min(46 dBm, Prated,t,TRP) |
| Interfering signal centre frequency offset from the lower (upper) edge of the wanted signal or edge of *sub-block* inside a gap | ± 2.5 MHz  ± 7.5 MHz  ± 12.5 MHz |

* Options
  + Option 1: Approve proposals in R4-2318474, and agree R4-2318475, R4-2318476, R4-2318477
  + Option 2: Revise proposals in R4-2318474, and revise R4-2318475, R4-2318476, R4-2318477
  + Option 3: Note proposals in R4-2318474, and note R4-2318475, R4-2318476, R4-2318477
* Recommended WF
  + TBD

Online:

Ericsson: Is this issue also applicable to other bands? Should we also add the other bands?

Nokia: Japan is specific with 5 MHz interferer, even if 3 MHz is supported. We can approve this CR and address the other regions separately.

ZTE: Prefer to limit to Japan, don’t need for other bands.

Huawei: Ok with band specific solution, but the wording could be improved “5 MHz and over”

NEC: The wording is incorrect on parameter description, center-to-center frequency is not correct

Ericsson: Ok to limit to Japan

**Issue 1-2: R4-2318566 (CR to TS 38.104 on clarification of applicable SS raster entries for 3 MHz channel bandwidth)**

* Proposals
  + Option 1: Agree the CR
  + Option 2: Revise the CR
* Recommended WF
  + Option 1: Agree the CR (Resubmission of endorsed draft CR in R4-2315269)

**Issue 1-3: R4-2319750 (CR to TS 38.104 on support of NB-IoT operation in NR in-band for 3 MHz channel bandwidth)**

* Proposals
  + Option 1: Agree the CR
  + Option 2: Revise the CR
* Recommended WF
  + Option 1: Agree the CR (According to the agreed WF in R4-2316899)

**Issue 2-1: R4-2318393 (Draft CR to TS 38.141-1 on introduction of 3 MHz channel bandwidth in clauses 4.1, 6.3 and 6.6)**

* Proposals
  + Option 1: Endorse the draft CR
  + Option 2: Revise the draft CR
* Recommended WF
  + Option 1: Endorse the draft CR (Resubmission of endorsed draft CR in R4-2316897)

Online:

Huawei: Unwanted emissions wording says “above 3 MHz” which implies bandwidths between 3 and 5 MHz.

Nokia: Want to handle the case of 20 RB’s for 5 MHz. This was discussed previously.

Huawei: it is not consistent across other sections which explicitly mention 3 MHz

Ericsson: Can we endorse this CR and make the change in the big CR?

**Issue 2-2: R4-2319198 (Draft CR to TS 38.141-1: Introduction of 3 MHz channel bandwidth with NB-IoT support)**

* Proposals
  + Option 1: Endorse the draft CR
  + Option 2: Revise the draft CR
* Recommended WF
  + Option 1: Endorse the draft CR (Resubmission of endorsed draft CR in R4-2315145 with updates according to the agreed WF in R4-2316899)

**Issue 2-3: R4-2319581, R4-2318582, R4-2318583, R4-2320415 (Spectrum less than 5 MHz - BS RF conformance considerations)**

* Proposals
  + Proposal 1: Build NRTC1 with the narrowest supported channel bandwidth NR signal if NB-IoT is not supported and with 5 MHz channel BW signal when NB-IoT is supported. Build all other test configurations with a 5 MHz channel bandwidth signal.
  + Proposal 2: RAN4 should further consider building all NR test configurations (even NRTC1 when NB-IoT is not supported) using a 5 MHz channel bandwidth NR signal.
* Options
  + Option 1: Approve proposal 1 in R4-2319581, endorse R4-2319582, agree R4-2320415
  + Option 2: Approve proposal 2 in R4-2319581, revise R4-2319582 and R4-2320415
* Recommended WF
  + TBD (TS 37.141 needs to be included in the list of impacted specifications in the WID)

Online:

Nokia: We had decided a single bandwidth, support option 1

**Issue 2-4: R4-2320151 (Draft CR to TS 38.141-1: Operating band unwanted emissions for 3 MHz channel bandwidth)**

* Proposals
  + Option 1: Endorse the draft CR
  + Option 2: Revise the draft CR
  + Option 3: Note the draft CR
* Recommended WF
  + TBD

**Issue 2-5: R4-2320844 (Draft CR to TS 38.141-1: in-band blocking requirements for 3 MHz channel bandwidth (7.4.2) including in-band NB-IoT, Rel-18)**

* Proposals
  + Option 1: Endorse the draft CR
  + Option 2: Revise the draft CR
* Recommended WF
  + Option 1: Endorse the draft CR (Resubmission of endorsed draft CR in R4-2316844 with updates according to the agreed WF in R4-2316899)

Online:

Ericsson: Should remove the [] in the big CR

Need a revision of the big CR. This is the only remaining issue for this topic.

Revised to R4-2321025

|  |  |  |
| --- | --- | --- |
| R4-2318394 | Nokia, Nokia Shanghai Bell, ZTE Corporation, Ericsson, Huawei | Proposal 1: Big CR to TS 38.141-1 on introduction of 3 MHz channel bandwidth.  Observation 1: |

**R4-2318214 Topic summary for [109][322] NR\_FR1\_lessthan\_5MHz\_BW\_demod**

*Type: other For: Information  
 Source: Moderator (Nokia)*

**Abstract:**

[109][300] BDaT Session AI 8.14.6.1, 8.14.6.2

**Decision: Noted.**

**Will UE/BS exist that support ONLY 5MHz CBW and less?**

* Option 1: Yes, this is possible because there are bands that are defined only for 5MHz and 3MHz only (e.g., n100).
  + The support of 3MHz is up to UE capability/BS declaration.
* Option 2: No device/BS will always support other bands defined for more than 5MHz CBW.

Online

Apple: We want to consider the possibility of devices that only support < 5 MHz. Otherwise, we already have requirements.

UIUC: We don’t expect this for the railway case. We expect also support of 10 MHz in Band n101.

Anterix: Do not expect on the UE side. Our devices support multiple North American bands. On the BS side, it is expected to support both 3 and 5 MHz bandwidths.

Moderator: On the UE side, we don’t have tests for 5 MHz or less. On the BS side, we have tests for 5 MHz.

WF: For the purpose of demodulation test coverage in Rel-18, assume there are no UE’s that support maximum channel bandwidth of 5 MHz. ~~If and how to capture this assumption in the specification is FFS.~~

**Issue 1-1-2: Number of RX antenna in UE Demodulation requirements**

* Background
  + At RAN4#108bis requirements with 2RX were generally supported by all the companies, but 4RX was left FFS.
* Proposals and Observations:
  + Observation 1 (Apple): 4Rx is not mandatory for the frequency bands considered in this R18 work item.
  + **Proposal** **1** (Apple): Define 3MHz requirements using only 2Rx, since 4Rx is not mandatory for the frequency bands considered in this WI.
  + **Proposal 3** (Ericsson): Define UE demodulation and CSI requirements for 2Rx only.
  + **Proposal 5** (Huawei): Cover both 2Rx and 4Rx for requirements definition
  + **Proposal 6** (Qualcomm): RAN4 to consider [2, 4] RX for the PDSCH Demodulation requirements for less than 5MHz CBW;
* Candidate options / tentative agreements:
  + *Tentative agreement*: Define UE Demodulation performance and CSI reporting UE requirements in 3MHz CBW for 2Rx.
  + Option 1 [Apple, Ericsson]: Define 3MHz requirements using only 2Rx
  + Option 2 [Huawei, Nokia, Qualcomm]: Cover both 2Rx and 4Rx for requirements definition.
* Recommended WF
  + Discussion candidate options during the meeting.
* Define UE Demodulation performance and CSI reporting UE requirements in 3MHz CBW for 2Rx
  + FFS,
    - Option 1 [Apple, Ericsson]: Define 3MHz requirements using only 2Rx
    - Option 2 [Huawei, Nokia, Qualcomm]: Cover both 2Rx and 4Rx for requirements definition.

Online

MTK: Support option 1, we don’t need so many test cases

ZTE: Support option 1. The bands under consideration do not require 4Rx mandatory.

Qualcomm: How would 4Rx devices be tested if not requirement?

Samsung: Support option 1

Huawei: From Rel-15, the 4Rx requirement has been baseline. If the UE supports 4Rx, it should be tested as such.

Apple: Which requirements need to be tested with 2Rx and 4Rx?

Ericsson: Rel-15 is based on FR1, where we defined 2Rx and 4Rx up to 6 GHz. But these bands are up to 900 MHz, 2Rx is sufficient.

Anterix: Demod performance is important to us for 4Rx. We would like both 2Rx and 4Rx requirements.

Apple: Agree with Ericsson

Huawei: The WI only lists example bands, but from demod point of view, we should define requirements to be band agnostic.

Chair: What is the disadvantage or cost of defining a 4Rx requirement? Is it only the specification work required?

Ericsson: We are flexible to also define 4Rx if there is interest, i.e., from Anterix.

**Issue 1-2-1: Scope of PDSCH requirements**

**Issue 1-2-1: Scope of PDSCH requirements**

**Possible agreement:**

* Introduce PDSCH requirements with ~~HST~~ channel for 3MHZ CBW only.
  + Duplex: FDD, CBW: 3MHz, SCS: 15kHz, Number of PRBs: 15

**FFS:**

* Option 1: Introduce a new set of requirements for PDSCH for 3MHz CBW in non-HST conditions:
  + Option 1-a: Use RedCap requirements parameters as a reference/starting point
  + Option 1-b: Introduce limited set of requirements for PDSCH for 3MHz CBW
* Option 2 [Huawei]: Only define PDSCH requirements with HST channel.

Online:

Apple: For a device that supports both >5 and <=5 we should use legacy requirement. For a device that only supports <=5, new requirement could be needed but we already agreed on an assumption that no such devices exist. There is no change in the baseband for this bandwidth. Filter effect should already be taken care of in RB restrictions. Based on the assumption there is no such device supporting only <= 5 MHz, we do not believe PDSCH requirement for 3 MHz is needed.

Nokia: 15 RB was chosen to align with LTE 3 MHz.

Huawei: Same view as Apple.

MTK: Based on assumption there is no UE supporting only < 5 MHz, new PDSCH requirement is not needed as there is no change.

Nokia: We observed a difference in performance possibly due to the RF or channel. We should at least look into the possible differences between 3 MHz and existing 10 MHz.

Qualcomm: Share view as Apple. Expect the performance will differ because it’s a narrower channel, but don’t expect the UE to do something different.

Apple: The difference between 3 MHz and 10 MHz is the channel, not the UE behavior. It’s an artifact of the channel. How big is the difference?

ZTE: We did not see a big difference between 3 MHz and 10 MHz in our simulation results.

Nokia: Would the UE be able to maintain the same performance on 3 MHz? Would the UE do anything to improve the performance in 3 MHz?

Apple: Where do we draw the line? Performance will be different between different channel bandwidths?

Nokia: This is not just a new bandwidth, it’s a new feature. With a new feature, we should introduce a test for it.

MTK: We can introduce PBCH or other requirements that may have different processing change, but PDSCH is not justified.

Qualcomm: We already have PDSCH test with 6 RB.

**Issue 2-3-1: Introduction of PUCCH requirements**

* Candidate options / tentative agreements:
  + Option 1 [Nokia, Ericsson]: Introduce new PUCCH format 2 for UCI BLER requirements for 3MHz. Other formats are not precluded.
    - FFS the need for the other new PUCCH requirements for less than 5MHz
  + Option 2 [Huawei]: Don’t define PUCCH requirements with 3MHz bandwidth.
* Recommended WF
  + Check if Option 1 is agreeable.

Online:

Huawei: We can compromise to option 1

Samsung: Can accept option 1

[**R4-2321064**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321064.zip) **WF on [109][322] NR\_FR1\_lessthan\_5MHz\_BW\_demod**

*Type: other For: Approval  
 Source: Nokia*

**Decision: Approved.**

### 8.15 Enhancement of TRP and TRS requirements and test methodologies

**R4-2318231 Adding NR channel bandwidths for OTA TRS testing**

*Type: discussion For: Approval  
 Source: Orange*

**Decision: Noted.**

**R4-2319776 Adding NR channel bandwidths for OTA TRP/TRS testing**

*Type: discussion For: Approval  
 Source: Orange*

**Decision:** The document was **withdrawn**.

**R4-2320394 Adding NR channel bandwidths for OTA TRP/TRS testing**

*Type: discussion For: Approval  
 Source: Orange*

**Decision:** The document was **withdrawn**.

**R4-2320413 Adding NR channel bandwidths for OTA TRP/TRS testing**

*Type: discussion For: Approval  
 Source: Orange, Vodafone, AT&T, T-Mobile USA, Verizon, DISH Network, BT plc*

**Decision:** The document was **withdrawn**.

**R4-2320600 Adding NR channel bandwidths for OTA TRP/TRS testing**

*Type: discussion For: Approval  
 Source: Orange, Vodafone, AT&T, T-Mobile USA, Verizon, DISH Network, BT plc, Telecom Italia*

**Decision: Noted.**

#### 8.15.1 General aspects

**R4-2318106 TP to TR 38.870 on TRP TRS test procedure for CA**

*Type: other For: Approval  
 Source: Huawei, HiSilicon, Rohde & Schwarz, Orange, OPPO, vivo, Vodafone, CAICT*

**Decision: Revised to R4-2321097 (from R4-2318106).**

[**R4-2321097**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321097.zip) **TP to TR 38.870 on TRP TRS test procedure for CA**

*Type: other For: Approval  
 Source: Huawei, HiSilicon, Rohde & Schwarz, Orange, OPPO, vivo, Vodafone, CAICT*

**Conclusions: Approve TP in RAN4#109 and if needed company can trigger the discussion on TR in RAN#102.**

**Decision: Approved**

Apple: We still have a concern on this. We intend to raise this at RAN plenary for clarification of requirements and test procedure.

Huawei: The concern from Apple was based on rationale. This has been discussed for past 3 meetings.

R&S: Apple’s concern seems to be on the requirement, but this TP is about test procedures. The concerns from Apple have been expressed for past several meetings, but we haven’t been able to resolve.

Apple: OTA has never defined test procedures without outlook on test requirements.

Vivo: The WID objective is for test methods without mention of requirements.

Huawei: This is been discussed for 3 or 4 meetings with only a single objecting company. Can the chair declare a working agreement?

Samsung: We compromised in first round to introduce test method, but our understanding was there would be no requirements for CA. If there are no requirements ever, we are fine, but if there are expected to be requirements, we would have a concern. We had assumed this would follow the approach in CTIA where there is test method but no requirement.

R&S: We agreed to capture the procedure because there was insufficient time in this release to define requirements. That does not preclude requirement definition in a future release. The work we have done here on test procedure is according to the WID objective that other companies also had agreed on.

Chair: Can we find a compromise by adding text into the TP to indicate that the test method may be revisited if/after test requirements are available?

Apple: Our preference is not to follow this approach. We submitted a document last meeting with our proposal.

Samsung: We can agree to the TP if it is modified to indicate that test method is informative only.

Apple: Cannot agree

Huawei: We would like to request a working agreement

Chair: Chair does not have sufficient background since he has only chaired 2 meetings. Suggest to bring this up in main session with RAN4 chairman.

**R4-2318965 3GPP TR 38.870 v0.7.0**

*Type: draft TR For: Agreement  
 38.870 v0.7.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: For email approval**

**R4-2318972 CR to TS 38.161 on New test configurations for Rel-18 TRP TRS**

*Type: CR For: Agreement  
 38.161 v17.3.0 CR-0007 rev Cat: B (Rel-18)  
  
 Source: vivo*

**Abstract:**

Cat B CR. Will generate Rel-18 TS

**Decision: Agreed.**

#### 8.15.2 Enhancement of test methodology

##### 8.15.2.1 Anechoic chamber test methodology

**R4-2318103 Measurement results for 3GPP Rel-18 TRP TRS AC lab alignment activity-Huawei**

*Type: other For: Information  
 Source: Huawei, HiSilicon*

**Decision: Noted.**

**R4-2318105 on TxD phase drift and number of receive chains**

*Type: discussion For: Agreement  
 Source: Huawei, HiSilicon*

**Decision: Noted.**

**R4-2318427 TP to TR38.870 on MIMO radiated output power metric**

*Type: pCR For: Approval  
 38.870 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: Apple, T-Mobile USA*

**Decision: Postponed.**

**R4-2318432 On UL MIMO test methodology**

*Type: other For: Decision  
 Source: Apple, Vodafone, T-Mobile USA*

**Decision: Noted.**

**R4-2318834 On Single-Layer UL MIMO for non-coherent/coherent UEs**

*Type: other For: Approval  
 Source: Keysight Technologies UK Ltd*

**Decision: Noted.**

**R4-2318966 TP to TR 38.870 on TRP TRS test method**

*Type: pCR For: Approval  
 38.870 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: Revised to R4-2321098 (from R4-2318966).**

[**R4-2321098**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321098.zip) **TP to TR 38.870 on TRP TRS test method**

*Type: pCR For: Approval  
 38.870 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: Approved.**

**R4-2318967 Proposals for concluding the core part work of TRP TRS WI**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2319915 Discussion on single-layer UL MIMO test methodology**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320175 Discussion on 2TX test methodology**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

**R4-2320246 Discussion on TRP test method for Single-Layer UL-MIMO**

*Type: other For: Approval  
 Source: Google Inc.*

**Decision: Noted.**

**R4-2320379 Discussion on FR1 2Tx TRP test method**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320380 TP to TR 38.870 on 2Tx TRP test method**

*Type: pCR For: Approval  
 38.870 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Incorporated*

**Decision: Postponed.**

Vivo: This is a backup method, we should reach conclusion on the primary method first. There are many details here that we cannot simply approve.

Qualcomm: Will this TR will still be open for new content during performance part of WI?

Vivo: yes

Samsung: Other methods can be captured in the TR.

R&S: We agreed in WF to capture this as a backup plan. We are not ready to capture a backup plan in the TR. It is not clear how this procedure captures improvement for UL MIMO, nor how the method will correlate to the currently discussed methods for UL MIMO. We are not ready to capture this into the TR.

##### 8.15.2.2 Reverberation chamber test methodology

**R4-2318104 Measurement results for 3GPP Rel-18 TRP TRS RC harmonization-Huawei**

*Type: other For: Information  
 Source: Huawei, HiSilicon*

**Decision: Noted.**

**R4-2318969 Analysis of 3GPP TRP TRS AC lab alignment and RC harmonization measurement results**

*Type: other For: Approval  
 Source: vivo*

**Abstract:**

The contribution is reserved to provide analysis of all the measurement results submitted by comapnies. Will be uploaded before meeting starts.

**Decision: Noted.**

**R4-2318971 Measurement results for 3GPP Rel-18 TRP TRS RC harmonization activity**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2319635 3GPP Rel-18 TRP TRS RC harmonization from SRTC**

*Type: discussion For: Approval  
 38.870 v CR- rev Cat: (Rel-18)  
  
 Source: SRTC*

**Decision: Noted.**

**R4-2319921 3GPP Rel-18 TRP TRS LAD measurement for RC harmonization\_n78**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320178 CAICT measurement results for 3GPP Rel-18 TRP TRS RC harmonization activity**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

##### 8.15.2.3 MU assessment

**R4-2318835 On Single-Layer UL MIMO TRP Measurement Grid Uncertainties for the Considered Metric Options 1 and 2**

*Type: other For: Approval  
 Source: Keysight Technologies UK Ltd*

**Decision: Noted.**

**R4-2320707 TP to TR 38.870 on contents for Annex B**

*Type: pCR For: Approval  
 38.870 v0.6.0 CR- rev Cat: (Rel-18)  
  
 Source: ROHDE & SCHWARZ*

**Abstract:**

This contribution is intended to provide the Text Proposals endorsed by RAN5 during RAN5#101 (November 2023) on Measurement Uncertainty, and to be included in Annex B of TR 38.870.

**Decision: Approved.**

##### 8.15.2.4 Testing time reduction

**R4-2318429 On TRP test time reduction adopting reduced grids**

*Type: discussion For: Discussion  
 Source: Apple, Vodafone, AT&T, ETS Lindgren, Telecom Italia*

**Decision: Noted.**

**R4-2318431 TP to TR 38.870 on test time reduction adopting reduced grids**

*Type: other For: Approval  
 38.870 v CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: Noted.**

Vivo: This conflicts with previous agreements on coarse grid.

Apple: We are ok with the agreements reached by RAN5 this morning and expect they will be reflected in RAN4.

R&S: The agreement was captured in our TP R4-2320707.

**R4-2319270 Discussion on TRP TRS measurement grid for coherent UL MIMO**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320176 Discussion on 2Tx measurement grids**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

#### 8.15.3 Performance requirements

**R4-2318428 Template for TRP TRS and MIMO OTA Device Information Collection**

*Type: other For: Approval  
 Source: Apple, Telecom Italia*

**Decision: Revised to R4-2321191 (from R4-2318428).**

[**R4-2321191**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321191.zip) **Template for TRP TRS and MIMO OTA Device Information Collection**

*Type: other For: Approval  
 Source: Apple, Telecom Italia*

**Decision: Approved.**

**R4-2318968 Discussions on TRP TRS requirement related work**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2318970 Measurement results for 3GPP Rel-18 TRP TRS AC lab alignment activity**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2319288 Measurement results for 3GPP Rel-18 TRP TRS AC lab alignment activity**

*Type: other For: Approval  
 Source: SGS Wireless*

**Decision: Noted.**

**R4-2319641 3GPP Rel-18 TRP TRS AC lab alignment activity from SRTC**

*Type: discussion For: Approval  
 38.161 v CR- rev Cat: (Rel-18)  
  
 Source: SRTC*

**Decision: Noted.**

**R4-2319920 3GPP Rel-18 TRP TRS LAD measurement for AC lab alignment\_n78**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320177 CAICT measurement results for 3GPP Rel-18 TRP TRS AC lab alignment activity**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

**R4-2320617 Updates to the working procedure for TRP TRS Performance Test Campaign**

*Type: discussion For: Decision  
 Source: TELECOM ITALIA S.p.A., Vodafone, China Telecom, Orange, T-Mobile USA*

**Decision: Noted.**

**R4-2320626 On usage of coarse sampling grid for TRP/TRS measurement**

*Type: discussion For: Decision  
 Source: TELECOM ITALIA S.p.A., Vodafone, China Telecom, Orange, T-Mobile USA*

**Decision: Noted.**

**R4-2320627 On device provisioning for TRP TRS Performance Test Campaign**

*Type: discussion For: Information  
 Source: TELECOM ITALIA S.p.A.*

**Decision: Noted.**

#### 8.15.4 Moderator summary and conclusions

**R4-2318227 Topic summary for [109][335] NR\_FR1\_TRP\_TRS\_enh**

*Type: other For: Information  
 Source: Moderator (vivo)*

**Abstract:**

[109][300] BDaT Session AI 8.15.1, 8.15.2.1, 8.15.2.2, 8.15.2.3, 8.15.2.4, 8.15.3

**Decision: Noted.**

[**R4-2321092**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321092.zip) **Ad-hoc meeting minutes for [109][335] NR\_FR1\_TRP\_TRS\_enh**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**Issue 1-1-1: For fully Coherent UE support multiple TPMI index 2~5**

* Proposals
  + **Option 1 (averaging TRPs)**
  + **Option 2 (Max EIRPs)**
* Recommended WF
  + Option 1 for Rel-18 TRP coherent UE baseline method. This is aligned with legacy averaging approach
  + Option 2 as alternative method for further study
  + FFS further requirements for coherent UE in Rel-19

**Discussions:**

Apple: Option 2 for further study only for Rel-19 is not acceptable.

QC: there might be different metric for coherent UE. Suggest to consider similar performance metric as FR2 spherical coverage as compromise. Two set of requirements would increase test burden.

Samsung: 2Tx requirement is not considered in this release. Two set of requirements is not necessary. No progress if keep both two options this meeting. Option 1 is Ok to us, precondition is single requirements for coherent UL-MIMO. No requirement for option 2, then this can be considered as an alternative test methods.

Apple: the averaging approach of option 1 is unreasonable, in our understanding, it is not based on real network behaviour.

QC: the common test procedure is not changed. The data processing is for EIRP CDF, then define a new metric as FR1 spherical coverage.

R&S: it is agreed the common test procedure should be captured. Further discuss just performance metric. It is valuable to move on for performance definition of these two options, instead of making down-selection this meeting.

Huawei: we see difference from the simulation of option 1 and option 2. Two options both do not reflect network condition.

Samsung: can not agree to introduce spherical coverage for FR1. Option 3 is subset of Option2. This is out of scope.

**Way forward:**

* + Focus on performance metric discussion of two options with a goal to select a single metric as baseline in Rel-18.
    - Comparison criteria to assist in downselection should be discussed in the next meeting
    - For Option 2: best EIRP CDF approach can also be considered as a new metric

Samsung: the EIRP CDF is not aligned with WID scope.

Online:

Apple: Fine to include EIRP CDF approach. What will we discuss for option 1, so far we have not seen any measurement results. What is the rationale for Option 1?

Samsung: Strong concern on EIRP CDF. This WI is about TRP/TRS, and this is out of scope.

Qualcomm: We don’t think EIRP CDF is out of scope. This is a compromise between option 1 and option 2. The intention of the work item is to define radiated requirement, so we don’t think it’s out of scope.

Keysight: MTK did provide measurement results for option 1

Samsung: How is EIRP CDF addressing total power (TRP)?

Vivo: Amplitude and phase variation assumptions need to update option 1 and option 2. We would like to wait for further measurements before downselecting. Option 1 is straightforward and has been used for many years.

Apple: We do average TRP for SISO, but the averaging is across channels not side conditions such as TPMI index. This is new aspect. The user is not expected to experience this in a network.

Huawei: A bad antenna would impact both options. Option 2 is outside the scope of the WI.

Vivo: there is no commercial UE available, so requirements will not be defined in this release. There will be no strong motivation to downselect. We don’t have a clear answer on how to downselect between the two options.

Apple: Two options would have two requirements. Option 1 would reduce performance of the UE. Only option 2 can measure the improved performance of the UE.

Oppo: Agree with Samsung that the WI should be restricted to TRP/TRS metrics. EIRP CDF is out of scope and would confuse industry.

AT&T: The WID is requesting the test method is enhanced for 2Tx, not strictly limiting to TRP which is only defined for 1Tx

Telecom Italia: WID is typically more general.

Oppo, Samsung: We cannot accept to study EIRP CDF in this TRP work item. We don’t think they are the same.

**Issue 1-1-3: Requirements work for Option 1 and Option 2 methodology**

* Proposals
  + **Proposal 1:** **Match the requirements definition with the test methodology, e.g., define requirements and perform testing based on Option 1 or Option 2 and do not allow the requirements to be defined based on Option1 while allowing testing to be performed based on Option 2. (Keysight)**
* Recommended WF
  + Agree proposal 1

Offline agreements:

If specifying requirements is considered, match the requirements definition with the test methodology, e.g., define requirements and perform testing based on Option 1 or Option 2 and do not allow the requirements to be defined based on Option1 while allowing testing to be performed based on Option 2.

Online

Samsung: This agreement indicates that in the future, there could be two sets of requirements for the same UE but we already discussed downselection. We already agreed in Rel-18 there would not be requirements, so unnecessary to discuss this issue.

Keysight: If we have two test methodologies, but only a single requirement. The requirement should be tested against the same methodology from which it was derived.

WF: The intention is a single metric and a single requirement, which means one test methodology.

Huawei: Knowing there is no coherent UL MIMO capable UE available, it is not expected any performance requirement will be defined in Rel-18.

Samsung: It was agreed at RAN4 #108bis that RAN4 would not define 2Tx requirements.

Apple: Same view as Samsung

**Issue 1-1-4: Test procedure of Option 2 for fully Coherent UE**

* Proposals
  + **Proposal 1:** In the test procedure of Option 2, the TPMI **at each test point should be selected by system simulator based on UE’s SRS rather than sweeping all the applicable TPMIs. (Qualcomm)**
* Recommended WF
  + Collecting views from companies on how to align option 2 with real UE behaviour

Offline agreements: SRS depends on BS/BS simulator implementation, would be difficult to be adopted for OTA testing.

Online:

R&S: This is capturing the discussion of the offline. The proposal from QC is not practical.

Keysight: We think it is feasible to implement, but different call boxes will give different results. Aligning call boxes to ensure they are providing the same TPMI index is not practical. This should not be considered for conformance testing.

Apple: There would be additional TE challenges not also system integrators. It is a more complex method, but not sure we should descope it now. It can be considered as part of comparison criteria. One potential benefit is reduced test time due to not sweeping TPMI.

WF: The proposal 1 is not considered in Rel-18

**Issue 1-1-5: Phase variation for single-layer UL-MIMO**

* Proposals
  + **Proposal 1: For coherent UEs as the phase variation issue can be considered insignificant. For non-coherent UEs the phase variation impact on the performance metric can be captured as an MU. (Keysight)**
  + **Proposal 2: RAN4 should decide the 2Tx TRP test method for single-layer UL-MIMO and TxD taking into phase variant impact account. (Qualcomm)**
* Recommended WF
  + A random phase and amplitude offset within a long time window should be considered in both option 1 and option 2 evaluation.

Offline agreements: agreed online

*The amplitude and phase relative error behaviour longer than 20ms should be considered in coherent UE simulation. The UL-MIMO simulation should be updated based on updated assumption of amplitude and phase.*

Online:

Keysight: We need to capture exactly what the assumptions are in the WF.

**Issue 1-1-6: Test mode for 2Tx UE configuration (including coherent/non-coherent UE)**

* Proposals
  + **Proposal 1: The test mode of single antenna transmission each time, i.e., UE transmits power with 2 physical antennas separately. TE measures the TRP per physical antenna, and then sum two TRP values per antenna up, should be considered as the backup option to solve the phase variation issue for TxD/SL UL-MIMO coherent/non-coherent/partial coherent UE. The test mode of two antenna transmission simultaneously should be precluded. (Qualcomm)**
  + **Proposal 2: A test mode is not needed for coherent and non-coherent UEs. (Keysight)**
* Recommended WF
  + Collecting views

Discussions:

QC: we are discussing the phase issue. Not clear about the impacts on results. Given test mode is backup, can be further discussed.

Samsung: support QC. Can not conclude test mode is precluded. For 2Tx test mode, we should not be precluded.

Apple: support test mode as backup solution. If separate measurement for each antenna, then the metric is different from current discussed metric for UL-MIMO O1 and O2. We should also discuss this new metric.

Ad-hoc agreements:

Further discuss test mode as a backup solution, the corresponding new metric should also be considered.

Online:

Samsung: We may not need to consider a new metric. We support the QC test method.

Apple: What is meant by test mode? We support proposal 1 with new performance metric.

R&S: Agree with Apple. Not obvious how to combine two metrics. There must be a new metric if this backup test method is considered.

[**R4-2321099**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321099.zip) **WF on [109][335] NR\_FR1\_TRP\_TRS\_enh**

*Type: other For: Approval  
 Source: vivo*

**Decision: Revised to R4-2321209 (from R4-2321099).**

[**R4-2321209**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321209.zip) **WF on [109][335] NR\_FR1\_TRP\_TRS\_enh**

*Type: other For: Approval  
 Source: vivo*

**Decision: Approved.**

Telecom Italia: There were two contributions regarding coarse grid that haven’t been captured in this WF.

Apple: We cannot agree to the WF as-is. We have a compromise proposal but not acceptable to vivo.

Agreement: Based on agreement made in R4-2320707, RAN4 can further discuss the impact in the measurement campaign in the next meeting.

### 8.16 Enhancement of Multiple Input Multiple Output Over-the-Air test methodology and requirements for NR UEs

#### 8.16.1 General aspects and TR

**R4-2318430 TP to TR 38.761 on Lab 6 Power Validation**

*Type: other For: Approval  
 38.761 v CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: Revised to R4-2321107 (from R4-2318430).**

[**R4-2321107**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321107.zip) **TP to TR 38.761 on Lab 6 Power Validation**

*Type: other For: Approval  
 38.761 v CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: Agreed.**

Keysight: There are 7 significant digits in power values. We should only keep 2.

**R4-2318836 CR to update preliminary FR2 MU**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0020 rev Cat: F (Rel-17)  
  
 Source: Keysight Technologies UK Ltd*

**Decision: Agreed.**

**R4-2319164 3GPP TR 38.761 v0.1.0**

*Type: draft TR For: Agreement  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Agreed.**

Moderator: This should have been submitted last meeting for email approval to reflect TP’s from last meeting but it was missed. There will be 0.2.0 for email approval this meeting.

**R4-2320060 TP to TR 38.761 on General Aspects and Measurement Setup**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Approved.**

**R4-2320065 Updated Framework and time plan for FR1 MIMO OTA performance requirements development (Nov 2023)**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Revised to R4-2321137 (from R4-2320065).**

[**R4-2321137**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321137.zip) **Updated Framework and time plan for FR1 MIMO OTA performance requirements development (Nov 2023)**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Approved.**

**R4-2320066 Updated Framework and time plan for FR2 MIMO OTA performance requirements development (Nov 2023)**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Revised to R4-2321138 (from R4-2320066).**

[**R4-2321138**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321138.zip) **Updated Framework and time plan for FR2 MIMO OTA performance requirements development (Nov 2023)**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Approved.**

**R4-2320179 3GPP TR 38.761 v0.2.0**

*Type: draft TR For: Agreement  
 38.761 v0.2.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: For email approval**

#### 8.16.2 FR2 MIMO OTA test methodology enhancement

**R4-2320062 TP to TR 38.761 on FR2 channel model validation**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Approved.**

#### 8.16.3 FR1 MIMO OTA test methodology enhancement

**R4-2318102 on identification of number receive paths in devices**

*Type: discussion For: Agreement  
 Source: Huawei, HiSilicon*

**Decision: Noted.**

**R4-2318230 Updates to FR1 Channel model validation**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0019 rev Cat: F (Rel-17)  
  
 Source: MVG Industries, MVG, Spirent, Keysight, Apple*

**Decision: Revised to R4-2321203 (from R4-2318230).**

[**R4-2321203**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321203.zip) **Updates to FR1 Channel model validation**

*Type: CR For: Agreement  
 38.151 v17.5.0 CR-0019 rev Cat: F (Rel-17)  
  
 Source: MVG Industries, MVG, Spirent, Keysight, Apple*

**Decision: Agreed.**

**R4-2318895 TP for TR 38.761 on channel model validation for n78 and n41**

*Type: other For: Approval  
 38.761 v CR- rev Cat: (Rel-18)  
  
 Source: Xiaomi*

**Decision: Approved.**

**R4-2318896 Measure results for 3GPP Rel-18 FR1 MIMO OTA Lab Alignment**

*Type: other For: Approval  
 Source: Xiaomi*

**Decision: Noted.**

**R4-2319109 On FR1 MIMO OTA noise evaluation**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2319916 Study of number of slots for low band FR1 MIMO OTA**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320061 TP to TR 38.761 on channel model validation for n28**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Approved.**

**R4-2320063 TP to TR 38.761 on FR1 noise impact**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Revised to R4-2321108 (from R4-2320063).**

[**R4-2321108**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321108.zip) **TP to TR 38.761 on FR1 noise impact**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Approved.**

**R4-2320068 Channel model validation results for Bands n1, n5**

*Type: discussion For: Discussion  
 Source: CAICT*

**Decision: Noted.**

**R4-2320381 Discussion on FR1 MIMO OTA test method**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320594 On FR1 MIMO OTA test time reduction**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

#### 8.16.4 MU assessment

#### 8.16.5 Performance requirements

**R4-2318269 Measurement results of Mediatek lab for 3GPP Rel-18 FR1 MIMO OTA lab alignment activity**

*Type: discussion For: Approval  
 Source: Mediatek India Technology Pvt.*

**Decision: Noted.**

**R4-2318927 PADs measurement results for n28.**

*Type: discussion For: Decision  
 Source: CMCC*

**Decision: Noted.**

**R4-2318977 Discussions on FR1 MIMO OTA requirement related work**

*Type: other For: Approval  
 Source: vivo*

**Decision: Noted.**

**R4-2319919 3GPP Rel-18 FR1 MIMO OTA PAD measurement**

*Type: other For: Approval  
 Source: OPPO*

**Decision: Noted.**

**R4-2320064 TP to TR 38.761 on Rel-18 lab alignment framework**

*Type: pCR For: Approval  
 38.761 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: CAICT*

**Decision: Approved.**

**R4-2320067 CAICT Rel-18 FR1 MIMO OTA Lab Alignment PAD Results**

*Type: discussion For: Discussion  
 Source: CAICT*

**Decision: Noted.**

**R4-2320595 On MIMO OTA performance requirements work**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Noted.**

#### 8.16.6 Moderator summary and conclusions

**R4-2318228 Topic summary for [109][336] NR\_MIMO\_OTA\_enh**

*Type: other For: Information  
 Source: Moderator (CAICT)*

**Abstract:**

[109][300] BDaT Session AI 8.16.1, 8.16.2, 8.16.3, 8.16.4, 8.16.5

**Decision: Noted.**

[**R4-2321084**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321084.zip) **Ad-hoc meeting minutes on [109][336] NR\_MIMO\_OTA\_enh**

*Type: other For: Information  
 Source: CAICT*

**Decision: Noted.**

**Issue 1-1: Reduce Minimum Number of Slots per Stream for bands <1GHz to 10k**

* Proposals
  + Proposal 1 (CAICT, OPPO): adopt 10k as minimum number of slots per stream for MIMO OTA measurements of bands < 1GHz. (for FR1 MIMO OTA test lab alignments and FR1 MIMO OTA UE performance requirements, as stated in Table E.1-1 in TS 38.151)

Ad-hoc Agreements: (agreed online)

10k can be adopted to measurement campaign, and conformance testing.

**Issue 1-2-1: Exclude the impact of noise on MIMO OTA test results**

* Proposals
  + Proposal 1 (Apple): RAN4 to accept the measurement results presented in this contribution (R4-2319109) as an evidence of Apple’s FR1 MIMO OTA lab compliance on low frequency noise mitigation evaluation.

Ad-hoc Agreements: (agreed online)

Proposal 1 is agreed

**Issue 1-2-2: Complete channel model validation**

* Proposals
  + Proposal 1 (Moderator): Volunteer labs should provide channel model validation results for bands n1/5/8 no later than RAN4 #110 (Feb. 2024), to ensure the Measurement Campaigns will not be delayed.

Ad-hoc Agreements: (agreed online)

Proposal 1 is agreed.

Online:

Oppo: What if the lab cannot provide the result for some of the bands? Can the other bands be included in measurement campaign?

CAICT: Yes

**Issue 1-3: Preliminary outcome of Rel-18 FR1 MIMO OTA lab alignment**

Ad-hoc Agreements: (agreed online)

* + Reuse the pass/fail limit of Rel-17 FR1 MIMO OTA lab alignment, i.e., +/- 0.75\*preliminary MU (+/- 2.25 dB for bands < 3GHz).
  + Start the Measurement Campaign after RAN4#109 immediately, based on the preliminary outcome that ≥ 3 labs can be aligned.
  + The reference values will be derived by averaging the results from all 6 labs submitted in the 1st round. Then determine which labs are aligned; the potential failed labs can have the chance to retest. The reference values will not be changed, and the aligned labs will not be affected.

**Issue 1-4-1: Which MIMO OTA requirements should be defined for band n1**

Ad-hoc Agreements: (agreed online)

* + RAN4 should define 4x4 MIMO OTA requirements for 4Rx UE first in Rel-18, considering 4Rx UEs at band n1 is the majority on the market and mandatory in some countries/regions.
  + Not to define 2x2 MIMO OTA requirements for 4Rx UE.
  + Not to perform measurement campaign for 2Rx UE.
  + Continue to study and investigate an offset between MIMO OTA performance for 4Rx and 2Rx

Online:

Apple: We would like the same agreement as for TRP/TRS

Huawei: The agreement for TRP/TRS is we will look at the difference between 4Rx and 2Rx and apply an offset. But we aren’t sure how to apply this for MIMO.

Samsung: Support Apple’s proposal

Apple: We can continue to study and investigate

CAICT: We are ok to study the offset, but not sure we can find a stable offset between 4Rx and 2Rx for MIMO OTA. The 4x4 MIMO is more complex. We may not be able to find a suitable offset.

Apple: What is the implication if we cannot define 2x2 requirements?

Huawei: It’s better not to have a requirement at all than the wrong requirement.

**Issue 1-4-2: Whether IEs can be used to identify 2Rx UE and 4Rx UE**

Ad-hoc Agreements: (agreed online)

The IE of maxNumberMIMO-LayersPDSCH can be used to identify 4Rx UE

Further check if the IE srs-TxSwitch can be used to identify 4Rx UE.

**Issue 1-4-3: How to identify 2Rx UE and 4Rx UE**

Ad-hoc Agreements: (agreed online)

* + Proposal 1: Labs can try to identify 4Rx UE by themselves in any methods listed below:
    - Method 1: If a UE can be connected to call box with 4x4 MIMO, the UE can be confirmed as a 4Rx UE
    - Method 2: Obtain the MIMO layer information from BS simulator, e.g., check the IE maxNumberMIMO-LayersPDSCH
      * FFS IE srs-TxSwitch
    - Method 3: Directly collect the information from OEMs.
    - Other methods are not precluded
  + Proposal 2: Any 3GPP member can work with the selected test labs to provide 4Rx UEs.

**Issue 1-4-4: Updated working procedure for Measurement Campaign**

**Working procedures for FR1 MIMO OTA Measurement Campaign**

1. …
2. …
3. Commercial device (Smartphone) selection criteria for FR1 MIMO OTA Measurement Campaign:
   1. DUT capability: support for all the bands n1, n5, n8, n28, and n77 listed in the WID is preferred, but devices supporting only a subset of the above bands can equally be used in the measurement campaign for such supported bands
   2. DUT variety: the selection of commercial devices should cover various of devices in the market. The following selection criteria can also be considered:
      1. Year of production: 2021-2024
      2. Brand variety
      3. Price range (to cover different price ranges, including High/Mid/Low-end products)
      4. Popularity
      5. Number of bands supported
4. Commercial devices provision:
   1. Test labs can prepare and collect commercial devices by themselves based on the above selection criteria.
   2. Any 3GPP member can work with the selected test labs to provide devices
      1. A test lab shall measure only one UE model in case different samples are provided
      2. Same UE model supporting different sets of bands can be measured. For this case, the UE model should be marked as different model, e.g., model A-1, model A-2. (guidance on how to manage this case are provided in the spreadsheet in [TBD])
   3. The 3GPP member providing the DUTs should contact one of the selected labs to check their availability to receive the DUTs and define together the related provisioning aspects
      1. Any issue should be reported to the rapporteur in a timely manner to discuss for an alternative solution
      2. To plan properly the measurement campaign, the following actions are requested for the RAN4 Nov meeting:
         1. The rapporteur checks with the volunteer labs the number of DUTs (minimum 3, maximum 15) they expect to be able to measure AND how many DUTs they can accommodate from 3GPP members
         2. The 3GPP members providing the DUTs checks how many samples they intend to provide (with support of UE pre-configuration for measurements)
         3. Planning of the measurement campaign and thresholds of the data pool can be reviewed based on the above points
5. Measurement results submission:
   1. RAN4 Secretary will cover the role of the trusted and neutral third party for the whole procedure
   2. UE information disclosure: labs use the spreadsheet in [TBD] to submit the device information. The UE information should NOT BE CORRELATED with the order in the measurement data submitted by the same lab for the respective list of devices in c, i.e., the UE mode order in the list should be randomly disrupted.
   3. Labs use the worksheet template in [TBD] to submit the measurement results for Rel-18 3GPP FR1 MIMO OTA performance data pool.
   4. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed):
      1. The minimum number of submitted devices from each lab is 3, the maximum number is 15. Meanwhile, labs are encouraged to provide as much data as possible within 15
      2. Volunteer labs provide the device information sheet ONLY to the RAN4 Secretary and the sheet used to submit measurement results to 3GPP RAN4
   5. RAN4 Secretary ONLY publishes to 3GPP RAN4 the following summary of statistical information after anonymizing the sensitive UE information data, i.e., UE model name and vendor name:
      1. Total number of devices
      2. Total number of models
      3. Total number of devices vendors
      4. Percentage of devices per vendor
      5. Percentage of devices per Power Class
      6. Percentage of devices per each supported band
      7. Percentage of devices per year of production
      8. Percentage of the devices that are certified by at least one of certification bodies as following: PTCRB, GCF, NAL/CTA (Chinese network access licensed test)], FCC, CE
         * Once the device gets the above certification, for RAN4 discussion that means the device is commercially available
      9. Percentage of devices that are commercially available
   6. For band n1, the measurement data from 2Rx UE and 4Rx UE should be distinguished.
      1. FFS how to identify the number of Rx antenna ports of UEs and how to submit the measurement results.
   7. The progress in each lab is encouraged to be shared on the RAN4 reflector (for example, how many devices have been measured and on which bands)

Online:

Huawei: For SISO the range was 2021 – 2024

**Issue 1-4-5: Thresholds of data pool for specifying FR1 MIMO OTA requirements**

* Proposals
  + Proposal 1 (CAICT): Confirm the Minimum number of devices for defining requirements for each band as 15

Online:

CAICT: 15 devices was agreed during R17

**Issue 2-1: FR2 PAD delivery scheme and time plan**

* Proposals
  + Proposal 1 (CAICT): The FR2 PAD delivery scheme should be updated based on real progress. In case, Huawei/CMCC/CAICT cannot complete the testing of the three PADs before 10 Nov 2023, still transfer the PADs to Apple/ETS-L at this meeting. Apple and ETS-L should try to complete the test before RAN #102 plenary, then transfer the PADs back to Huawei/CMCC/CAICT at RAN #102 plenary (Dec 2023).

Ad-hoc Agreements: (agreed online)

* + Postpone the deadline of FR2 lab alignment activity to Apr. RAN4 110-bis meeting.

**Issue 2-2: Updated working procedures of FR2 MIMO OTA Measurement Campaign for specifying requirements**

* Proposals
  + Proposal 1 (R4-2320066): Approve the following working procedures of FR2 MIMO OTA Measurement Campaign

**2.2.3 Measurement Campaign**

1. The purpose of Measurement Campaign is to collect measurement results of commercial devices from permitted labs after the Lab Alignment Activity for specifying FR2 MIMO OTA performance requirements.
2. Test cases for FR2 MIMO OTA Measurement Campaign:
   1. Test band: n261 (first stage)
   2. Operation mode: NR Non-Standalone (NSA) (first stage)
   3. Powe class: PC3 (first stage)
3. Commercial Device (Smartphone) selection criteria:
   1. DUT capability: at least support n261 (for the first stage)
   2. The following selection criteria can also be considered:
      1. Year of production: 2019-2023
      2. Brand variety
      3. Popularity
      4. Number of bands supported
   3. Power Class: PC3
4. Commercial devices provision:
   1. Test labs can collect commercial devices by themselves based on the above selection criteria
   2. Any 3GPP member can work with the selected test labs to provide devices
      1. A test lab shall measure only one UE model in case different samples are provided
      2. Same UE model supporting different sets of bands can be measured. For this case, the UE model should be marked as different model, e.g., model A-1, model A-2. (guidance on how to manage this case are provided in the spreadsheet in [TBD])
   3. The 3GPP member providing the DUTs should contact one of the selected labs to check their availability to receive the DUTs and define together the related provisioning aspects
      1. Any issue should be reported to the rapporteur in a timely manner to discuss for an alternative solution
      2. To plan properly the measurement campaign, the following actions are requested for the RAN4 Nov meeting:
         1. The rapporteur checks with the volunteer labs the number of DUTs (minimum 3) they expect to be able to measure AND how many DUTs they can accommodate from 3GPP members
         2. The 3GPP member providing the DUTs checks how many samples they intend to provide (in terms of maximum number)
         3. Planning of the measurement campaign could be reviewed based on the above points
5. Measurement results submission:
   1. Use the same worksheet template to submit the measurement results (a template will be submitted to RAN4 meetings for approval)
   2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed). The following information should be provided:
      1. All FR2 bands supported by each UE
      2. Production year of each UE
      3. Other information that should be disclosed is FFS
   3. The plan and progress of each lab are encouraged to be shared via the RAN4 reflector (e.g., how many devices are planned to be/ have been measured)

**2.2.4 Specifying Performance Requirements**

1. Only the results from aligned labs will be considered for specifying requirements
2. Minimum number of commercial devices for defining requirements: [8-15] per band
   * + FFS after receiving some feedback from volunteer labs on the estimated amount of measurement data can be provided. More measurement data is preferred.
     + To increase the number of measurement data, include the PAD measurement results from aligned labs into the data pool for specifying FR2 MIMO OTA performance requirements, if allowed by PAD providers. FFS how to process the PAD measurement results from aligned labs.
3. Method: Derive the requirements based on per-band Data driven approach. The value at [TBD] percentile of the CDF curve can be selected as the starting point for requirement discussion.
4. Performance part of the work will proceed in a contribution-driven manner.

Online:

Samsung: Not ready to change TBD to 85% in “Method: Derive the requirements based on per-band Data driven approach. The value at [85%] percentile of the CDF curve can be selected as the starting point for requirement discussion.”

CAICT: We spent several meetings in Rel-17 to study this number and couldn’t agree. Based on this experience we are ok to change 85% to TBD.

**Issue 4-1-1: CR (R4-2318230) to update FR1 Channel model validation**

Ad-hoc Agreements:

* FFS whether “The power validation result is considered as systematic offset, which needs to be corrected on the UE final sensitivity value to further reduce measurement uncertainty.” can be removed.
* Other changes proposed in the CR are agreeable.

Online:

CAICT: We are not ok with the change to remove the sentence

R&S: The same sentence is in the TR, so the change would need to be made more broadly.

**Issue 4-1-2: Doppler pass/fail limits for FR1 and FR2 channel model validation**

* Proposals (CAICT)
  + Proposal 1: The Doppler pass/fail limits for FR1 and FR2 channel model validation should be tightened appropriately.
  + Proposal 2: The pass/fail limits for temporal correlation are formed as bands of ±10% of correlation capped at 100% from the target. Additionally, when the upper bound reaches 20%, the limit stays at 20% and the lower limit drops to 0%. The pass/fail limits apply for both FR1 and FR2.

Online:

Keysight: We are ok to tighten the limits

ETS: Agree with Huawei

CAICT: Current limit has been specified for one year. We are ok not to tighten the limit in this release.

Agreement: Do not tighten the limits in this release

[**R4-2321085**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321085.zip) **WF on [109][336] NR\_MIMO\_OTA\_enh**

*Type: other For: Approval  
 Source: CAICT*

**Decision: Approved.**

### 8.17 BS and UE EMC enhancements

#### 8.17.1 BS EMC enhancements

**R4-2320498 On the open issues listed in the WF**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Provide feedback of the open issues listed in the WF

**Decision: Noted.**

**R4-2320499 CR to TS 37.113 Implementation of EMC enhancement**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0129 rev Cat: B (Rel-18)  
  
 Source: Ericsson, Nokia, ZTE Corporation*

**Abstract:**

Implementation of EMC enhancement for MSR BS

**Decision: Revised to R4-2321067 (from R4-2320499).**

[**R4-2321067**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321067.zip) **CR to TS 37.113 Implementation of EMC enhancement**

*Type: CR For: Agreement  
 37.113 v17.2.0 CR-0129 rev Cat: B (Rel-18)  
  
 Source: Ericsson, Nokia, ZTE Corporation, Huawei*

**Abstract:**

Implementation of EMC enhancement for MSR BS

**Decision: Agreed.**

**R4-2320825 CR to TS 37.114: Implementation of AAS BS testing simplifications, Rel-18**

*Type: CR For: Agreement  
 37.114 v17.1.0 CR-0109 rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the Draft CR Endorsed in R4-2316933 during RAN4#108bis meeting (Xiamen), a formal CR is provided.

NR\_LTE\_EMC\_enh WI outcomes are captured in this CR, while the underlying frameform for EMC-specific declarations is introduces in a separate Mainte

**Decision: Revised to R4-2321068 (from R4-2320825).**

[**R4-2321068**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321068.zip) **CR to TS 37.114: Implementation of AAS BS testing simplifications, Rel-18**

*Type: CR For: Agreement  
 37.114 v17.1.0 CR-0109 rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon, Ericsson, Nokia, ZTE*

**Abstract:**

Based on the Draft CR Endorsed in R4-2316933 during RAN4#108bis meeting (Xiamen), a formal CR is provided.

NR\_LTE\_EMC\_enh WI outcomes are captured in this CR, while the underlying frameform for EMC-specific declarations is introduces in a separate Mainte

**Decision: Agreed.**

**R4-2320828 Discussion on remaining open issues for the BS EMC testing simplification**

*Type: discussion For: Discussion  
 Source: Huawei, HiSilicon*

**Abstract:**

In this contribution we provide feedback on the remaining open issues for the EMC testing simplification, as collected in the related WF from RAN4#108bis meeting.

**Decision: Noted.**

Huawei: We need a WF

#### 8.17.2 UE EMC enhancements

**R4-2318894 CR to 38.124 on R18 UE EMC requirements for CA and DC combinations**

*Type: CR For: Agreement  
 38.124 v18.0.0 CR-0049 rev Cat: B (Rel-18)  
  
 Source: Xiaomi*

**Abstract:**

Define test configurations for UE supporting multiple NR CA or DC band combinations

**Decision: Revised to R4-2321069 (from R4-2318894).**

Moderator: Cover page errors

[**R4-2321069**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321069.zip) **CR to 38.124 on R18 UE EMC requirements for CA and DC combinations**

*Type: CR For: Agreement  
 38.124 v18.0.0 CR-0049 rev Cat: B (Rel-18)  
  
 Source: Xiaomi*

**Abstract:**

Define test configurations for UE supporting multiple NR CA or DC band combinations

**Decision: Agreed.**

**R4-2320831 CR to 36.124: EMC requirements simplifications for CA and DC combinations, Rel-18**

*Type: CR For: Agreement  
 36.124 v17.1.0 CR-0062 rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the draft CR Endorsed during RAN4#108bis meeting in R4-2316850, in this contribution we provide formal CR to implement EMC requirements simplifications for E-UTRA CA and DC combinations.

**Decision: Agreed.**

#### 8.17.3 Moderator summary and conclusions

**R4-2318196 Topic summary for [109][304] NR\_LTE\_EMC\_enh**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 4.3, 8.17.1, 8.17.2

**Decision: Noted.**

[**R4-2321070**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321070.zip) **WF on maintenance of EMC TC simplification**

*Type: other For: Approval  
 Source: Huawei*

**Decision: Approved.**

### 8.18 NR demodulation performance evolution

#### 8.18.1 General aspects (TR/big CR)

**R4-2319394 Big CR on TR 38.878**

*Type: CR For: Agreement  
 38.878 v18.0.0 CR-0002 rev Cat: F (Rel-18)  
  
 Source: China Telecom*

**Abstract:**

For post meeting e-mail approval. Capture changes to TR38.878 in case there are multiple draft CRs.

**Decision: Withdrawn.**

CTC: The big CR is not needed because there was only 1 CR already agreed.

#### 8.18.2 Advanced receiver to cancel inter-user interference for MU-MIMO

##### 8.18.2.1 Receiver assumption and NWA signaling

**R4-2318558 Discussion on MIMO-IC on MU-MIMO**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318575 On NWA for advanced receiver to cancel intra-user interference for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318576 On UE feature for advanced receiver for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318784 CR for TR38.878 on Summary of link level evaluation**

*Type: CR For: Agreement  
 38.878 v18.0.0 CR-0001 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Removal of [] in section "Summary of link level evaluation". DraftCR was endorsed in RAN4#108bis

**Decision: Agreed.**

**R4-2318785 On Advanced Receivers - Receiver assumption and NWA signalling**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's views on various open issues with relation to receiver assumptions and NWA signalling for advanced receivers

**Decision: Noted.**

**R4-2318934 MU-MIMO advanced receiver discussion**

*Type: discussion For: Approval  
 Source: Qualcomm, Inc.*

**Decision: Noted.**

**R4-2319234 On the left open issues and UE capabilities**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the left open issues and UE capabilities.

**Decision: Noted.**

**R4-2319334 discussion on advanced receiver assumption and NWA signaling for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319392 Discussion on the receiver assumption and signaling aspects for the advanced receiver for MU-MIMO**

*Type: discussion For: Discussion  
 Source: China Telecom*

**Decision: Noted.**

**R4-2319539 Discussion on Receiver assumption and NWA signaling for MU-MIMO**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320172 Discussion on advanced receiver- NWA signaling and UE capability**

*Type: discussion For: Discussion  
 Source: Spreadtrum Communications*

**Decision: Noted.**

**R4-2320187 On receiver assumption and NWA signalling on advanced receiver for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.18.2.2 Test parameters and simulation results

**R4-2318559 Simulation results of MIMO-IC on MU-MIMO**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318577 On demod for requirements for MU-MIMO with advanced receiver**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318786 On Advanced Receivers - Test parameters**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's views on various open issues with relation to test parameters for advanced receivers

**Decision: Noted.**

**R4-2318787 On Advanced Receivers - Test parameters - Simulations**

*Type: discussion For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This paper presents Nokia's simulation results for Advanced receivers.

**Decision: Noted.**

**R4-2319235 On the parameter assumptions for phase II**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the parameter assumptions for phase II

**Decision: Noted.**

**R4-2319335 discussion on advanced receiver test parameters for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319393 Discussion on test parameters for the advanced receiver for MU-MIMO**

*Type: discussion For: Discussion  
 Source: China Telecom*

**Decision: Noted.**

**R4-2319540 Discussion on advanced receiver test parameters for MU-MIMO**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320188 On test parameters for advanced receiver for MU-MIMO**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.18.3 Absolute physical layer throughput requirements with link adaptation

**R4-2318578 Introducing release independence for Absolute physical layer throughput requirements**

*Type: CR For: Agreement  
 38.307 v17.10.0 CR-0133 rev Cat: B (Rel-18)  
  
 Source: Apple*

**Decision: Agreed.**

**R4-2318796 CR for 38.101-4 on Demodulation and CSI requiremets for ATP**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0428 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

CR to remove remaining [] and yellow highlighted text.

**Decision: Revised to R4-2321204 (from R4-2318796).**

**[R4-2321204](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321204.zip) CR for 38.101-4 on Demodulation and CSI requiremets for ATP**

*Type: CR For: Agreement  
 38.101-4 v18.1.0 CR-0428 rev Cat: F (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

CR to remove remaining [] and yellow highlighted text.

**Decision: Agreed.**

#### 8.18.4 Moderator summary and conclusions

**R4-2318215 Topic summary for [109][323] NR\_demod\_enh3\_Part1**

*Type: other For: Information  
 Source: Moderator (CTC)*

**Abstract:**

[109][300] BDaT Session AI 8.18.1, 8.18.2.1, 8.18.2.2, 8.18.3

**Decision: Noted.**

[**R4-2321036**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321036.zip) **Offline meeting minutes for [109][323] NR\_demod\_enh3\_Part1**

*Type: other For: Information  
 Source: Apple*

**Abstract:**

**Decision: Noted.**

**Issue 1-3-1: Capability signalling for advanced receiver for MU-MIMO**

* *Status in the last meeting WF in R4-2316915*

|  |
| --- |
| *UE advanced receiver to cancel inter-user interference for MU-MIMO is an optional feature with UE capability signalling*  *Candidate options on capability definition for R-ML with modulation order blind detection:*   * + *Option 1: Blind modulation order detection is based on UE capability signaling*     - *Option 1A: Define different capability in the scenarios indicated by DCI index 6 and 7 respectively*     - *Option 1B: Introduce 3 level UE capabilities: 1) Low-end UE: Support DCI 0-5; 2) Medium-end UE supporting DCI 0-6; 3) High-end UE supporting DCI 0-7*   + *Option 2: Blind modulation order detection is based on UE declaration*   *Candidate options on capability definition for Maximum number of layers:*   * + *Option 1: Introduce UE capability for Maximum number of layers of co-UE or total number of layers for joint detection*   + *Option 2: Not to introduce such capability definition*     - *Option 2A: The maximum number of layers of co-UE can be derived by subtracting the scheduled MIMO layers for the target UE from maxNumberMIMO-LayersPDSCH*   *Candidate options on capability definition for Maximum number of DMRS ports:*   * + *Option 1: Introduce UE capability signalling for maximum DMRS ports to be detected*   + *Option 2: Not to introduce such capability definition*   *Candidate options on capability definition for Maximum modulation orders of interfering DMRS ports supported:*   * + *Option 1: UE capability signaling to inform network of the maximum modulation orders of interfering DMRS port supported*   + *Option 2: Not to introduce such capability definition* |

* Proposals on capability definition for R-ML with modulation order blind detection:
  + Option 1: Blind modulation order detection is based on UE capability signaling (MTK, Apple, Nokia, Samsung, ZTE, Spreadtrum)
    - Option 1A: Define different capability in the scenarios indicated by DCI index 6 and 7 respectively (Spreadtrum)
    - Option 1B: Introduce 3 level UE capabilities: 1) Low-end UE: Support DCI 0-5; 2) Medium-end UE supporting DCI 0-6; 3) High-end UE supporting DCI 0-7 (MTK)
  + Option 2: Blind modulation order detection is based on UE declaration (Qualcomm, Huawei)
* Proposals on capability definition for Maximum number of layers:
  + Option 1: Introduce UE capability for Maximum number of layers of co-UE or total number of layers for joint detection (Spreadtrum)
  + Option 2: Not to introduce such capability definition (China Telecom, MTK, Apple, Ericsson, ZTE, Huawei, Samsung if the max number of layers is no more than 4)
    - Option 2A: The maximum number of layers for R-ML (target +co-UE(s)) is upper bounded by UE capability of *maxNumberMIMO-LayersPDSCH*. (MTK, Apple, Ericsson, Spreadtrum, Nokia)
* Proposals on capability definition for Maximum number of DMRS ports:
  + Option 1: Introduce UE capability signalling for maximum DMRS ports to be detected. (MTK, Apple, Nokia, ZTE)
  + Option 2: Not to introduce such capability definition (China Telecom, Spreadtrum, Huawei, Samsung if the max number of DMRS ports is no more than 4)
* Proposals on capability definition for Maximum modulation orders of interfering DMRS ports supported:
  + Option 1: UE capability signaling to inform network of the maximum modulation orders of interfering DMRS port supported (MTK, Nokia, Ericsson, Spreadtrum)
  + Option 2: Not to introduce such capability definition (China Telecom, ZTE, Huawei, Samsung if the max number of DMRS ports is no more than 4)
* Proposals on capability definition for supported DMRS configurations:
  + Option 1: Introduce UE capability signaling for supported DMRS configuration for R-ML (Apple)
* Recommended WF
  + For R-ML with modulation order blind detection:
    - Need discussion.
  + For Maximum number of layers and Maximum number of DMRS ports:
    - Need further check the necessity after UE types definition is made in Issue 1-1-1.
  + For Maximum modulation orders of interfering DMRS ports:
    - Need discussion.
  + For supported DMRS configurations:
    - Need discussion.

Discussion points:

1. Basic capability - UE capability for advanced receiver for MU-MIMO [Already agreed, need to discuss components]

* 2Rx UE capable of R-ML process 2 layers across target and co-scheduled UEs
* 4Rx UE capable of R-ML process [2,3,] 4 layers across target and co-scheduled UEs
* Is this needed or is it signaled implicitly by UE capability of *maxNumberMIMO-LayersPDSCH*.

**Discussion Monday AM offline**

**Basic capability**

Qualcomm: The basic capability should be tied to BD MO capability?

Mod: This capability is without BD MO.

Huawei: Agree. This Capability is for DCI index 1-5

Mod: The UE capability signalling should be irrespective of DCI

Qualcomm: Is this union or the sub feature group

Nokia: What about 8RX UE capable of R-ML? Does it not signal anything?

QC: To Nokia this is covered below when 8RX UE signals MU-MIMO capability under 4RX and 2RX mode.

Agreement: Agreed online  
The basic UE capability with R-ML receiver for MU-MIMO (for all UE types):

* UE is capable of MU-MIMO with R-ML for 2 layers across target and co-scheduled UEs under 2RX conditions
* UE is capable of MU-MIMO with R-ML up to 2,3, or 4 layers across target and co-scheduled UEs under 4RX conditions

The above bullets are not intended to be components.

**UE Types**

Should we discuss different UE types – capable of BD MO, not capable of BD-MO

QC: There is additional processing for BD-MO. But it need not do BD-MO if it receives index 1-5. IT can have different capability for MIMO layers if it does BD-MO, than when it does

Agreement: Agreed online

The UE Types to be covered in terms of #layers it can process with R-ML:

1. Capability when modulation order is signaled (index 1-5)
   1. Up to *maxNumberMIMO-LayersPDSCH* layers across target and co-scheduled UEs in 2 RX and 4RX condition
2. Capability when modulation order is not signalled (index 6)
   1. UE cannot support R-ML
   2. UE can support 2 layers across target and co-scheduled UEs with 2RX and 4RX
   3. UE can support 2 layers across target and co-scheduled UEs with 2RX and can support *maxNumberMIMO-LayersPDSCH* layers across target and co-scheduled UEs with 4RX
3. Capability when modulation order is not signalled (index 7)
   1. UE is not expected to support R-ML
4. For R-ML with blind modulation order detection
   * Option 1: Blind modulation order detection is based on UE capability signaling (MTK, Apple, Nokia, Samsung, ZTE, Spreadtrum)
     1. Option 1A: Define different capability in the scenarios indicated by DCI index 6 and 7 respectively (Spreadtrum)
     2. Option 1B: Introduce 3 level UE capabilities: 1) Low-end UE: Support DCI 0-5; 2) Medium-end UE supporting DCI 0-6; 3) High-end UE supporting DCI 0-7 (MTK)
   * Option 2: Blind modulation order detection is based on UE declaration (Qualcomm, Huawei)
5. For Maximum number of layers and Maximum number of DMRS ports
   * Option 1: Introduce UE capability signalling for maximum DMRS ports to be detected. (MTK, Apple, Nokia, ZTE)
   * Option 2: Not to introduce such capability definition (China Telecom, Spreadtrum, Huawei, Samsung if the max number of DMRS ports is no more than 4)
6. For Maximum modulation orders of interfering DMRS ports
   * Option 1: UE capability signaling to inform network of the maximum modulation orders of interfering DMRS port supported (MTK, Nokia, Ericsson, Spreadtrum)
   * Option 2: Not to introduce such capability definition (China Telecom, ZTE, Huawei, Samsung if the max number of DMRS ports is no more than 4)
7. For supported DMRS configurations
   * Option 1: Introduce UE capability signaling for supported DMRS configuration for R-ML (Apple)

**Issue 1-3-2:** **Capability granularity for the R-ML capability signalling**

* *Status in the last meeting WF in R4-2316915*

|  |
| --- |
| * + *Option 1: Align with the Rel-17 MMSE-IRC for MU-MIMO, i.e., per UE, no FDD/TDD difference, FR1 only*   + *Option 2: Introduce per CC per band per band combination (Per-FSPC) UE capability* |

* Proposals:
  + Option 1: Align with the Rel-17 MMSE-IRC for MU-MIMO, i.e., per UE. (China Telecom, Nokia, Qualcomm, Samsung, ZTE)
    - QC: With the assumption that UE may have limited processing resources to support R-ML on all the carriers in CA with large CHBW
  + Option 2: Introduce per CC per band per band combination (Per-FSPC) UE capability (MTK, Apple, Spreadtrum, Huawei)
    - Apple: The UE capability of *maxNumberMIMO-LayersPDSCH* is indicated per-FSPC.
* Recommended WF
  + Check if QC’s proposal could be a middle way for all companies:
    - R-ML receiver for MU-MIMO is a Per UE capability with the assumption that UE may have limited processing resources to support R-ML on all the carriers in CA with large CHBW.

Online:

Qualcomm: For CA, UE may not support all CC’s in all band combinations due to processing limitations. This information is not very relevant to the network as it is too complicated for network to do anything with.

Huawei: Support option 2. The complexity of R-ML requires the finer granularity. The basestation may have different MU-MIMO strategies. The basestation needs the information.

CTC: Increased complexity is related to the allocated RB, not so much the number of CC’s. We are fine with QC’s proposal.

Apple: Support option 2. Where would note about UE with limited processing resources would be captured? The reason for per-FSPC is when bandwidth is large, the UE may not be able to support the blind detection for all bands and band combinations. We also used this for CRS-IM.

Charter: We expect UE’s in the future should be more capable.

Apple: We are not precluding CA, but allowing finer granularity in capability signaling

Qualcomm: We can work on the wording if based on grant size. The fundamental issue with per-FSBC is that it is not flexible enough for MU-MIMO. With the note, the UE is allowed to enable R-ML whenever it is capable.

Nokia: Option 2 is very high granularity. We support QC proposal, prefer per-UE. We could define a different capability instead of the per-FSBC which is too complex.

ZTE: Agree with Nokia. Per-UE is fine for us.

Apple: UE capability for CA MIMO layers is also per-FSBC. We don’t see that overhead is limiting, but it gives UE flexibility.

Huawei: Same view as Apple. The basestation will scheduling will not be optimized without the information from the UE.

Nokia: RAN2 guidance is there should be sufficient justification before specifying per-FSBC capabilities.

**Issue 1-3-3:** **Other details for the R-ML capability signalling**

* Proposals:
  + Option 1: (China Telecom, Apple, Nokia, Qualcomm, Samsung)
    - Applicable to the capability signalling exchange between UEs (V2X WI only)”: N/A
    - No FDD/TDD difference
    - FR1 only
* Recommended WF
  + Option 1?

**Issue 2-8: Test setting for UEs not supporting modulation order blind detection**

* *Status in the last meeting WF in R4-2316915*

|  |
| --- |
| *Candidate options on Test with DCI index 1-5 configured (Tests #1-1):*   * + *Option 1: Define Tests #1-1 with 1 co-scheduled UE and full FDRA*   + *Option 2: In addition to the Tests with 1 co-UE, consider cases with 2 co-UEs having same modulation order*   *Candidate options on Test with DCI index 6 configured (Tests #1-2):*   * + *Option 1: In addition to Tests #1-1, define Tests #1-2 to verify UE E-IRC receiving process under the same test parameters with Tests #1-1*   + *Option 2: Do not introduce test cases for scenarios where R-ML receiver is not applicable* |

* Proposals on Tests with DCI index 1-5 configured (Tests #1-1):
  + Option 1: Define Tests #1-1 with 1 co-scheduled UE and full FDRA (China Telecom, MTK, Apple, [Qualcomm], Ericsson, ZTE, Huawei, Nokia, Samsung)
* Nokia: In addition to the Tests with 1 co-UE, consider cases with 2 co-UEs having same modulation order
* Samsung: In addition to the Tests with full FDRA, consider 1 co-scheduled UE with partial FDRA.
* Proposals on Tests with DCI index 6 configured (Tests #1-2):
  + Option 1: In addition to Tests #1-1, define Tests #1-2 to verify UE E-IRC receiving process under the same test parameters with Tests #1-1 (Nokia, Qualcomm)
* QC: have the same test configurations as Tests #2-2
  + Option 2: Do not introduce test cases for scenarios where R-ML receiver is not applicable. (MTK, Apple, Ericsson, Samsung, ZTE, Huawei)
  + Option 3: RAN4 should firstly reach consensus on the UE behaviour under the following scenario (China Telecom)
* UE receives DCI index 6 and the UE supports modulation order blind detection
* Recommended WF
  + Define Tests with DCI index 1-5 configured (Tests #1-1) with 1 co-scheduled UE and full FDRA.
* Need discussion whether to additionally cover~~: 1) 2 co-UEs with different modulation order;~~ and/or 2) 1 co-UE with partial FDRA.
* Further discuss the other detailed parameters under other issues.
  + Need discussion whether to define Tests with DCI index 6 configured (Tests #1-2).
* RAN4 needs to firstly reach consensus on the UE behaviour:
* Option 1: UE fallbacks to MMSE-IRC.
* Option 2: UE will use E-IRC.
* Others

Online:

Qualcomm: We should not include DCI 1-5 to cover 2 co-UE’s with different modulation order because DCI 1-5 is only with single UE.

MediaTek: Prefer not to have test for DCI 6. If we have to have a test, the performance from option 1 to 2 is nearly the same.

Nokia: We need the requirement for DCI 6 to have some minimum requirement for UE’s that do not support blind detection.

Samsung: We do not need to define a test case for DCI 6, but leave to UE implementation

Apple: We don’t think we need a test for partial FDRA. We don’t want to define tests cases for all DCI 1-5. For DCI 6, we don’t need a test but would like to understand expected UE behavior, i.e., fallback to MMSE-IRC. We don’t need a test case just to verify this.

CTC: Partial FDRA is relevant. Share the view with Nokia on DCI 6. We should have a minimum requirement to verify at least MMSE-IRC.

Huawei: For partial FDRA the interference is less compared to full overlap. We do not need a test for partial FDRA.

MediaTek: Agree with Huawei on not needing partial FDRA test.

Spreadtrum:

Ericsson: We are happy to consider partial FDRA with test cases, but we hadn’t considered this in phase 1 so we are also ok to deprioritize it. For DCI 6, share the same view as Nokia at least some minimum requirement needs to be verified.

MTK: We already have a Rel-17 test case for the basic receiver.

**Issue 2-9: Test setting for UEs supporting modulation order blind detection**

* *Status in the last meeting WF in R4-2316915*

|  |
| --- |
| *Candidate options on Tests with DCI index 6 configured (Tests #2-2):*   * + *Option 1: Define Tests #2-2 to verify UE R-ML process with modulation order blind detection* * *Option 1A: Model 2-co-scheduled UEs with different modulation order and different FDRA* * *Option 1B: Follow test settings from test without modulation order blind detection except DCI signalling* * *Option 1C: Model 1-co-scheduled UE with partial FDRA and single modulation order* * *Option 1D: Only consider rank 1+1 with QPSK for the co-UE*   *Candidate options on Test with DCI index 1-5 configured (Test #2-1):*   * + *Option 1: In addition to Tests #2-2, Define Tests #2-1 to verify UE R-ML receiving process with modulation order information with 1 co-scheduled UE and full FDRA*   + *Other options are not precluded.*   *Candidate options on Test with DCI index 7 configured (Test #2-3):*   * + *Option 1: Introducing tests for R-ML with modulation order blind detection, with DCI index 7*   + *Other options are not precluded.* |

* Proposals on Tests with DCI index 6 configured (Tests #2-2):
  + Option 1: Define Tests #2-2 to verify UE R-ML process with modulation order blind detection (China Telecom, MTK, Nokia, Ericsson, Samsung, ZTE, Huawei)
* Option 1A: Model 2-co-scheduled UEs with different modulation order and different FDRA (China Telecom, Nokia, Ericsson, Samsung, ZTE)
* Option 1B: Same test configurations as Tests#1-1 except DCI signalling (MTK, Qualcomm)
* Option 1C: Model 1-co-scheduled UE with partial FDRA and single modulation order (Nokia)
* Option 1D: Only consider rank 1+1 with QPSK (Huawei)
  + Option 2: Test cases with blind modulation order need further study. Limit further study and requirements if any to DCI index 6 for R-ML with modulation order blind detection. (Apple)
* Proposals on Tests with DCI index 1-5 configured (Tests #2-1):
  + Option 1: In addition to Tests #2-2, Define Tests #2-1 to verify UE R-ML receiving process with modulation order information (China Telecom, MTK, Apple, Qualcomm, Samsung, Nokia)
* Option 1A: Same test configurations as Tests#1-1 (China Telecom, MTK, Apple, Qualcomm, Nokia)
* Option 1B: Consider 1 co-scheduled UE and full FDRA (Samsung)
  + Option 2: No additional tests with DCI index 1-5 configured (Ericsson)
* Proposals on Test with DCI index 7 configured (Test #2-3):
  + Option 1: Introducing tests for R-ML with modulation order blind detection, with DCI index 7 (MTK, Nokia)
* Option 1A: Same test setting as test without modulation order blind detection (MTK)
* Option 1B: modeling 2 co-UEs with different modulation orders which are multiplexed on different DMRS ports (Nokia)
  + Option 2: RAN4 should firstly reach consensus on the UE behaviour under the following scenario (China Telecom)
* UE receives DCI index 7 and the UE supports modulation order blind detection
* Recommended WF
  + Define tests with DCI index 6 configured (Tests #2-2) to verify UE R-ML process with modulation order blind detection.
* Need discussion on the co-UE number and FDRA.
  + Can we agree to define tests with DCI index 1-5 configured (Tests #2-1) with 1 co-scheduled UE and full FDRA?
  + Need discussion whether to define Tests with DCI index 7 configured (Tests #2-3).
* RAN4 needs to firstly reach consensus on the UE behaviour:
* Option 1: UE fallbacks to MMSE-IRC.
* Option 2: UE tries to perform R-ML for part of the co-scheduled layers.
* Others

Online:

Qualcomm: DCI-6 tests both blind detection and R-ML, so already covers DCI 1-5 test case which only tests R-ML. If UE passes DCI-6, it does not need to test DCI 1-5. DCI-7 is not applicable.

Nokia: We expect if the UE is given modulation order, it should perform same or better than the UE that detects modulation order. If DCI-6 is mutually exclusive with DCI 1-5 test cases, we may miss something.

Apple: For UE with modulation detection, we should have DCI 1-5 test case. We haven’t aligned results for blind modulation order detection. Introducing DCI-6 test case depends on whether there is a gain. Modulation detection performance varies depending on SNR, so need to verify there is sufficient gain. We should not have test for index 7. We already have Rel-17 requirement for MMSE-IRC.

CTC: We prefer test cases for both index 6 and also index 1-5. For index 7, agree with Apple.

MTK: Prefer test cases for both index 6 and indexes 1-5. Expect if given modulation, could have better performance than if detected.

Huawei: For index 6, we have 1+1 and 2+2. We prefer to focus on 1+1. We don’t need to include test for indexes 1-5. For index 7, agree with Apple.

Apple: We would like to further evaluate feasibility and performance of blind detection before defining any requirement for index 6. It is premature to agree to exclude tests for indexes 1-5 if there is a test for index 6.

Tentative WF: If the UE supports MU-MIMO with R-ML, we introduce test cases for indexes 1-5 and further evaluate the performance of DCI-6. Applicability rules to be further discussed related to UE’s that support or do not support blind modulation order detection if DCI-6 test case is introduced.

Qualcomm: We’d like to make clear what we are evaluating for DCI-6.

[**R4-2321142**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321142.zip) **Ad-hoc meeting minutes for [109][323] NR\_demod\_enh3\_Part1**

*Type: other For: Information  
 Source: Apple*

**Abstract:**

**Decision: Noted.**

Apple: Tentative agreements made during the ad-hoc session have been captured in the WF.

[**R4-2321114**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321114.zip) **WF for advanced receiver for MU-MIMO**

*Type: other For: Approval  
 Source: CTC, Apple*

**Decision: Approved.**

### 8.19 Study on evolution of NR duplex operation

#### 8.19.1 General aspects (TR)

**R4-2318925 Draft TR 38.858 SBFD**

*Type: other For: Agreement  
 Source: CMCC*

**Decision: For email approval**

#### 8.19.2 Study the feasibility of and impact on RF requirements

##### 8.19.2.1 Adjacent channel co-existence evaluation

**R4-2318924 TP for TR 38.858 to update annex E**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: CMCC*

**Decision: Merged (with R4-2321078).**

**R4-2319183 Draft TP to TR 38.858 Section 11.3**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung*

**Abstract:**

Propose additional text to 11.3 in TR 38.858 to summarize the study.

**Decision: Merged (with R4-2321077).**

**R4-2319184 Draft TP to TR 38.858 Section 11.2**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung*

**Abstract:**

Propose content to 11.2 in TR 38.858.

**Decision: Revised to R4-2321077 (from R4-2319184).**

[**R4-2321077**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321077.zip) **Big TP to TR 38.858 Section 11**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung, Qualcomm, Charter, Ericsson, Nokia, CableLabs, SparkNZ, CMCC, Huawei, ZTE*

**Abstract:**

Propose content to 11.2 in TR 38.858.

**Decision: Approved.**

**R4-2319395 TP to TR 38.858: Additions and corrections relevant for adjacent channel co-existence evaluation results in clause 11**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

In this contribution we provide some additional information and corrections with intent to finalize the adjacent channel coexistence evaluation part of the SBFD SI (FS\_NR\_duplex\_evo). At the end of this contribution a text proposal for TR 38.858, clause 1

**Decision: Merged (with R4-2321077).**

**R4-2319396 Additional simulation results (Scenario 3 and 9) related to SBFD adjacent channel coexistence evaluation**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

In this contribution we provide additional simulation results for Scneario 3 and Scenario 9 (indoor)

**Decision: Noted.**

**R4-2319399 SBFD coexistence simulation results (Scenario 3 and 9) in Excel-format**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

In this contribution additional simulation results are provided for Scenario 3 and Scenario 9 (in-door)

**Decision: Noted.**

**R4-2319400 TP to TR 38.858: Addition of missing information relevant for interference power scaling in Annex E**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

In this contribution we provide a text proposal missing information and other updates required to finalise the work for SBFD SI. At the end of this contribution a text proposal is attached for approval.

**Decision: Revised to R4-2321078 (from R4-2319400).**

[**R4-2321078**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321078.zip) **TP to TR 38.858: Editorial corrections in Annex E**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Ericsson, Qualcomm, Charter, Samsung, Nokia, CableLabs, SparkNZ, CMCC, Huawei, ZTE*

**Abstract:**

**Decision: Approved.**

**R4-2319780 TP to TR 38.858: Section 11.2**

*Type: discussion For: Approval  
 Source: Qualcomm Germany*

**Decision:** The document was **withdrawn**.

**R4-2319807 TP to TR 38.858 Annex E**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Germany*

**Decision: Merged (with R4-2321078).**

**R4-2320055 TP to TR 38.858: Chapter 11 Annex E corrections**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision:** The document was **withdrawn**.

**R4-2320056 TP to TR 38.858: Chapter 11 Editorial corrections**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision:** The document was **withdrawn**.

**R4-2320057 TP to TR 38.858: Chapter 11 Case conclusions**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision:** The document was **withdrawn**.

**R4-2320253 ACIR enhancement in NR duplex evolution adjacent-channel coexistence study**

*Type: discussion For: Approval  
 38.858 v CR- rev Cat: (Rel-18)  
  
 Source: CableLabs, Charter Communications, Nokia, Nokia Shanghai Bell, Spark NZ Ltd.*

**Decision: Noted.**

Chair: The contents have been merged into R4-2321077

**R4-2320448 TP to TR 38.858: Section 11.2**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Germany*

**Decision: Merged (with R4-2321077).**

**R4-2320640 TP to TR 38.858: Chapter 11 Annex E corrections**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision: Merged (with R4-2321078).**

**R4-2320641 TP to TR 38.858: Chapter 11 Editorial corrections**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision: Merged (with R4-2321077).**

**R4-2320642 TP to TR 38.858: Chapter 11 Case conclusions**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.*

**Decision: Merged (with R4-2321077).**

##### 8.19.2.2 Implementation feasibility of SBFD

**R4-2318923 TP for TR 38.858 to add RAN4 conclusion part**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: CMCC*

**Decision: Revised to R4-2321090 (from R4-2318923).**

**[R4-2321090](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321090.zip) TP for TR 38.858 to add RAN4 conclusion part**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: CMCC, Samsung*

**Decision: Approved.**

###### 8.19.2.2.1 Feasibility of FR1 BS aspects

**R4-2318471 Feasibility of filtering for FR1 BS in SBFD**

*Type: discussion For: Discussion  
 Source: Murata Manufacturing Co Ltd.*

**Decision: Noted.**

**R4-2318472 TP to TR 38.858: Feasibility of FR1 WA BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Murata Manufacturing Co Ltd.*

**Decision: Withdrawn.**

**R4-2319678 TP to TR 38.858: Feasibility of FR1 BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321087 (from R4-2319678).**

[**R4-2321087**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321087.zip) **TP to TR 38.858: Feasibility of FR1 BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Approved.**

Moderator: This TP is needed for LA

**R4-2320051 TP to TR 38.858: Feasibility of FR1 MR BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Revised to R4-2321057 (from R4-2320051).**

[**R4-2321057**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321057.zip) **TP to TR 38.858: Feasibility of FR1 MR BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Approved.**

**R4-2320052 TP to TR 38.858: Feasibility of FR1 WA BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Merged (with R4-2321086).**

**R4-2320327 Further discussion on full duplex from FR1 BS perspective**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320615 Text Proposal to TR 38.858 on feasibility of FR1 Wide Area BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung*

**Decision: Revised to R4-2321086 (from R4-2320615).**

[**R4-2321086**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321086.zip) **Text Proposal to TR 38.858 on feasibility of FR1 Wide Area BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung, Murata, Huawei, Nokia*

**Decision: Revised to R4-2321201 (from R4-2321086).**

[**R4-2321201**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321201.zip) **Text Proposal to TR 38.858 on feasibility of FR1 Wide Area BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung, Huawei, Nokia*

**Decision: Approved.**

Chair: Since Murata withdrew their document, please check if they still want to co-sign the TP

Ericsson: The content is agreeable

Chair: Return-to discussion in 3rd round will only be about co-sourcing companies, not content

**R4-2320616 Text Proposal to TR 38.858 on feasibility of FR1 Medium Range BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung*

**Decision: Merged (with R4-2321057).**

###### 8.19.2.2.2 Feasibility of FR2 BS aspects

**R4-2319679 TP to TR 38.858: Feasibility of FR2 wide area BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Revised to R4-2321088 (from R4-2319679).**

[**R4-2321088**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321088.zip) **TP to TR 38.858: Feasibility of FR2 wide area BS**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon, Nokia*

**Decision: Approved.**

**R4-2320053 TP to TR 38.858: Feasibility of FR2 BS aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Merged (with R4-2321088).**

###### 8.19.2.2.3 Feasibility of FR1 UE aspects

**R4-2318683 On UE sub-band selectivity**

*Type: discussion For: Approval  
 Source: Apple*

**Decision: Noted.**

**R4-2318684 TP on UE sub-band selectivity and impact on UE RF requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Apple*

**Decision: Merged (with R4-2321080).**

**R4-2319002 Maintenance TP to TR 38.858  on UE aspects for FR1 in Full Duplex operation**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: Merged (with R4-2321080).**

**R4-2319024 Maintenance TP to TR 38.858 on Feasibility of FR1 UE aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: MediaTek (Shenzhen) Inc.*

**Decision: Revised to R4-2321080 (from R4-2319024).**

**[R4-2321080](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321080.zip) Maintenance TP to TR 38.858 on Feasibility of FR1 UE aspects**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: MediaTek (Shenzhen) Inc.*

**Decision: Approved.**

###### 8.19.2.2.4 Feasibility of FR2 UE aspects

**R4-2319003 Maintenance TP to TR 38.858 on UE aspects for FR2-1 in Full Duplex operation**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: Revised to R4-2321081 (from R4-2319003).**

**[R4-2321081](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321081.zip) Maintenance TP to TR 38.858 on UE aspects for FR2-1 in Full Duplex operation**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: vivo*

**Decision: Approved.**

##### 8.19.2.3 Impacts on BS RF requirements

**R4-2318305 Discussion on BS RF requirements impact for SBFD**

*Type: discussion For: Discussion  
 Source: CATT*

**Decision: Noted.**

**R4-2318926 Discussion on SBFD BS RF requirement**

*Type: discussion For: Decision  
 Source: CMCC*

**Decision: Noted.**

**R4-2319648 TP to TR 38.858: Update on BS requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Correct TX switching requirements

**Decision: Merged (with R4-2321091).**

**R4-2319649 On SBFD BS requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Remaining open issues on BS requirements

**Decision: Noted.**

**R4-2319680 RF requirments for SBFD operation**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Decision: Merged (with R4-2321091).**

**R4-2320054 Discussion on BS RF requirements for SBFD**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320328 Discussion on BS RF requirement impacts from SBFD perspective**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320329 TP to TR 38.858 Impact on BS RF requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321091 (from R4-2320329).**

[**R4-2321091**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321091.zip) **TP to TR 38.858 Impact on BS RF requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation, Samsung, CMCC, Ericsson*

**Decision: Approved.**

**R4-2320613 Study on the remaining issues of SBFD-capable BS RF requirements**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320614 Text Proposal to TR 38.858 on BS RF requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Samsung*

**Decision: Merged (with R4-2321091).**

##### 8.19.2.4 Impacts on UE RF requirements

#### 8.19.3 Summary of regulatory aspects

**R4-2319781 TP for TR 38.858 on Europe regulatory requirements**

*Type: discussion For: Approval  
 Source: Qualcomm Germany*

**Decision:** The document was **withdrawn**.

**R4-2320449 TP for TR 38.858 on Europe regulatory requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Germany*

**Decision: Revised to R4-2321082 (from R4-2320449).**

**[R4-2321082](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321082.zip) TP for TR 38.858 on Europe regulatory requirements**

*Type: pCR For: Approval  
 38.858 v1.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Qualcomm Germany*

**Decision: Approved.**

#### 8.19.4 Moderator summary and conclusions

**R4-2318197 Topic summary for [109][305] FS\_NR\_duplex\_evo\_Part1**

*Type: other For: Information  
 Source: Moderator (Samsung)*

**Abstract:**

[109][300] BDaT Session AI 8.19.1, 8.19.2.2.1, 8.19.2.2.2, 8.19.2.3, 8.19.3

**Decision: Noted.**

**R4-2318198 Topic summary for [109][306] FS\_NR\_duplex\_evo\_Part2**

*Type: other For: Information  
 Source: Moderator (Qualcomm)*

**Abstract:**

[109][300] BDaT Session AI 8.19.2.2.3, 8.19.2.2.4, 8.19.2.4

**Decision: Noted.**

**R4-2318199 Topic summary for [109][307] FS\_NR\_duplex\_evo\_Part3**

*Type: other For: Information  
 Source: Moderator (CMCC)*

**Abstract:**

[109][300] BDaT Session AI 8.19.2.1

**Decision: Noted.**

[**R4-2321079**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321079.zip) **Simulation results for SBFD coexistence**

*Type: other For: Information  
 Source: CMCC*

**Decision: Noted.**

Ericsson: Will this be included in submission of TR to RAN plenary? Would the file be embedded into the zip file, or just the reference number to the tdoc. Including the file is the RAN1 convention.

CMCC: We can try it.

[**R4-2321066**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321066.zip) **Ad-hoc meeting minutes for FS\_NR\_duplex\_evo\_Part1, 2, and 3**

*Type: other For: Information  
 Source: Samsung*

**Decision: Noted.**

Moderator proposal:

TP to TS38.858 clause 11.1 is agreed

TP to TS38.858 clause 11.2 is agreed

TP to TS38.858 clause 11.3: Case 1, 2 and 4 are agreed

Case 3

Under baseline assumptions, SBFD UL throughput degradation is observed only for cell edge throughput and [minor but acceptable] degradation is observed for average throughput. With other assumptions (higher gNB Tx power and lower grid shifts), the degradation is increased for cell edge throughput and average throughput

Nokia: “minor but acceptable” should be “minor”. Baseline is only for 100% grid shift. What is the meaning of the baseline assumption in the text.

Samsung: Baseline has been discussed for a long time and captured in Annex E already. We know what is the criteria for acceptability even if not written in the text. We had a previous agreement and compromise already.

Ericsson: For readability, we prefer some clarification in the text as well as already being in annex. We see more than 5% degradation, maybe about 7% taking the median of companies results. We prefer to indicate “minor” without including “but acceptable”

Charter: Agree with Ericsson and Nokia on “minor” For the other cases, we have not stated acceptable/not acceptable, but only the degradation.

CMCC: We would like to avoid duplication in the conclusion part on baseline assumptions. We suggest just including a reference or pointer to Annex E. For consistent conclusion with other sections, then we would prefer to indicate “no degradation” but if we want to indicate >5%, then the current version is a compromise.

Qualcomm: Not a strong view on baseline assumptions. We had long discussion on hard thresholds, 5%, 8%, etc. We don’t want to reopen this discussion. We may need to reopen other cases as well if we want to rediscuss this.

Nokia: We have two options: no degradation or degradation. We have already compromised to include “minor” degradation.

Samsung: We discussed acceptable degradation previously. The conclusion was to keep “no degradation and degradation” but to add margin.

Chair: We have “no degradation”, “minor [but acceptable]”, “significant degradation”, and “degradation”. The issue is what to call the category of “minor [but acceptable]”. How do we justify what is “acceptable”

Qualcomm: Other cases such as ATG, mIAB where larger than 5% degradation was regarded as acceptable. The range of acceptability was [5 – 10%]

Ericsson: For ATG and mIAB, these were special cases. But the general assumption in RAN4 is 5% as a gentleman’s agreement.

Nokia: Conformance testing typically is 95% which indicates 5% degradation.

Qualcomm: A deviation from 5% is needed due to uncertainty in simulation results.

ZTE: For coexistence cell edge degradation is from 5 – 10%. There is usually some flexibility.

Samsung: Can we say “minor but acceptable to some companies”?

Nokia: We know cell edge is degraded, but now we are evaluating average. If we follow Samsung proposal, we should also include “throughput is degraded to other companies”. This is only for the baseline assumption. There is clear degradation for other assumptions.

Huawei: For other technologies when deriving ACIR for example, we didn’t have a hard limit of 5%. We are ok with “minor but acceptable”

Spark: The real issue is the impact to the network operator. We support “minor” which recognizes there is some degradation expected, but not major level of interference. To say “acceptable” is based on your perspective. As a victim, it may not be considered as acceptable.

CableLabs: How about “tolerable minor degradation”?

Agreement on wording: “minor degradation but acceptable to some companies”

“Under baseline assumptions”

Agreement: Keep “under baseline assumption” with a reference or pointer to the Annex where baseline assumptions are defined.

**11.3.5 General remarks on coexistence findings**

For the ~~above~~ cases where no throughput degradation has been observed assuming SBFD-capable gNB and SBFD-aware UE having same ACLR or ACS as legacy TDD gNB and UE, no additional coexistence measures are required for SBFD deployment. ~~And these cases are:~~

* ~~Case 1 SBFD interferring TDD DL:~~
  + ~~All scenarios except Urban hotspot to Urban hotspot in FR1.~~
* ~~Case 2 SBFD interferring TDD UL:~~
  + ~~Indoor to Indoor in both FR1 and FR2-1.~~
* ~~Case 3-1 TDD DL interferring SBFD DL:~~
  + ~~All scenarios.~~
* ~~Case 3-2 TDD DL interferring SBFD UL~~
  + ~~Urban macro to Urban macro in FR2-1 with 30dBm Tx power and 100% grid shift;~~
  + ~~Indoor to Indoor in both FR1 and FR2-1.~~
  + ~~Urban micro to Urban micro in FR1 with 38dBm Tx power and 100% grid shift.~~
* ~~Case 4-1 TDD UL interferring SBFD DL:~~
  + ~~All scenarios except Urban hotspot to Urban hotspot in FR1.~~
* ~~Case 4-2 TDD UL interferring SBFD UL:~~
  + ~~All scenarios.~~

On the other hand, for other cases where throughput degradation has been observed, interference mitigation techniques will need to be considered. ~~For example, in scenario 2 case 1, the coexistence study results showed that ACIR enhancement could mitigate the interference from SBFD to legacy TDD. In another example, Interference mitigation techniques on the SBFD devices could enhance ACIR by up to 4.8 dB and reduce the legacy TDD cell-edge UL throughput degradation from 17% (baseline) to 8%. By further applying interference mitigation techniques on the legacy TDD devices, the throughput degradation could be reduced to almost 0% if the ACIR enhancement could achieve 8 dB.~~

Ericsson: We would like to group the scenarios for which there is no degradation rather than listing them as above

Samsung: The intention of the text is to write observations on scenarios

Qualcomm: Organizing by case is what is shown in the conclusion. To list only scenarios is misleading.

Samsung: Aligns with the structure of the study, not only the conclusion. We can add additional sentence to highlight the indoor scenario for ease of reading, but prefer to keep the structure.

**Thread [109][306] Conclusions**

[For the UE aspects, existing UE RF requirements has been applied as default assumptions for study phase conclusion, since no issues related to existing UE RF requirements has been identified in the co-existence study.]

Based on ad-hoc comment from Apple, the sentence is revised to

[For the UE aspects, reusing existing UE RF requirements is the conclusion of the study phase, since no issues related to existing UE RF requirements has been identified in the co-existence study.]

[The performance metrics were throughput loss at the cell edge and cell average ~~cell throughput loss~~ ~~performance~~.]

**Issue 2-1-2: Multi-carrier support**

* Agreement: (confirmed online)
  + For multi-carrier SBFD operation (interpretation 1), it is expected that the same conclusion can be drawn as the single carrier SBFD case.

Chair: Does this agreement need to be documented in the TR or somewhere else besides the chair notes?

Moderator: Will consider where to put it, but can likely add it to one of the TP’s being revised

Sub-topic 3-1: BS TX Requirement Impact for SBFD

**Issue 3-1-1: Output power dynamics**

|  |
| --- |
| RAN#107:   * Agreement from Ad-Hoc session:   + Output power dynamics for conducted and OTA TX requirement     - To reuse the existing RE power control dynamic range requirement for SBFD BS;     - FFS the necessity and how to define the total dynamic range requirement for SBFD based on the DL transmission bandwidth configuration for SBFD DL symbols/slots.   RAN#108:  Agreement:   * RE power control dynamic range: Same requirements can be applied. * Total dynamic range: Requirements applicable for SBFD slots   + FFS for the requirements limit and conformance testing   RAN4#108bis:  Total power dynamic range   * The requirement limit for the total power dynamic range for SBFD slots is not as yet agreed. Contributions proposing a requirement limit are encouraged. |

* Proposals/Observations on total power dynamic range:
  + Proposal 1 (Ericsson/Samsung/ZTE): Define the output power dynamic range requirement for SBFD as the ratio of the declared rated output power with all DL RBs active for SBFD (maximum) and the same single RB power as non-SBFD (minimum).
    - Proposal 1a (Samsung): New total power dynamic range for SBFD slots/symbols can be considered in normative phase, by reusing the existing total power dynamic range requirement can also be applied by using “SBFD DL subband bandwidth” for “BS channel BW” instead.
  + Proposal 2 (CMCC): Further discussion in work phase is needed regarding whether RAN4 could assume some typical D-U and U-D guard band for total power dynamic range RF requirements definition in work phase.
  + Proposal 3 (Nokia): There is no need to define a new total dynamic range requirement for SBFD operation.
* Moderator Recommendation:
  + Proposal 1 and 1a.
* Ad-Hoc discussion:
* Agreement:

Online:

Ericsson: Is proposal 1a an alternative to proposal 1?

Moderator: We don’t think they are contradicting but covering different aspects

Ericsson: 1a refers to bandwidth of DL part, not sure if this implies scaling to DL bandwidth

ZTE: 1a and 1 are the same. The active BW should be the same.

Samsung: Can agree to proposal 1. Proposal 1a is related to the detailed requirement which we can address in the WI.

**Issue 3-1-2: Co-location and co-existence**

[Moderator] In RAN4#108-bis, there are two options provided in the WF:

|  |
| --- |
| For co-location and coexistence requirement, further contributions are encouraged to decide on one of the following options:   * + - Option 1: Co-location requirement can’t use 30 dB coupling loss as the coupling loss assumption for SBFD capable gNB co-location related requirement.     - Option 2: No update on existing requirements, it’s declaration basis whether BS need to follow the requirements. |

* Proposals on reconsidering 30dB coupling loss assumption:
  + Proposal 1 (Ericsson): Do not consider the 30dB isolation as part of SBFD, but consider whether to investigate more generally in RAN4.
* Proposals for inter-band co-location and co-existence requirements for SBFD-capable BS:
  + Proposal 2 (Samsung): The requirement limit and conformance testing during SBFD symbols/slots will be further discussed in the normative stage, by considering the two options agreed.
  + Proposal 3 (CMCC/CATT/Ericsson/Nokia/ZTE): No updating on existing inter-band co-location requirements, Manufacturer will declare whether support co-location requirements in SBFD symbols/slots
* Proposals for intra-band adjacent carrier co-location requirement, i.e. co-location ACLR and ACS
  + Proposal 4 (CMCC): For intra-band adjacent channel co-location requirements, One alternation solution is to define requirements but with explicitly stating assumed spatial isolation and max gNB Tx power and keep in mind that this is not the minimum requirements, instead this is the typical/optimal BS performance under declaration basis.
* Moderator Recommendation:
  + Proposal 1 to be discussed not only within SBFD group, but involving more experts in BDaT session.
  + Further discussion on P2-P4.
* Ad-Hoc discussion:
* Agreement:

Online:

Ericsson: Ok to ignore proposal 1 for this discussion

ZTE: Support proposal 3

CATT: Also support proposal 3 for inter-band colocation. For intra-band, we may need to find a solution.

Ericsson: Support proposal 3 for inter-band. Proposal 4 implies a new requirement to be discussed separately

CMCC: Same view as above

Huawei: Same view as above. For proposal 4, we should discuss in WI phase.

CATT: Proposal 4 may be referring to Tx IM test rather than ACLR

Samsung: Even for inter-band, we need further discussion, but can compromise for the inter-band case if no other companies have concern

CMCC: Our objective is to indicate this needs to be discussed with isolation assumption. This can be discussed in the WI phase.

Ericsson: TxIM is often referred to in regulations so should keep the same requirement. We can capture the intra-band ACLR/ACS in the TR that it needs to be discussed in the WI, but we don’t have time to discuss now within the timeframe of the SI.

ZTE: Agree with Ericsson. We can capture this in our TP.

Samsung: This is the first time we are seeing this. We need more time to think about this before agreeing any kind of way forward.

CATT: Same view as Samsung. We may need coex study first.

**Issue 3-1-3: Unwanted emission**

* Proposals/Observations on in-channel emission/OBUE:
  + Proposal 1 (ZTE): for in-channel emission/OBUE, to consider this emission in the gNB Refsens degradation via self interference and inter-sector interference implicitly.
* Proposals/Observations on ACLR:
  + Proposal 1 (ZTE): for in-channel ACLR requirement, to consider this ACLR requirement in the gNB Refsens degradation via self interference and inter-sector interference implicitly.
* Moderator Recommendation:
  + Discuss further on how self-interference and inter-sector interference considered implicitly.
* Ad-Hoc discussion:
* Agreement:

Online:

Samsung: We should not factor in the intersector interference. Also there are unknowns such as the level. The current proposal is not acceptable to us.

Ericsson: This is related to whether we need new requirements for inter-sub-band interference.

ZTE: This requirement can be captured in the inter-sub-band leakage discussion.

Samsung: Inter-sub-band leakage and selectivity have not been agreed yet.

[**R4-2321089**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321089.zip) **WF on BS RF requirements for SBFD**

*Type: other For: Approval  
 Source: Samsung*

**Decision: Approved.**

### 8.20 Study on low-power wake-up signal and receiver for NR

### 8.21 Study on Artificial Intelligence (AI)/Machine Learning (ML) for NR air interface

### 8.22 Expanded and improved NR positioning

### 8.23 Multi-carrier enhancements for NR

### 8.24 Further NR mobility enhancements

### 8.25 Dual Tx/Rx Multi-SIM for NR

### 8.26 NR NTN enhancement

#### 8.26.1 General aspects

##### 8.26.1.1 System parameters

**R4-2319569 NTN enhancement: system parameters update**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

This contribuition discusses some necessary updates to previsouly agreed system parameters

**Decision: Noted.**

**R4-2320152 Draft CR on TS 38.108: Corrections on channel raster and synchronization raster**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: NEC*

**Decision: Revised to R4-2321026 (from R4-2320152).**

**[R4-2321026](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321026.zip) Draft CR on TS 38.108: Corrections on channel raster and synchronization raster**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: NEC*

**Decision: Endorsed.**

##### 8.26.1.2 Regulatory information

**R4-2319182 Discussion on regulatory information on NTN UE**

*Type: other For: Approval  
 Source: Samsung*

**Abstract:**

In this document, we propose the analysis over the FCC chapter 25 clause by clause and the corresponding requirements that associated with these terms.

**Decision: Noted.**

**R4-2319571 NTN enhancement: CR to TR 38.863 NTN Ka-band Regulatory aspects**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0010 rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This contribution is a CR to TR 38.863 related to regulatory aspects of the NTN Ka-band

**Decision: Agreed.**

##### 8.26.1.3 Others

**R4-2320949 Draft CR proposal to add Doppler and Delay variation examples as a function of time for NGSO and GSO in a new Annex**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0011 rev Cat: B (Rel-18)  
  
 Source: THALES*

**Abstract:**

Note: The CR coversheet has CR revision as 0. Doppler shift and Delay variation versus time is not explicitly defined in the document. Plots for NGSO (LEO at 600 km, LEO at 1200 km) with orbit inclination of 88 degrees and GSO with orbit inclination of 7

**Decision: Revised to R4-2321058 (from R4-2320949).**

[**R4-2321058**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321058.zip) **Draft CR proposal to add Doppler and Delay variation examples as a function of time for NGSO and GSO in a new Annex**

*Type: CR For: Agreement  
 38.863 v17.2.0 CR-0011 rev Cat: B (Rel-18)  
  
 Source: THALES*

**Abstract:**

Note: The CR coversheet has CR revision as 0. Doppler shift and Delay variation versus time is not explicitly defined in the document. Plots for NGSO (LEO at 600 km, LEO at 1200 km) with orbit inclination of 88 degrees and GSO with orbit inclination of 7

**Decision: Postponed.**

Thales: Based on comments from other companies, we indicate that the content is for information only, not for test purposes.

ZTE: We do not agree to the CR. We are open to further discussion, we aren’t sure about the specific details provided in this CR.

Thales: This is only an example to be included in the TR. It is not a specification.

ZTE: We haven’t even discussed the channel model yet. The information here might be misleading without a full discussion.

Thales: This relates directly from the equations in the TR 38.811. Based on the equations, we have simply evaluated Doppler and delay.

ZTE: There is no urgency to agree to the CR this meeting. If we can confirm the information by next meeting, we can agree to it at that time.

Thales: We are not proposing to introduce the channel model into the TS. This is just to introduce information in the TR.

ZTE: If the equations are coming from the RAN1 TR, then this clarification might be better placed in the RAN1 TR rather than RAN4 TR. We do believe this is useful information.

ZTE: We can promise to evaluate during the period before the next meeting. It is possible for RAN4 to refer to RAN1 TR.

Thales: The RAN1 TR is from Rel-15, so we have concerns to add the content to the RAN1 TR at this time.

**R4-2320952 Draft TP for TR 37.911 - Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology**

*Type: pCR For: Approval  
 37.911 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: THALES*

**Abstract:**

TP for on-going TR 37.911 - Clauses 7.2 and 7.3 (Bandwidth and Spectrum)

**Decision: Revised to R4-2321029 (from R4-2320952).**

**[R4-2321029](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321029.zip) Draft TP for TR 37.911 - Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology**

*Type: pCR For: Approval  
 37.911 v0.1.0 CR- rev Cat: (Rel-18)  
  
 Source: THALES*

**Abstract:**

TP for on-going TR 37.911 - Clauses 7.2 and 7.3 (Bandwidth and Spectrum)

**Decision: Approved.**

ZTE: We don’t have a RAN4 agenda for this discussion. This should be a RAN plenary discussion. We do not object to approval of this TP based on technical content.

Huawei: We believe the document should be endorsed, rather than approved. The RAN plenary guidance is only requesting RAN4 input.

Thales: We need this to be approved.

Chair: Is Band n254 completed? Is it in an official 3GPP TS?

ZTE: The CR is expected to be agreed this meeting.

Huawei: RAN owns the 37.911 TR. There needs submitted as a formal TP in RAN plenary. Band n254 can be included in this TP because RAN will receive the latest status on the band completion at the next RAN plenary meeting.

#### 8.26.2 Co-existence study for above 10GHz bands

**R4-2318298 Co-existence study result for above 10GHz bands**

*Type: other For: Discussion  
 Source: CATT*

**Decision: Noted.**

**R4-2318493 Discussion on Co-existence study result for above 10GHz bands**

*Type: other For: Discussion  
 Source: CATT*

**Decision: Noted.**

**R4-2319260 Joint proposals on NTN co-existence study**

*Type: discussion For: Approval  
 Source: Samsung R&D Institute UK*

**Abstract:**

This document contains proposals from comapnies to further update NTN co-existence assumptions.

**Decision: Noted.**

**R4-2319566 NTN enhancement: coexistence simulations results**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

This contribution provides our coexistence simulation results for NTN Ka-band

**Decision: Noted.**

**R4-2319567 NTN enhancement: initial conclusion from simulations results**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

This contribution provides an initial conclusion of the simulation results for the coexistence study on NTN operation in the Ka-band, based on our results

**Decision: Noted.**

**R4-2319777 Results of NTN coexistence study in above 10GHz**

*Type: discussion For: Discussion  
 Source: Samsung Electronics Nordic AB*

**Decision: Noted.**

**R4-2319890 Some simulation results for Rel-18 NTN coexistence study**

*Type: other For: Approval  
 Source: Huawei, HiSilicon*

**Decision: Noted.**

**R4-2320330 Coexistence simulation results for NTN in Ka-band**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320392 Coexistence simulation results between TN and NTN above 10GHz bands for VSAT and L-ESIM**

*Type: other For: Approval  
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**R4-2320970 NTN-TN co-existence simulation results in above 10 GHz bands**

*Type: discussion For: Discussion  
 Source: THALES, Magister Solutions Ltd*

**Abstract:**

The scope of this document is to provide simulation results for NTN-TN coexistence scenarios in above 10 GHz and related derived requirements.

**Decision: Noted.**

#### 8.26.3 SAN RF requirements

**R4-2318299 Further discussion on SAN RF requirements for above 10GHz bands**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2318300 Draft CR for TS 38.108, On introduction of above 10GHz bands to clause 10.1-10.4**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: CATT*

**Decision: Endorsed.**

**R4-2318302 Simulation results for Ka-band NTN SAN dynamic range**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2319570 NTN enhancement: draft CR to TS 38.108 NTN Ka-band - system parameters udpate**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This draft CR proposed needed updates to clause 5 and NR-ARFCN ranges

**Decision: Noted.**

**R4-2319577 NTN enhancement: draft CR to TS 38.108 NTN Ka-band - clause 4.3**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This contribution is a draft CR to TS 38.108, introducing NTN Ka-band, drafting clause 4.3

**Decision: Endorsed.**

**R4-2319578 NTN enhancement: draft CR to TS 38.108 NTN Ka-band - clause 4.6**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This contribution is a draft CR to TS 38.108, introducing NTN Ka-band, drafting clause 4.6

**Decision: Endorsed.**

**R4-2319579 NTN enhancement: draft CR to TS 38.108 NTN Ka-band - clause 9.4**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

This contribution is a draft CR to TS 38.108, introducing NTN Ka-band, drafting clause 9.4

**Decision: Endorsed.**

NEC: Some typos

Ericsson: Can we endorse this draft CR and fix the typo in the big CR?

**R4-2319580 NTN enhancement: Running CR to TS 38.108 NTN Ka-band**

*Type: CR For: Agreement  
 38.108 v18.0.0 CR-0047 rev Cat: B (Rel-18)  
  
 Source: Ericsson, Huawei, Thales*

**Abstract:**

This contribution is the running CR to TS 38.108 capturing all endorsed draft CRs

**Decision: Revised to R4-2321031 (from R4-2319580).**

[**R4-2321031**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321031.zip) **NTN enhancement: Running CR to TS 38.108 NTN Ka-band**

*Type: CR For: Agreement  
 38.108 v18.0.0 CR-0047 rev Cat: B (Rel-18)  
  
 Source: Ericsson, Huawei, Thales*

**Abstract:**

This contribution is the running CR to TS 38.108 capturing all endorsed draft CRs

**Decision: For email endorsement**

Moderator: The CR is not complete, but we can endorse this document to capture the agreed parts so far.

**R4-2319711 Draft CR to TS 38.108: correction on EVM measurement annex for FR2-NTN, Rel-18**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Keysight Technologies UK Ltd*

**Decision: Revised to R4-2321030 (from R4-2319711).**

[**R4-2321030**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321030.zip) **Draft CR to TS 38.108: correction on EVM measurement annex for FR2-NTN, Rel-18**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: Keysight Technologies UK Ltd, NEC*

**Decision: Endorsed.**

**R4-2320153 Draft CR on TS 38.108: Radiated transmit power requirements in extreme conditions**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Endorsed.**

**R4-2320154 Draft CR on TS 38.108: OTA modulation quality**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Revised to R4-2321194 (from R4-2320154).**

[**R4-2321194**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321194.zip) **Draft CR on TS 38.108: OTA modulation quality**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Endorsed.**

Ericsson: This should be in conformance spec, not core spec

NEC: The same note can appear in both

**R4-2320155 Draft CR on TS 38.108: EVM annex for FR2-NTN**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Merged (with R4-2319711).**

**R4-2320331 Further discussion on SAN RF requirements for NTN in Ka-band**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320334 Draft CR to TS 38.108 Clause 10.5 OTA in-band selectivity and blocking**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321148 (from R4-2320334).**

[**R4-2321148**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321148.zip) **Draft CR to TS 38.108 Clause 10.5 OTA in-band selectivity and blocking**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

ZTE: We have captured ACS

**R4-2320335 Draft CR to TS 38.108 Clause 10.6 OTA out-of-band blocking**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321149 (from R4-2320335).**

[**R4-2321149**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321149.zip) **Draft CR to TS 38.108 Clause 10.6 OTA out-of-band blocking**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Postponed.**

**R4-2320336 Draft CR to TS 38.108 Clause 10.7 OTA in-channel selectivity**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321150 (from R4-2320336).**

[**R4-2321150**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321150.zip) **Draft CR to TS 38.108 Clause 10.7 OTA in-channel selectivity**

*Type: draftCR For: Endorsement  
 38.108 v18.0.0 CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Postponed.**

**R4-2320917 Draft CR on TS 38.108 for Clause 9.7 - OTA unwanted emissions**

*Type: CR For: Agreement  
 38.108 v18.0.0 CR-0049 rev Cat: B (Rel-18)  
  
 Source: THALES*

**Abstract:**

Note: The CR coversheet have CR revision as 0. Adding SAN Type 2-O information to Clause 9.7 - OTA unwanted emission for above 10 GHz WI.

**Decision: Revised to R4-2321151 (from R4-2320917).**

[**R4-2321151**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321151.zip) **Draft CR on TS 38.108 for Clause 9.7 - OTA unwanted emissions**

*Type: CR For: Agreement  
 38.108 v18.0.0 CR-0049 rev Cat: B (Rel-18)  
  
 Source: THALES*

**Abstract:**

Note: The CR coversheet have CR revision as 0. Adding SAN Type 2-O information to Clause 9.7 - OTA unwanted emission for above 10 GHz WI.

**Decision: Endorsed.**

Moderator: This should be included in the big running CR. It should not have been submitted as a CR.

**R4-2320972 Remaining issues for SAN RF requirements in above 10 GHz**

*Type: discussion For: Discussion  
 Source: THALES*

**Abstract:**

This contribution further considers remaining issues for SAN RF to be considered for NTN in above 10 GHz.

**Decision: Noted.**

#### 8.26.4 SAN RF conformance testing requirements

**R4-2318301 Discussion on SAN RF conformance testing requirements for above 10GHz bands**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

#### 8.26.5 UE RF requirements

#### 8.26.6 RRM core requirements

#### 8.26.7 RRM performance requirements

#### 8.26.8 Demodulation performance requirements

**R4-2320238 Discussion on general issues for demodulation requirements for NR NTN enhancements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.26.8.1 SAN demodulation performance requirements

**R4-2318058 Discussion on NR NTN SAN Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

The introduction of NR NTN enhancements for Rel-18 has been outlined in the WID, with an aim to add functionality to increase features that were introduced in Rel 15, 16 and 17.

In this paper, we present Nokia’s view on the impact to SAN demodulation req

**Decision: Noted.**

**R4-2319846 View on BS demodulation requirements for NTN enhancement**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320239 Discussion on SAN demodulation requirements for NR NTN enhancements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.26.8.2 UE demodulation performance and CSI requirements

**R4-2318059 NR NTN UE demodulation disussion**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

The introduction of NR NTN enhancements for Rel-18 has been outlined in the WID, with an aim to add functionality to increase features that were introduced in Rel 15, 16 and 17.

In this paper, we present Nokia’s view on the impact to UE demodulation requi

**Decision: Noted.**

**R4-2318582 On UE demod and CSI requirements for NR NTN enhancement**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318735 Discussion on the UE demodulation and CSI requirements for NR NTN enhancements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2318736 Simulation results summary for NR NTN enhancements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2319223 On general issues and UE demodulation requirements for NR NTN enh.**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the scope for PDCCH, PBCH, CQI report, SDR, detailed configuration on PDSCH for Ka band/FR2

**Decision: Noted.**

**R4-2319224 Simulation results for NR NTN enhancement UE demodulation**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This contribution showed limited cases of simulation results on PDSCH for channel model disucssion

**Decision: Noted.**

**R4-2319313 Discussion on NR NTN enhancement SAN demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Channel model, link budget for high modulaiton for Ka band/FR2

**Decision: Noted.**

**R4-2319314 Simulation results for NR NTN enhancement SAN demodulation requirements**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

Initial simulations on PUSCH for channel model

**Decision: Noted.**

**R4-2320240 Discussion on UE demodulation requirements for NR NTN enhancements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.26.9 Moderator summary and conclusions

**R4-2318200 Topic summary for [109][308] NR\_NTN\_enh\_Part1**

*Type: other For: Information  
 Source: Moderator (Thales)*

**Abstract:**

[109][300] BDaT Session AI 8.26.1.1, 8.26.1.2, 8.26.1.3

**Decision: Noted.**

**Issue 1-1-1:** NR-ARFCN Extension for NTN in above 10 GHz

* Proposals
  + Option 1: **Extend the NR-ARFCN parameters table with the following range (P1/**[R4-2319569](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319569.zip))**:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Range of frequencies (MHz) | ΔFGlobal (kHz) | FREF-Offs (MHz) | NREF-Offs | Range of NREF |
| 24250 – 100000 | 60 | 24250.08 | 2016667 | 2016667 – 3279165 |

* + Option 2: ([R4-2320152](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320152.zip))

Table 5.4.2.1-1: NR-ARFCN parameters for the global frequency raster

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Range of frequencies (MHz) | ΔFGlobal (kHz) | FREF-Offs (MHz) | NREF-Offs | Range of NREF |
| 0 – 3000 | 5 | 0 | 0 | 0 – 599999 |
| 3000 – 24250 | 15 | 3000 | 600000 | 600000 – 2016666 |
| 24250 – 30000 | 60 | 24250.08 | 2016667 | 2016667 – 2112499 |

* Recommended WF
  + Option 2 if agreeable, since corresponds better to FR2-NTN range.

Online:

Ericsson: Ok with option 2 also

ZTE: Upper frequency range is different between option1 and option 2. Prefer option 2

Thales: We need to update the running CR from Ericsson with this agreement.

**Issue 1-1-2:** GSCN Extension for NTN in above 10 GHz

* Proposals
  + Option 1: ([R4-2320152](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320152.zip))

Table 5.4.3.1-1: GSCN parameters for the global frequency raster

|  |  |  |  |
| --- | --- | --- | --- |
| Range of frequencies (MHz) | SS block frequency position SSREF | GSCN | Range of GSCN |
| 0 – 3000 | N \* 1200 kHz + M \* 50 kHz,  N = 1:2499, M ϵ {1,3,5} (Note) | 3N + (M-3)/2 | 2 – 7498 |
| 3000 – 24250 | 3000 MHz + N \* 1.44 MHz,  N = 0:14756 | 7499 + N | 7499 – 22255 |
| 24250 – 30000 | 24250.08 MHz + N \* 17.28 MHz,  N = 0:332 | 22256 + N | 22256 – 22588 |
| NOTE: The default value for *operating bands* which only support SCS spaced channel raster(s) is M=3. | | | |

* Recommended WF
  + Option 1 if agreeable. However, the proposal seems strange since the NTN DL Ka-band is between 17.2 and 20.3 GHz.

Online:

ZTE: Last row is for UL and is not needed, GSCN is only for downlink.

Ericsson: Same as ZTE

NEC: Agree 30 GHz is only for UL, but FR2 NTN is defined up to 30 GHz.

Thales: We can introduce new range if/when a new band is defined.

Qualcomm: Agree with Thales, ZTE, Ericsson

NEC: Ok with not agreeing to our proposal on GSCN

Revise the draft CR

[R4-2321026](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321026.zip) Draft CR on TS 38.108: Corrections on channel raster and synchronization raster

|  |  |  |
| --- | --- | --- |
| [R4-2320152](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320152.zip) | NEC | Frequency range of FR2-NTN is defined as between 17,300 MHz and 30,000 MHz. However, NR-ARFCN and GSCN parameters are defined only up to 24,250 MHz.  The CR proposes to define the NR-ARFCN and GSCN parameters for the frequency range between 24.25 GHz and 30 GHz for FR2-NTN. |

**Issue 1-2-1:** Emission limitations

* Proposals
  + Option 1: **(P1 & P2/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **OOBE: Adopt FCC 25.202(f)(1)~(3) for band n511 and n510 for OOBE requirements for NTN UE in TS 38.101-5.**
    - **Spurious: Adopt FCC 25.202(f)(4) for band n511 and n510 for spurious emission requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-2:** Power limits for earth stations

* Proposals
  + Option 1: **(P3/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Adopt FCC 25.204(b), (c), (d), (e)(1), (e)(3) and (e)(4) for band n511 and n510 to the transmit power requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-3:** Minimum antenna elevation angle

* Proposals
  + Option 1: **(P4/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Adopt FCC 25.205 for band n511 and n510 to the transmit power requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-4:** Earth station antenna performance standards

* Proposals
  + Option 1: **(P5/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Adopt FCC 25.209(a)(1), (a)(3), (a)(6), (b)(3), (e) and (f) for band n511 and n510 to the off-axis eirp limit requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-5:** Narrowband analog transmissions and digital transmissions in the GSO FSS

* Proposals
  + Option 1: **(P6/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Adopt FCC 25.212(e) for band n511 and n510 to the transmit power requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-6:** Off-axis EIRP density envelopes for FSS earth stations transmitting in certain frequency bands

* Proposals
  + Option 1: **(P7/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Adopt FCC 25.218(i) for band n511 and n510 to the off-axis eirp limit requirements for NTN UE in TS 38.101-5.**
* Recommended WF
  + Option 1 if agreeable.

**Issue 1-2-7:** Operating and coordination requirements for earth stations in motion (ESIMs)

* Proposals
  + Option 1: **(P8/**[R4-2319182](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319182.zip))
    - **Propose the meeting to consider whether the FCC operational requirements, related to n510 and n511, need to be considered in the TS. It relates to the mechanism to apply stop-transmission command to an earth station that creating unacceptable interferences and others.**
* Recommended WF
  + Option 1 if agreeable.

Online:

Chair: Should these requirements be discussed in UE RF session instead?

ZTE: Perhaps we can have the high level discussion here about which kind of regulatory requirements should be captured in UE specification and which ones in the TR

Thales: UE RF session is Thursday

Chair: Suggest to treat in ad-hoc, offline, and/or UE RF session

Samsung: Prefer to treat it online in main (UE RF) session to have input from operators and regulators

**Issue 1-3-1:** Update TR 38.863 - regulatory section with information for Ka-band (R4-2319571, Ericsson).

* Proposals
  + Option 1: This ~~draft~~ CR proposes updates of TR 38.863 mentioning the regulatory information of NTN Ka-band.
* Recommended WF
  + To be Agreed if no other objections ([R4-2319571](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319571.zip) submitted from previous endorsed [R4-2315767](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2315767.zip), re-submitted from [R4-2313242](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2313242.zip))

**Agreed**

**Issue 1-3-2:** Update TS 38.108 - Define the NR-ARFCN and GSCN parameters for the frequency range between 24.25 GHz and 30 GHz for FR2-NTN (R4-2320152, NEC).

* Proposals
  + Option 1: Define the NR-ARFCN and GSCN parameters for the frequency range between 24.25 GHz and 30 GHz for FR2-NTN.
* Recommended WF
  + To be Endorsed at least for NR-ARFCN if no other objections (in order to be included in the Running CR [R4-2319580](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319580.zip) “NTN enhancement: Running CR to TS 38.108 NTN Ka-band” from Ericsson, Huawei, THALES on TS 38.108 for RAN4#109)
  + However, with respect to GSCN it seems strange since the NTN DL Ka-band is between 17.2 and 20.3 GHz.

**Revised to 21026**

**Issue 1-3-3:** Update TR 37.911 - Draft TP for TR 37.911 - Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology (R4-2320952, THALES).

* Proposals
  + Option 1: TP for introduction of Clauses 7.2 Bandwidth and 7.3 Spectrum.
* Recommended WF
  + To be Approved if no other objections.

Online:

ZTE: This belongs to RAN plenary, not RAN4 for the ITU submission

Thales: RAN1 provided contribution for their part, and they need feedback from RAN4

Ericsson: Agree with ZTE

Huawei: Same as ZTE and Ericsson. There is a disclaimer needed for 30 MHz bandwidth.

Thales: Suggest checking with colleagues from RAN1.

ZTE: We don’t have a RAN4 agenda item for this. We can check if the contents are technically endorsable.

NEC: Table number 5-1-1 is wrong

ZTE: Why is Band n254 not included?

Huawei: This is not a RAN4 WI, not on RAN4 AI. Why are we spending time on this?

ITU AH contact: We need final approval by December in RAN plenary. If we move this to RAN plenary, then we may not complete on time.

Chair: Revised. Will consult with RAN4 chair on whether to treat the revision or not.

**Issue 1-3-4:** Update TR 38.863 - Plots for NGSO (LEO at 600 km, LEO at 1200 km) with orbit inclination of 88 degrees and GSO with orbit inclination of 7 degrees is given as part of a new Annex (R4-2320949, THALES).

* Proposals
  + Option 1: Add plots Doppler, Delay=Function(time) as examples for NGSO (LEO at 600 km, LEO at 1200 km) with orbit inclination of 88 degrees and GSO with orbit inclination of 7 degrees is given as part of a new Annex of TR 38.863.
* Recommended WF
  + To be Approved if no other objections.

Online:

ZTE: This is the first time to see proposal to use ephemeris to derive Doppler and delay values. We could discuss in R19. Need time to check the technical content.

Thales: We don’t present information on ephemeris in this paper, just the doppler and delay variation.

Huawei: Should this be discussed in RAN task, AI 12?

Inmarsat: This should be included for information, just for the TR.

Samsung: This is a Cat B, but this is not a new feature. This is for information. We need a specific purpose to add to the TR by CR. We are open to discuss in a future release.

ZTE: We need more information about how to map the plots to doppler and delay.

Noted.

**R4-2318201 Topic summary for [109][309] NR\_NTN\_enh\_Part2**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 8.26.3, 8.26.4

**Decision: Noted.**

**Issue 1-2-1: Offset to FR2 OTA REFSENS ΔFR2\_REFSENS**

* Proposals: ΔFR2\_REFSENS is still needed for FR2-NTN SAN and could be reused for the definition if OTA REFSENS.
  + Agree, *OTA REFSENS RoAoA* was also used for FR1-NTN SAN (CATT)
  + Disagree, this is not needed. (Thales)
* Recommended WF
  + TBA

Online:

CATT: Based on current TN approach, but we don’t have a very strong view if a technical argument can be provided otherwise.

ZTE: We have this for FR1. Why don’t we need it for FR2? What is the technical reason?

Thales: FR2 beams are very narrow, but we are also ok to use the same approach as FR1

**Issue 1-3-1:** **SAN type 2-O dynamic range requirement**

* Proposals: Do not specify dynamic range requirement for SAN type 2-O and for both GEO and LEO classes.
  + Agree (CATT, Thales)
  + Disagree
* Recommended WF
  + Based on the simulation results provided by CATT, this proposal should be acceptable: the dynamic range requirement should not be specified for SAN type 2-O.

ZTE: The simulation result was based on FRF=2, but considering FRF=1, we have a different conclusion. Admit that for coex so far, we have only considered FRF=2 so ok with the proposal.

Inmarsat: FRF=1 is a feasible deployment, but the interference needs to be managed. This does not necessarily mean we have to specify the dynamic range requirement.

Ericsson: We have done coex with FRF=2 which was considered worst case. FRF=1 should be out of scope.

ZTE: Agree with Ericsson

**Issue 1-4-1: SAN type 2-O out-of-band blocking requirement for the 12.75 GHz – 2nd harmonic of upper frequency range.**

* Proposals: Considering the following services for the 12.75 GHz – 2nd harmonic of upper frequency range:
  + - Ku-band UL
    - Frequency and timing reference signal between satellite nodes.
    - Wireless positioning between satellite
  + Agree (ZTE)
  + Disagree (Thales)
* Recommended WF
  + TBA

Thales: Highly dependent on the geometry of the network and deployment

Inmarsat: We need an out-of-band blocking, but including the particular services listed here needs further discussion

Hughes: We have concern with the frequency range

[**R4-2321146**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321146.zip) **Ad-hoc meeting minutes for [109][309] NR\_NTN\_enh\_Part2**

*Type: other For: Information  
 Source: Ericsson*

**Decision: Noted.**

[**R4-2321147**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321147.zip) **WF on [109][309] NR\_NTN\_enh\_Part2**

*Type: other For: Approval  
 Source: Ericsson*

**Decision: Approved.**

**R4-2318202 Topic summary for [109][310] NR\_NTN\_enh\_Part3**

*Type: other For: Information  
 Source: Moderator (Samsung)*

**Abstract:**

[109][300] BDaT Session AI 8.26.2

**Decision: Noted.**

**Issue 1-1: NTN UE antenna model**

* Proposals
  + Option 1: Change NTN UE antenna model parameter as below

|  |
| --- |
| 1    For UE,  where:  - J1(x) is the Bessel function of the first kind and first order with argument ‘x’;  - a is the radius of the antenna's circular aperture;  - k = 2f/c is the wave number;  - f is the frequency of operation;  - c is the speed of light in a vacuum and  is the angle measured from the bore sight of the antenna's main beam.  Note that *ka* equals to the number of wavelengths on the circumference of the aperture and is independent of the operating frequency. And the sin () function is in radian. |

* Recommended WF
  + Agree on Option 1

**Issue 1-2 TN diameter**

* Proposals
  + Option 1: Consider a cellular Terrestrial Network (TN) not larger than 50 km diameter.
* Recommended WF
  + Pause the discussion unless no conclusions can be made for Issue 2-2

Samsung: Given the agreement on 2-2, do we still need to consider 1-2, 1-3, and 1-4?

Thales: This is very specific to 25 deg scenario where the satellite beam footprint is much larger than 90 deg elevation. We still need to discuss these aspects even if 2-2 is agreed.

ZTE: Thales proposal is to revise simulation assumptions and resimulte. We prefer to use current results to derive ACIR. Once we’ve done that, we can consider the other scenarios with relaxation.

Samsung: Agree with ZTE. We need to conclude this coex study. We want to avoid further revising simulation assumptions which would result in not being able to conclude ACIR this meeting. We need initial ACIR by this meeting. If critical case is identified that prevents us from defining ACLR/ACS, we can address it at that time.

Ericsson: We should look at the results and analyze first. Not revisiting the assumptions.

Qualcomm: We don’t believe we need to change the scaling factor. This is last meeting and we need to focus on current simulation results.

Inmarsat: Some of the assumptions are not realistic. These are the results we have with these assumptions and we have no time to revisit. We don’t know if these assumptions will hold in the real world.

Thales: We don’t need to resimulate, but just to reinterpret the existing result with different post-processing.

Samsung: Proposal to aim to agree this meeting, but if a critical issue is found, then we can further discuss.

**Issue 1-3 Scaling factor**

* Proposals
  + Option 1: To use same scaling factor values for lower NTN SAN elevation angle (e.g. 25°) and 90° NTN SAN elevation angle.

|  |  |  |
| --- | --- | --- |
| **Orbit** | **90°** | **25°** |
| LEO600 | **13.8 dB** | **13.8 dB** |
| LEO1200 | **19.6 dB** | **19.6 dB** |
| GEO | **29.1 dB** | **29.1 dB** |

* Recommended WF
  + Pause the discussion unless no conclusions can be made for Issue 2-2

**Issue 1-4: Further consideration for 25˚ cases**

*[Editor’s note on background of Issue 1-4]*

*[As observed by several companies, 5% throughputs in 25˚ elevation angle cases cannot guarantee the performance of NTN systems. Therefore, several options to improve the performance from simulation aspect are proposed during offline.]*

* Proposals
  + Option 1: Following settings can be considered to resolve issues in 25 degree cases
    - For UL: decrease RB numbers
    - For DL

- Drop users below -10dB SNR with current Tx power settings OR

- Increase satellite Tx power.

* + - For Case 5, use Uma between TN BS and NTN UE rather than Free Space model

- For Fixed VSAT (22.5m) use Uma while using the VSAT height as UE height

- For L-ESIM (1.5m) use Uma.

* + - To increase hypothetical TN requirements (which are not currently specified by any TN specification since such TN deployment does not exist) at least with 3 more dBs:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency band | BS | | UE | | ACIR | |
| ACLR | ACS | ACLR | ACS | BS ACLR  UE ACS | UE ACLR  BS ACS |
| 17 GHz | [30] + XdB | [26] + XdB | [19] + XdB | [25] + XdB | [23.8] +XdB | [18.2] +XdB |
| 27 GHz | 28 | 24 | 17 | 23 | 21.8 | 16.2 |

* + - To increase the guard band of NTN CBW.
  + Option 2: Do not consider lower elevation angle, e.g. 25 degree cases, for L-ESIM
  + Option 3: Focus on 90 degree cases and consider other values rather than 25 degree, e.g. 45 degree
  + Option 4: In case that cell edge throughput is NaN due to the out of coverage, RAN4 can conclude based on average throughput loss.
  + Option 5: Other alternatives are not precluded.
* Recommended WF
  + If no conclusions on results of 25 degree cases can be made, first consider Option 2, 3 and 4.

**Issue 2-2: Treatment of NaN value**

* Proposals
  + Option 1: In case that cell edge throughput is NaN due to the out of coverage, RAN4 can conclude based on average throughput loss.
* Recommended WF
  + Agree on Option 1.

Online:

Huawei: Is this only for scenario 5?

Samsung: This is a general statement. For any case where cell edge throughput is not observable, we propose to use average throughput.

ZTE: Another proposal: If cell edge throughput is nonexistent, we can remove users with < -10 dB and keep the remaining.

Samsung: We prefer average throughput loss as the conventional approach and to minimize simulation effort. We are concerned that ZTE proposal could not be completed on time for completion of the WI.

ZTE: We are also ok with Samsung proposal to conclude ACIR in this meeting.

Qualcomm: Ok with option 1 to complete the core part WI.

Ericsson: Samsung proposal is reasonable. We already adopted this for FR1.

Thales: Agree with option 1. Below -10 dB SNR is not typical, does not appear often in simulation.

**Issue 2-4: Parameters to determine ACLR & ACS**

* Proposals
  + Option 1: Use following table to derive ACLR and ACS of NTN SAN & UE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency band | BS | | UE | | ACIR | |
| ACLR | ACS | ACLR | ACS | BS ACLR  UE ACS | UE ACLR  BS ACS |
| 17 GHz | [30] | [26] | [19] | [25] | [23.8] | [18.2] |
| 27 GHz | 28 | 24 | 17 | 23 | 21.8 | 16.2 |

* + Option 2: Other approaches are not precluded.
  + Option 3: To avoid the confusion, the ACLR and ACS values for 17GHz in the Table above should be removed after ACLR/ACS requirements are specified for NTN.
* Recommended WF
  + Discuss this issue after Issue 2-3 is concluded.

Ericsson: The values are in square brackets because they were derived based on 10 GHz frequency range. Ok for the purpose of coex, but not necessarily as the core requirement.

Qualcomm: We prefer not to capture this in an approved 3GPP tdoc. Ok to use this as information, but not even capture in simulation assumptions.

Samsung: We can add a note in a WF to indicate the values are only to be used to derive requirements, but does not indicate TN requirements in the future.

Inmarsat: Agree with Samsung, but we want to capture in the TR.

Huawei: These values are just company proposals, not RAN4 agreements. Even if these are just assumptions to derive requirements, they may impact TN requirements in the future.

Thales: We may need to increase the ACLR values to optimize between TN and NTN.

[**R4-2321115**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321115.zip) **WF for NTN co-existence study**

*Type: other For: Approval  
 Source: Samsung*

**Abstract:**

Capture agreements for co-existence study

**Decision: Approved.**

[**R4-2321116**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321116.zip) **Simulation assumption for NTN co-existence**

*Type: other For: Approval  
 Source: Samsung*

**Abstract:**

Update simulation assumption to be aligned with latest RAN4 agreement

**Decision: Approved.**

[**R4-2321117**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321117.zip) **Collection of simulation results for NTN co-existence study**

*Type: other For: Information  
 Source: Samsung*

**Abstract:**

Capture simulation results from companies

**Decision: Noted.**

[**R4-2321118**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321118.zip) **Ad-hoc minutes for NTN co-existence study**

*Type: other For: Information  
 Source: Samsung*

**Abstract:**

Capture the ad-hoc discussion outcome

**Decision: Noted.**

**R4-2318216 Topic summary for [109][324] NR\_NTN\_enh\_SAN\_UE\_demod**

*Type: other For: Information  
 Source: Moderator (Huawei)*

**Abstract:**

[109][300] BDaT Session AI 8.26.8.1, 8.26.8.2

**Decision: Noted.**

[**R4-2321037**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321037.zip) **Offline meeting minutes for [109][324] NR\_NTN\_enh\_SAN\_UE\_demod**

*Type: other For: Information  
 Source: Huawei, HiSilicon, Qualcomm*

**Abstract:**

**Decision: Revised to R4-2321143 (from R4-2321037).**

[**R4-2321143**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321143.zip) **Offline meeting minutes for [109][324] NR\_NTN\_enh\_SAN\_UE\_demod**

*Type: other For: Information  
 Source: Huawei, HiSilicon, Qualcomm*

**Abstract:**

**Decision: Noted.**

**Issue 1-1-1: Scenario**

|  |
| --- |
| * *Background (Agreement in RAN4#108bis)*   + *At least NGSO scenario to be considered for requirement definition, companies can check whether GSO can also be considered for NTN demod.*   + *Focus on the mobility scenario assumed by RRM. (Mobility VSAT with LEO is not considered)* |

* Proposals
  + Option 1 (Nokia):
    - GEO static UE
    - LEO static UE
    - GEO mobile UE (up to 1000km/h)
  + Option 2 (Qualcomm): Introduce performance requirements for GSO scenarios
  + Option 3 (Ericsson):
    - Do not introduce specific UE demodulation requirements for GSO scenario, legacy TN FR1 and FR2 UE demodulation requirement can be reused
    - Use one set of requirements to cover both GSO and NGSO scenarios for SAN
  + Option 4 (Samsung): Only focus on the NGSO for performance definition, the SAN requirement can be applied for both GSO and NGSO
  + Option 5 (Huawei):
    - Considering one set of requirements for both NGSO and GSO
    - Consider maximum UE speed 120km/h in Rel-18
* Recommended WF
  + For SAN side and UE side
    - Only focus on the NGSO for performance definition
    - One set of requirements that can be applied for both NGSO and GSO

Comments:

Apple: Different form Rel-17. Would like to understand what it means to say requirements are only applicable to NGSO.

Nokia/Qualcomm: K\_offset would be different between GSO/NGSO.

Huawei: NGSO Link budget is better than GSO.

Qualcomm: NO legacy requirements for GSO only device for FR2 bands.

Ericsson: Need to apply different requirement since there are capabilities for these scenarios.

Samsung: Need separate discussions between SAN and UE. Ericsson/Qualcomm share the same views.

Agreement: Agreed online

* + For UE side
    - Define requirements for NGSO and GSO. FFS whether one or two sets of requirements are specified for NGSO and GSO.
  + For SAN side
    - Define one set of requirements for both NGSO and GSO.

**Issue 1-1-2: Channel model**

* Proposals
  + Option 1 (Nokia, Apple): NTN-TDLC
  + Option 2 (Samsung, Huawei): NTN-TDLC and NTN-TDLA
    - Option 2a (Huawei):
      * Both NTN-TDLA and NTN-TDLC for PDSCH and PUSCH
      * Only NTN-TDLA for other channels

Apple: Since this is FR2, we can limit to NTN TDLC (LOS channel).

Ericsson/Nokia/Qualcomm shares the same view as Apple.

Apple: why TDLA for FR2?

Agreement: Agreed online

* + NTN-TDLC to be considered, FFS NTN-TDLA
  + FFS combination of the channel models and the physical channels

Online:

R&S: Is the assumption to use the same approach as FR1 with zero doppler, etc?

Qualcomm: Same assumption as FR1

**Issue 2-1-1: HARQ processes for above 10 GHz bands**

* Proposals
  + Option 1 (Nokia): 16 HARQ process for requirements alignment
  + Option 2 (Apple): 16 HARQ process and 32 HARQ process. Do not define requirements with disabled HARQ due to testability concern
  + Option 3 (Qualcomm): 16 HARQ process, FFS 32 HARQ process
  + Option 4 (Huawei): 16 HARQ process, 32 HARQ process and HARQ process disabled
* Recommended WF
  + Consider 16 HARQ process
  + FFS 32 HARQ process and HARQ process disabled

Online:

Charter: Is this number of repetitions? What is the discussion about?

Huawei: We have very large RTD so need larger HARQ process. 16 is currently the maximum number of mandatory HARQ.

Qualcomm: HARQ process is ReTx process. With only 16 processes with large RTD, the BS could run out of HARQ ID’s.

Charter: We aren’t sure why 16 is not sufficient

Airbus: Our analysis shows we need at least 32. With larger number of users in the future, we would need larger number.

Apple: In Rel-17, 16 was the minimum and 32 was optional to account for larger RTD. We cannot go back to RAN1 to ask for more than 32 or why 32. They have done their analysis to come up with these values.

Nokia: We had agreed to possibly 2 sets of requirements for the UE, we may need to revisit this issue if we decide on 32 processes.

WF: Consider both 16 and 32 HARQ processes, but need further consideration on how to apply these to GSO and NGSO. Disabled HARQ requires further discussion.

Apple: We would rather not have requirements for disabled HARQ. We ran into an issue in test set up for disabled HARQ in Rel-17.

Huawei: We support requirements for disabled HARQ, we do not believe there are any test setup issues.

Ericsson: We would also like to consider disabled HARQ. We have in Rel-17. It is quite different from 16 and 32 so need separate requirements. The number of HARQ would not greatly affect demod results. If we apply to both GSO and NGSO, we would need separate specifications.

Airbus: We also support disabled HARQ.

**Issue 2-1-2: Whether to define UE PDCCH demodulation requirements for above 10 GHz bands**

* Proposals:
  + Option 1 (Nokia, Apple, Ericsson, Huawei): Yes
    - Option 1a (Apple, Ericsson): Further evaluate feasibility of reusing TN FR2 PDCCH requirements
  + Option 2 (Qualcomm): No
* Recommended WF
  + Further discuss is needed

Online:

Qualcomm: The requirements are band agnostic, so we can rely on the legacy requirements. But we understand this is a new band and is FDD, so there could be a gap in the spec. We are ok to compromise.

Qualcomm: We can’t really use TN FR2 PDCCH. The channel models are different. Also not FDD. We would need to develop new requirements.

Apple: In Rel-17, we did not defined PDCCH requirements because existing TN were ok. But these are FDD bands. We don’t see anything wrong with using TN channel models, and don’t see a difference in requirements for PDCCH between FDD and TDD. If we can leverage TN requirements, we can reduce the simulation and alignment effort.

Huawei: We are open to further discussion on reusing legacy or defining new requirements.

**Issue 3-1-1: Whether to define PUSCH repetition Type A for SAN PUSCH demodulation requirements for above 10 GHz bands?**

* Proposals:
  + Option 1 (Ericsson): No
  + Option 2 (Samsung, Huawei, Nokia): Yes
* Recommended WF
  + Further discuss is needed

Ad-hoc:

Nok would support opt 2.

Ericsson: Link budget would be quite good, so its feasible. Could compromise.

Agreement: Agreed online

Define PUSCH repetition Type A for SAN PUSCH demodulation requirements for above 10 GHz bands.

**Issue 3-1-2: Whether to define SAN PUSCH demodulation performance requirements for DMRS bundling?**

|  |
| --- |
| * *Background (Agreement in RF session* in *RAN4#108bis, R4-2317767)*   + *Proposal 2 for agreement: Requirement to be defined in RAN4 for PUSCH DMRS bundling for NR NTN coverage enhancement in Rel-18 with the assumption of the zero Doppler shift and constant delay.* |

* Proposals:
  + Option 1 (Ericsson, Huawei, Nokia): Yes
  + Option 2 (Samsung):
    - PUSCH requirement with DMRS bundling can be introduced for NTN-specific UE if no frequency and timing drift modeling
    - FFS on introduce the timing drift model for specifying the PUSCH requirement with DMRS bundling in NTN scenario
* Recommended WF
  + Further discuss is needed

Samsung: It is necessary to define requirement with DMRS bundling. We need to make sure that PN continuity can be guaranteed.

Ericsson: RF already had agreement on zero Doppler and constant delay, so we could adopt the same assumption.

Agreement: Agreed online

* Define SAN PUSCH demodulation performance requirements for DMRS bundling
* FFS on whether actual model to be used for timing drift.

Online:

R&S: This is a BS test for UL. The UE should precompensate timing drift so the BS shouldn’t see any. Is this a test for a UE that doesn’t properly precompensate?

Samsung: Is the precompensation only for the first TTI because this is for bundling

**Issue 3-1-3: Whether to define SAN multi-slot PUCCH format 1 demodulation requirements under LOS channel?**

* Proposals
  + Option 1: No (Ericsson, Huawei)
  + Option 2: Yes (Samsung)
* Recommended WF
  + Further discuss is needed

Huawei: PUCCH requirement is define in rel-15 with multi-slot in NLOS channel, legacy test covered this feature.

Samsung: Limitation with LOS channel, so it may be necessary to define requirement.

Ericsson: NLOS is the worse case scenario, so requirement with LOS channel may not be necessary.

Samsung: RAN1 results show that existing requirements can not be met with LEO600/1200.

Ericsson: what are the RAN1 assumptions? May be simulation assumptions are different.

Samsung/Nokia: Samsung/Nokia could compromise.

Agreement: Agreed online

* Don’t define SAN PUCCH for msg4 HARQ-ACK demodulation requirements under LOS channel

**Issue 3-2-1: Channel bandwidth**

* Proposals
  + Option 1 (Ericsson, Samsung, Nokia): 50MHz
  + Option 2 (Huawei): 50MHz and 200MHz
* Recommended WF
  + Further discussion is needed.

Agreement: Agreed online

* Consider 50MHz as the channel bandwidth.

**Issue 3-2-2: Antenna configuration**

|  |
| --- |
| * *Background (Agreement in RAN4#108bis)*   + *For the SAN Rx, we need both 1Rx and 2Rx. For UE Tx, more discussion is needed to cover 1 Tx only or also 2Tx.* |

* Proposals
  + Option 1 (Nokia, Ericsson): 1Tx1Rx
  + Option 2 (Samsung): 1Tx1Rx and 1Tx2Rx, FFS 2Tx2Rx pending on conclusion of the 2Tx UE RF requirement
  + Option3 (Huawei): 1Tx
* Agreement: Agreed online
  + Keep the previous agreement to consider both 1Tx1Rx and 1Tx2Rx
  + FFS 2Tx2Rx pending on conclusion of the 2Tx UE RF requirement.

Huawei: 2Tx requirement is not needed (only rank1)

Thales: The UE RF session is tomorrow.

Qualcomm: We prefer not to consider 2Tx because we are only considering Rank 1 and don’t see 2Tx as necessary.

Charter: For LOS, dual polarization would not give advantage.

ZTE: We have parabolic and phased array. For parabolic we have left and right circular polarization. For phased array, we also have 2 polarization (+/- 45 deg). Is it typical to have simultaneous Tx/Rx across polarizations?

Thales: We still see benefit from having two antennas. There is at least the power gain.

ZTE: For coex, we considered only single polarization in center beam.

Charter: UE is limited by power, so better to have full power into a single antenna.

**Issue 3-2-3: Rank**

* Proposals
  + Option 1 (Nokia, Ericsson, Samsung, Huawei): Rank 1
* Agreement: Agreed online
  + Rank 1 for 1Tx

[**R4-2321187**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321187.zip) **WF on [109][324] NR\_NTN\_enh\_SAN\_UE\_demod**

*Type: other For: Approval  
 Source: Qualcomm, Huawei, HiSilicon*

**Decision: Approved.**

### 8.27 Further NR coverage enhancements

#### 8.27.1 UE RF requirements

#### 8.27.2 BS demodulation performance requirements

**R4-2318056 Discussion on Coverage Enhancement BS Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This document discusses features associated with coverage enhancement under the Work Item “Further NR coverage enhancements” and the impact of the newly introduced features on Base Station demodulation within RAN4.

**Decision: Noted.**

**R4-2318057 Simulations for Coverage Enhancement BS Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

Within this paper we provide simulation results for the PRACH repetition feature introduced in RAN1, as well as the impact of FDSS on PUSHC and their associated impact for BS demodulation performance requirements.

**Decision: Noted.**

**R4-2319310 Discussion on NR further coverage enhancement demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

configuration on PRACH repetition, necessary on FDSS

**Decision: Noted.**

**R4-2319311 Simulation results for NR PRACH repetition**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

Initial simulations for PRACH repetition

**Decision: Noted.**

**R4-2319391 Discussion on the BS performance part for Rel-18 coverage enhancement WI**

*Type: discussion For: Discussion  
 Source: China Telecom*

**Decision: Noted.**

**R4-2319533 Discussion on NR\_cov\_enh2 demodulation requirements**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319843 View on BS demodulation requirements for further coverage enhancement**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320223 Discussion on BS demodulation requirements for further coverage enhancements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.27.3 Moderator summary and conclusions

**R4-2318217 Topic summary for [109][325] NR\_cov\_enh2\_demod**

*Type: other For: Information  
 Source: Moderator (CTC)*

**Abstract:**

[109][300] BDaT Session AI 8.27.2

**Decision: Noted.**

[**R4-2321055**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321055.zip) **Offline meeting minutes for [109][325] NR\_cov\_enh2\_demod**

*Type: other For: Information  
 Source: Nokia, CTC*

**Abstract:**

**Decision: Noted.**

**Issue 1-1: Coverage of frequency range (FR) for Multiple PRACH transmission**

* Proposals:
  + Option 1: Consider PRACH repetition demodulation requirement for only FR2-1. (Ericsson, Huawei)
  + Option 2: Cover FR1 and FR2-1 (China Telecom)
  + Option 3: RAN4 should prioritize FR2-1 and FFS on FR1 (Samsung)
* Recommended WF
  + Need discussion on whether to cover FR1.
  + Keep the previous agreements if no consensus could be reached.

Discussion:

* FR2-1 agreed by all, discussion around FR1
* China Telecom: Based on our observation from the TR in Rel-17, conclusion is that the bottleneck is for FR2-1 and FR1 so they should both be covered.
* Ericsson: We do not see FR1 PRACH as a bottleneck, currently in RAN1 FR1 has not been discussed so we should have alignment with RAN1.
* Nokia: We agree that FR2-1 is focus of bottleneck in RAN1, this is due to beamforming being a higher priority in FR2-1, we would not be against FR1 requirements being defined.
* Huawei: We share similar view to Ericsson, based on the description this feature mainly targets FR2-1
* Samsung: We are open for discussion with priority on FR2-1, based on TR both are included, and the WID states that both are included. For Rel-17 we introduced both.
* ZTE: We believe that FR1 is exploited so we prefer FR2-1 and FR1.

**Agreement (agreed online):** FR2-1 agreed, and with priority. FR1 as FFS.

**Issue 1-2: Sequence length for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + Option 1: Only define PRACH requirements for normal mode and sequence length 139 (China Telecom, Ericsson, Samsung, Huawei)
* Recommended WF
  + Option 1 can be agreed.

**Agreement (agreed online):** Only define PRACH requirements for normal mode and sequence length 139.

**Issue 1-3: PRACH preamble format for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + Option 1: Use PRACH format B4 only (Nokia, Samsung, Huawei)
  + Option 2: Cover PRACH format B4 as well as other PRACH formats with similar or larger CP length as B4, i.e., A3, C0 and C2. (China Telecom)
  + Option 3: Consider format B4, A2 and C2 (Ericsson)
* Recommended WF
  + PRACH B4 can be included.
  + Need discussion on whether PRACH preamble formats in addition to B4 should be covered.

Discussion:

* China Telecom: Explain, we see from the TR the focus there is only on B4 which is the bottleneck, and as such we believe that based on these reasonings that similar or larger CP length formats are also a bottleneck.
* Ericsson: we think that format is based on declaration, thus we should consider the typical formats.
* Huawei: We don’t think so many PRACH formats is needed.
* Samsung: Different formats have been studied before but in the TR we have focussed on B4.
* China Telecom: Questions on A2, C2, and B4 are the most popular, confirmation from Nokia, Samsung confirm on C2 priority, as well as Ericsson

**Offline Tentative Agreement:** B4 is agreed, A2 and C2 to be considered and companies to provide further view during the online or in round 2.

Online:

Nokia: Not every network is implementing B4. All 3 B4, A2, and C2 are very common, coverage enh should apply to all formats.

Samsung: B4 is the most important. We can follow the same approach as Rel-15 which was all 3 based on declaration.

CTC: B4 is the bottleneck, but based on network vendor feedback we observe A2 and C2 are popular so we are ok to include them.

Huawei: We prefer only B4 but can compromise to include A2 and C2 also.

WF: Consider B4, A2, and C2.

**Issue 1-4: PRACH repetition number for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + Option 1: Test 8 times for PRACH repetition if the SNR value could be testable (China Telecom)
  + Option 2: Define PRACH requirements for 2 PRACH transmissions (Ericsson, ZTE, Samsung, Huawei)
* Recommended WF
  + Need discussion.

Discussion:

* China Telecom: We know that 2,4,8 are candidates; but we cannot agree 2 at the moment, as we do not know the clarity of performance differences, Proposal - Companies to provide simulations to understand a gain and to bring to RAN4#110
* Ericsson: We have simulations on 2 and 8 and we think that 2 repetitions provide enough gain. 5-6dB
* Samsung: RAN1 has done some study to show that BS can do multiple transmission combining. Existing requirements for PRACH are quite low anyway, so with even lower can this be tested.
* Ericsson: Purpose of this is to understand the BS is actually conducting this, and this can be proved with 2.
* Huawei: we share a similar view to Ericsson and Samsung
* China Telecom: If NW vendors have shown that they have enough gain we can compromise, but we encourage companies to provide simulations, and this can be revisited if not enough gain.
* Samsung: How to declare what is ‘enough’ gain.
* China Telecom: Perhaps the gain is enough, and we can revisit based on simulation if there is less than 1 dB gain.

**Agreement (agreed online):** PRACH repetition number 2, with companies encouraged to provide simulations to confirm gain at RAN4#110.

**Issue 1-5: Antenna configuration for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + FR1 (if introduced)
    - Option 1: 1x2 (Samsung)
    - Option 2: 1x2, 1x4, 1x8 (China Telecom)
  + FR2-1:
    - Option 1: 1x2 (China Telecom, Ericsson, Samsung)
* Recommended WF
  + FFS on FR1.
  + Consider 1x2 for FR2-1?
* China Telecom: as FR1 is deprioritized, perhaps FFS on FR1,
* Nokia: If people wish to bring simulations for FR1 we should agree something
* Samsung: 1x2 is the minimum.

**Agreement (agreed online):** 1x2 for FR2-1, 1x2 prioritized for FR1 studies.

**Issue 1-6: Channel model for BS performance requirements for Multiple PRACH transmission (if introduced)**

* Proposals:
  + FR1 (if introduced)
    - Option 1: TDLC 300-100 Low and AWGN channels (China Telecom, Samsung)
  + FR2-1
    - Option 1: TDLA30-300 Low and AWGN channels (China Telecom, Ericsson, [ZTE], Samsung, Huawei)
* Ericsson: CDL and TDL show similar gain, no need to use CDL model especially
  + - Option 2: Cover TDLA30-300 Low, AWGN and CDL-A ([Nokia])
* Nokia: CDL-A to reflect spatial domain gain.
* Recommended WF
  + FFS on FR1.
  + Need discussion whether CDL-A channel model should be covered.

Discussion (on FR2-1):

* + Samsung: we believe that CDL is not typical in RAN4 for requirements, the others are typical for FR2-1
  + Ericsson: For TDL and CDL we checked the RAN1 discussion, the CDL only showed 1dB gain vs 4dB in TDL.
  + Nokia: We understand the results that RAN1 have been seeing, we understand that they have taken the same beam and repeated, thus the results will likely be the same in TDL which has no spatial component, thus the lack of difference in performance between CDL and TDL. This will not remain the same in the future but for now we are fine to just use TDL.
  + ZTE: In our understanding RAN4 never used CDL in the past, considering the test effort we prefer TDL.
  + Samsung : With CDL how would we define beams.

**Agreement (agreed online):** TDLA30-300 Low and AWGN channels for FR2-1, TDLC 300-100 Low and AWGN channels for FR1 studies.

**Issue 1-7: Frequency offset for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + For AWGN for both FR1 (if introduced) and FR2-1:
    - Option 1: 0 Hz (China Telecom, Nokia, Ericsson, Samsung, Huawei)
  + For fading channel for FR1 (if introduced):
    - Option 1: 400 Hz (China Telecom, [Nokia], Samsung)
  + For fading channel for FR2-1:
    - Option 1: 4000 Hz (China Telecom, Ericsson, Samsung, Huawei, Nokia)
* Recommended WF
  + For AWGN for both FR1 (if introduced) and FR2-1: 0Hz
  + FFS on fading channel for FR1.
  + Can we agree to use 4000Hz for fading channel for FR2-1?

**Agreement (agreed online):** For AWGN 0 Hz, For FR2-1 4000 Hz (for fading channel), for FR1 studies 400 Hz (for fading channel).

**Issue 1-8: Sub Carrier Spacing for BS performance requirements for PRACH repetitions**

* Proposals:
  + FR1 (if introduced)
    - Option 1: 15kHz and 30kHz (China Telecom)
    - Option 2: 15KHz and 30KHz, 1.25KHz (Samsung)
  + FR2-1
    - Option 2: Cover 60kHz SCS and 120kHz SCS (China Telecom, Samsung, ZTE, Nokia. Ericsson)
    - Option 3: 120kHz SCS (Ericsson, Huawei)
* E///, HW: only 120kHz SCS is deployed in real network.
* Recommended WF
  + FFS on FR1.
  + For FR2-1, can we at least cover 120kHz SCS and FFS whether to cover 60kHz SCS?

Discussion:

* ZTE: We prefer to cover both (option 2) to align with existing requirements
* Nokia: to repeat, it keeps the specification consistent if we do both 60 and 120 kHz
* Samsung: We are open for discussion, but would prefer to keep alignment.
* Huawei: We still prefer only 120 kHz SCS

**Offline Tentative Agreement:** For FR2-1 agreed 120 kHz, discuss 60 kHz during online session. FR1 to be discussed in online.

Online:

Samsung: Both FR1 and FR2-1 are feasible for PRACH repetition. We would like to consider 15 KHz and 30 kHz SCS for FR1.

CTC: Same view as Samsung.

ZTE: Agree with Samsung and CTC. We would like to also consider 1.25 kHz SCS for FR1.

Nokia: 1.25 kHz is not applicable to short PRACH. 1.25 kHz leads to long symbol length.

Ericsson: If FR1 is introduced, ok for 15 and 30 kHz. But we don’t think FR1 is necessary.

Huawei: Same view as Ericsson.

Samsung: Agree with Nokia that 1.25 kHz only applies to long PRACH.

WF: If FR1 is agreed to be introduced with PRACH repetition, 15 kHz and 30 kHz should be included.

Nokia: We would like FR2-1 60 kHz for completeness and to future proof the specification and consistency with Rel-15.

Ericsson: 60 kHz is not deployed, so not necessary. But we are ok to define requirements for it to keep consistency.

Huawei: 60 kHz is not necessary. We have 60 kHz SCS in FR1 also, but we don’t define PRACH repetition there. We should focus on what is deployed in real networks. We prefer to define only 120 kHz SCS.

Nokia: 60 kHz in FR1 is only possible in data channels.

Samsung: Prefer both 60 kHz and 120 kHz.

Nokia: This WI is coverage enhancement so we need enhancement relative to legacy. This is anyways declaration based.

CTC: Agree with Samsung and Nokia

ZTE: Agree with Samsung and Nokia

WF: For FR2-1 agreed 120 kHz, 60 kHz is FFS.

**Issue 1-9: Test metric for BS performance requirements for Multiple PRACH transmission**

* Proposals:
  + Option 1: Reuse the same test metric with the legacy PRACH normal mode tests, i.e., SNR with missing detection of 1%. (China Telecom)
  + Option 2: Cover requirements for both missing detection of 1% and false alarm probability 0.1% (Samsung)
* Recommended WF
  + Need discussion on whether false alarm probability requirements should be defined.
* Samsung: We need to consider false alarm
* China Telecom: We agree with option 2
* Huawei/ZTE: we are fine with option 2

**Agreement (agreed online):** Cover requirements for both missing detection of 1% and false alarm probability 0.1%

**Issue 1-10: Whether to cover BS conformance test for Multiple PRACH transmission with different Tx beams (enhanced PRACH repetitions)**

* Proposals:
  + Option 1: RAN4 to define performance requirements for enhanced PRACH repetitions in Rel-18 (Nokia)
* Moderator observation:
  + The following conclusion is made in the RAN1#113 chairman note:
    - *There is no consensus to support Multiple PRACH transmission with different Tx beams in Rel-18.*
* Recommended WF
  + TBA

**Agreement (agreed online):** Do not cover BS conformance test for Multiple PRACH transmission with different Tx beams.

[**R4-2321061**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321061.zip) **WF on [109][325] NR\_cov\_enh2\_demod**

*Type: other For: Approval  
 Source: China Telecom, Nokia*

**Decision: Approved.**

### 8.28 NR Network-controlled Repeaters

#### 8.28.1 General aspects

**R4-2318308 Discussion on Rel-17 repeater terminology**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2320258 Discussion of terminology related to repeaters**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320342 Discussion on RAN4 feature list for NCR-MT**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

Proposal 1 and proposal 2 are agreed

#### 8.28.2 RF core requirements

##### 8.28.2.1 RF requirements for NCR-Fwd

**R4-2318309 Discussion on RF requirement for NCR-Fwd**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2318311 CR for TS 38.106, Introduction of Operating band and channel arrangement for NCR**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0040 rev Cat: B (Rel-18)  
  
 Source: CATT*

**Decision: Revised to R4-2321040 (from R4-2318311).**

[**R4-2321040**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321040.zip) **CR for TS 38.106, Introduction of Operating band and channel arrangement for NCR**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0040 rev Cat: B (Rel-18)  
  
 Source: CATT*

**Decision: Endorsed.**

Moderator: This should be included in the big CR so should have been submitted as a draft CR for endorsement.

**R4-2319645 NCR RF requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Remaining open RF issues

**Decision: Noted.**

**R4-2319647 Draft CR to 38.106: NCR conducted TX requirements**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR as per work split

**Decision: Revised to R4-2321041 (from R4-2319647).**

[**R4-2321041**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321041.zip) **Draft CR to 38.106: NCR conducted TX requirements**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

Draft CR as per work split

**Decision: Endorsed.**

**R4-2320167 Draft CR to TS 38.106: Clause 7 radiated requirement**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: NEC*

**Decision: Revised to R4-2321042 (from R4-2320167).**

[**R4-2321042**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321042.zip) **Draft CR to TS 38.106: Clause 7 radiated requirement**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: NEC*

**Decision: Endorsed.**

**R4-2320260 Discussion of Spurious Emissions requirements for NCR-Fwd**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320343 Discussion on RF requirements for NCR-Fwd**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320347 Draft CR of introduction of NCR into TS 38.106: Clause 1 ~4**

*Type: other For: Approval  
 38.106 v CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321043 (from R4-2320347).**

**[R4-2321043](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321043.zip) Draft CR of introduction of NCR into TS 38.106: Clause 1 ~4**

*Type: other For: Approval  
 38.106 v CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

##### 8.28.2.2 RF requirements for NCR-MT

**R4-2318310 Discussion on RF requirement for NCR-MT**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2318916 Draft CR for TS 38.106 to introduce conducted transmitter requirement for NCR-MT**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: CMCC*

**Decision: Revised to R4-2321044 (from R4-2318916).**

[**R4-2321044**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321044.zip) **Draft CR for TS 38.106 to introduce conducted transmitter requirement for NCR-MT**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: CMCC*

**Decision: Endorsed.**

**R4-2320257 CR to TS 38.106 with Clause 9: conducted receiver requirement for NCR-MT**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0045 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Dell Technologies*

**Decision: Revised to R4-2321045 (from R4-2320257).**

[**R4-2321045**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321045.zip) **CR to TS 38.106 with Clause 9: conducted receiver requirement for NCR-MT**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR-0045 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell, Dell Technologies*

**Decision: Endorsed.**

Moderator: This should be included in the big CR. This should be endorsed as a draft CR.

**R4-2320344 Discussion on RF requirements for NCR-MT**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320348 Draft CR of introduction of NCR into TS 38.106: Clause 11**

*Type: other For: Approval  
 38.106 v CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Revised to R4-2321046 (from R4-2320348).**

[**R4-2321046**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321046.zip) **Draft CR of introduction of NCR into TS 38.106: Clause 11**

*Type: other For: Approval  
 38.106 v CR- rev Cat: (Rel-18)  
  
 Source: ZTE Corporation*

**Decision: Endorsed.**

**R4-2320850 Draft CR to TS 38.106: OTA TX requirements for NCR-MT**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the pre-arranged work-split, Draft CR on the OTA TX requirements for NCR-MT is provided.

**Decision: Revised to R4-2321047 (from R4-2320850).**

**[R4-2321047](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321047.zip) Draft CR to TS 38.106: OTA TX requirements for NCR-MT**

*Type: draftCR For: Endorsement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Based on the pre-arranged work-split, Draft CR on the OTA TX requirements for NCR-MT is provided.

**Decision: Endorsed.**

**[R4-2321202](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321202.zip) Big CR to TS 38.106 Introduction of NCR**

*Type: CR For: Agreement  
 38.106 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: ZTE*

**Decision: For email approval**

Agreement: NCR Type 1-O is not supported in Rel-18

#### 8.28.3 EMC core requirements

**R4-2319026 CR to TS 38.114 network controlled repeater EMC core**

*Type: CR For: Agreement  
 38.114 v17.3.0 CR-0007 rev Cat: B (Rel-18)  
  
 Source: ZTE, Nokia, Nokia Shanghai Bell, Ericsson*

**Decision: Revised to R4-2321048 (from R4-2319026).**

[**R4-2321048**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321048.zip) **CR to TS 38.114 network controlled repeater EMC core**

*Type: CR For: Agreement  
 38.114 v17.3.0 CR-0007 rev Cat: B (Rel-18)  
  
 Source: ZTE, Nokia, Nokia Shanghai Bell, Ericsson*

**Decision: Agreed.**

**R4-2320843 General approach to the NCR EMC test configurations**

*Type: discussion For: Discussion  
 Source: Huawei, HiSilicon*

**Abstract:**

Referring to related discussion on legacy test configurations specification, in this contribution we provide discussion on simplified approach to the EMC test configurations for NCR.

**Decision: Noted.**

**R4-2320845 Further discussion on NCR EMC open issues**

*Type: discussion For: Discussion  
 Source: Huawei, HiSilicon*

**Abstract:**

In this contribution we provide further discussion on open issues for NCR EMC.

**Decision: Noted.**

**R4-2320846 Draft CR to TS 38.114: NCR Emissions requirements, Rel-18**

*Type: draftCR For: Endorsement  
 38.114 v17.3.0 CR- rev Cat: B (Rel-18)  
  
 Source: Huawei, HiSilicon*

**Abstract:**

Implementation of EMC requirements in a way that the NCR node is covered as a single entity, for both Emissions and Immunity requirements, aligning with the IAB approach.

**Decision: Endorsed.**

Moderator: The content is already captured in the formal CR from ZTE

#### 8.28.4 RF conformance testing

**R4-2318307 Further discussion on RF conformance testing for NCR**

*Type: other For: Approval  
 Source: CATT*

**Decision: Noted.**

**R4-2318915 Discussion on NCR conformance testing**

*Type: discussion For: Discussion  
 Source: CMCC*

**Decision: Noted.**

**R4-2319178 Discussions on NCR RF conformance test**

*Type: other For: Approval  
 Source: Samsung*

**Abstract:**

In this paper, we try to clarify the understanding of these corresponding wayforwards and seek solutions to avoid any conflicts or misunderstanding.

**Decision: Noted.**

**R4-2319398 Background and technical challenges with BS RF co-location requirements in relation to development of NCR RF co-location requirements**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

In this contribution we summarize the background and technical challenges with current concept used for BS-to-BS colocation requirements. Before re-using the concept to other nodes like e.g., NCR, careful considerations regarding the technical feasibility

**Decision: Noted.**

**R4-2320259 NCR conformance testing**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320345 Discussion on conformance testing requirement for NCR**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

#### 8.28.5 RRM core requirements

#### 8.28.6 Demodulation performance requirements

**R4-2319536 Discussion on NCR-MT demodulation requirements**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319537 Simulation results for NCR-MT demodulation requirements**

*Type: other For: Discussion  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319538 Simulation results collection for NCR-MT demodulation requirements**

*Type: other For: Information  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319646 NCR demod results**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Simulation results

**Decision: Noted.**

**R4-2320236 Discussion on demodulation performance requirements for NR network-controlled repeaters**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320237 Simulation results on demodulation performance requirements for NR network-controlled repeaters**

*Type: other For: Information  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320577 NCR Demodulation Performance Requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our views on Issues related to NCR Demodulation Performance Requirements

**Decision: Noted.**

**R4-2320578 Simulation Results on NCR PDSCH and PDCCH Demodulation Requirements**

*Type: other For: Information  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our simulation results on NCR PDSCH and PDCCH Demodulation Performance Requirements

**Decision: Noted.**

#### 8.28.7 Moderator summary and conclusions

**R4-2318203 Topic summary for [109][311] NR\_netcon\_repeater\_RF**

*Type: other For: Information  
 Source: Moderator (ZTE)*

**Abstract:**

[109][300] BDaT Session AI 8.28.1, 8.28.2.1, 8.28.2.2, 8.28.3

**Decision: Noted.**

**Issue 1-1: draft spec skeleton**

* + Proposal 1: Rel-17 repeater should be named as RF repeater. [CATT,[R4-2318308](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318308.zip) ]
  + Proposal 2:where the Release 17 repeater concept is referred to as NR repeater and the Release 18 concept is referred to as NR Network Controlled Repeater (NCR). [Nokia,[R4-2320258](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320258.zip) ]
* Recommend WF
  + RF repeater for Rel-17 repeater
  + Network controlled repeater for Rel-18 repeater

Nokia: NR repeater was already used in Rel-17. If we adopt RF repeater for Rel-17, would require a lot of changes.

ZTE: NR repeater for Rel-17 and NCR for Rel-18? No changes required.

NEC: NCR is already used in existing document

CATT: NR repeater could be Rel-17 or Rel-18. For Rel-18, the convention is to use NCR

Huawei: How about NRR (NR repeater)? There is no easy solution

ZTE: If we cannot reach agreement, can we discuss this in the future under maintenance?

Huawei: Rel-18 is clear, the issue is Rel-17 so this is maintenance

**Issue 1-2: NCR-MT feature list**

* Proposals
  + Proposal 1: to remove the square bracket for feature 1-3 for NCR-MT [ZTE,[R4-2320342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320342.zip)]
  + Proposal 2: to confirm the baseline agreement reached in R4-2316996 as agreement. [ZTE,[R4-2320342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320342.zip)]
* Recommend
  + Proposal 1 and proposal 2 is agreed

**Issue 2-1 Relationship mapping between input connectors and output connectors**

* Proposals
  + Proposal 1: for NCR-Fwd type 1-H, propose to specify both options proposed in R4-2316996 in the conformance testing specification. [ZTE,[R4-2320343](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320343.zip)]
* Option 1: to declare the relationship between input connectors and output connector for NCR-Fwd type 1-H
* Option 2: inject the signals on all input connectors and conduct the measurement at all output connectors.
  + Proposal 2: The mapping between input and output connector of type 1-H NCR-Fwd is manufacturer declaration basis. [CATT,[R4-2318309](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318309.zip)]
  + [Proposal 3: It is proposed to take one TAB connector pair under the test and declare TAB connectors in case they are identical.](#_Toc149060207) [Nokia,[R4-2320260](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320260.zip)]
  + Proposal 4: Define the core requirements as applying between corresponding output and input TAB connector groups. [Ericsson,[R4-2319645](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319645.zip)]
  + Proposal 5: During the performance phase, determine how to define the corresponding groups of TAB connectors. Consider whether 1-H conformance (and possibly core) is feasible in this release if a solution cannot be found. [Ericsson,[R4-2319645](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319645.zip)]

Recommended WF

* + Companies’ views are encouraged in 1st round.

Ericsson: If low number of connectors, can apply input to all connectors and observe all outputs. Declaration may not be a good solution because regulators may not prefer declaration.

ZTE: If we cannot find solution for 1-H, maybe we can defer to conformance phase. Ok with declaration.

CATT: Similar view as ZTE

Huawei: NCR for Europe may not be so common. As long as the declaration is related to the intended use of the product, it should not be a problem.

ZTE: The input/output mappings can be declared, but all declarations should be tested.

Huawei: For core, assume we will have declaration but will discuss in the performance part.

WF: Core part requirement is defined based on input/output pair. Declaration for input and output to be further discussed in the performance part.

**Issue 3-1 Simultaneous reception requirement for NCR-Fwd and NCR-MT**

* Proposals
  + Proposal 1:For the simultaneous reception of NCR-MT and NCR-Fwd in NCR input intermodulation requirement, 6dB REFSENS degradation could be allowed once the intermodulation signal fall into NCR-MT bandwidth; [ZTE,[R4-2320344](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320344.zip)]
  + Proposal 2: The receiver requirements for NCR-MT and NCR-Fwd should be defined separately. [CATT,[R4-2318310](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318310.zip)]
  + Proposal 3: For the joint requirement of input intermodulation, RAN4 should discuss how to align the requirements of different NCR parts, and whether the requirement should be defined for NCR-Fwd or NCR-MT or both. [CATT,[R4-2318310](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318310.zip)]
  + Proposal 4: RAN4 should discuss the test configuration and measurement setup for joint input intermodulation testing. [CATT,[R4-2318310](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318310.zip)]
* Recommended WF
  + Companies’ views are encouraged in 1st round.

CATT: We would like to clarify which part of the spec to put joint requirements in, in FWD, MT, both?

ZTE: NCR-MT

Huawei: There should be a general section for issues related to both FWD and MT

Ericsson: Do we need a joint requirement for reception? Linearity of MT and FWD are already tested separately.

ZTE: We are also fine with separate requirements.

Huawei: For the core, fine to consider separate requirement, but not sure we can ignore joint. Propose with separate requirement, but not explicitly exclude joint requirement for now. Leave it undefined for now – don’t mention it at all in the spec.

WF: Baseline assumption even for joint reception is separate requirements, but if we find a problem, we can come back to reconsider.

**Issue 3-2 OTA receiver requirements for FR1 LA NCR-MT**

* Proposals
  + Proposal 1: for FR1 LA NCR-MT receiver radiated requirement, to consider the following ways to define the requirement on top of conducted receiver requirement. [ZTE,[R4-2320344](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320344.zip)]

|  |  |  |
| --- | --- | --- |
| **RF requirement** | **Corresponding conducted Rx requirement for FR1 LA NCR-MT** | **Radiated Rx requirement for FR1 LA NCR-MT** |
| OTA reference sensitivity | TS 38.101-1, subclause 7.3 | ΔOTAREFSENS |
| OTA maximum input level | TS 38.101-2 , subclause 7.4 | ΔOTAREFSENS |
| OTA adjacent channel selectivity | TS 38.101-1, subclause 7.5 | ΔminSENS |
| OTA blocking characteristics | TS 38.101-1, subclause 7.6 | For IBB and NBB requirement.:   * ΔOTAREFSENS * ΔminSENS   For OOBB requirement:  ΔminSENS |
| OTA spurious response | TS 38.101-1, subclause 7.7 | * ΔOTAREFSENS   ΔminSENS |
| OTA intermodulation characteristics | TS 38.101-1, subclause 7.8 | * ΔOTAREFSENS * ΔminSENS |
| OTA spurious emissions | TS 38.101-1, subclause 7.9 | Scaled with 6 dB relaxation on  top of basic receiver spurious  emission requirement. |

* Recommended WF
  + Companies’ views are encouraged in 1st round.

Ericsson: Ok with proposal. Would need delta values for both FWD and MT.

WF: The approach is agreeable. OTA spurious emissions needs further discussion

**Issue 4-1: Test configuration for both emission and immunity test.**

* + Proposal 1: For the purpose of the EMC Emissions test configurations, do not copy-paste TC tables content from RF test specification. Instead, use detailed references to related NCR RF test specifications, pointing to specific Tx spurious emissions requirements.
  + Proposal 2: For the purpose of the EMC Immunity test configurations, do not copy-paste TC tables content from RF test specification. Instead, use detailed references to related NCR RF test specifications, pointing to specific Blocking requirements.
* Recommend WF
  + Companies’ views are encouraged during the meeting.

ZTE: Need further check

**Issue 4-2: Applicability overview for both emission and immunity test.**

* + Proposal 1: For NCR EMC Emissions requirements, its applicability shall be considered to the NCR node as a whole (i.e. NCR-Fwd and NCR-MT), irrespective of its implementation.

Related Draft CR depicting the proposal approach was submitted in R4-2320846.

* + Proposal 2: Further discuss whether multiple enclosures case is necessary for NCR node.
* Recommend WF
  + Companies’ views are encouraged during the meeting.

ZTE: Ok with the proposal

**Issue 4-3: Radiated immunity requirements applicability.**

* + Proposal 1: Radiated immunity requirements shall apply to the NCR as a single node, covering both NCR-Fwd and NCR‑MT.
  + Proposal 2: the throughput performance criteria shall be only applicable to the NCR-Fwd, and not to the MT signalling link.
  + Proposal 3: whether there is need to defined new performance metric for MT signalling link (e.g. BER, etc.) requires further study during the Perf part.
* Recommend WF
  + Companies’ views are encouraged during the meeting.

ZTE: For proposal 2 we should use power accuracy requirement instead of throughput since we don’t have a baseband for NCR-FWD

Ericsson: Agree with ZTE

Huawei: Should not use throughput for MT, but agree should not use throughput for FWD either. We would like further offline discussion.

ZTE: Why can’t we use throughput for MT? In the past for BS requirement, we used it.

Huawei: Throughput is not the best metric due to signaling overhead?

**R4-2318204 Topic summary for [109][312] NR\_netcon\_repeater\_RFConformance**

*Type: other For: Information  
 Source: Moderator (CATT)*

**Abstract:**

[109][300] BDaT Session AI 8.28.4

**Decision: Noted.**

**Issue 1-1: Simultaneously Tx/Rx declaration**

* Proposals
  + Option 1: Modify the simultaneously Tx/Rx declaration related agreements (From RAN4#108 meeting). For simultaneously Tx, supporting of simultaneous Tx is manufacture declaration basis, and this should be aligned with its capability signalling. For simultaneously Rx, there is no declaration because simultaneously Rx is mandatory. (R4-2318915, Samsung)
  + Option 2: Do not modify the existing agreements.
* Recommended WF
  + The declaration on simultaneously Rx can be removed.

Samsung: RAN1 agreement was simultaneous Rx is mandatory, we want to clarify the previous WF to reflect this.

Huawei: We should indicate in RAN4 that simultaneous Rx is mandatory in a WF. If we remove the declaration, it may not be clear.

**Issue 3-1: Test configuration of simultaneously Tx**

* Option 1 (CATT&ZTE):
  + For RTC1 and RTC2, adopt following approach (CATT):
  + RTC1 (for Contiguous spectrum operation):

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Description automatically generated

A green rectangle with black text

Description automatically generated

* + RTC2 (for Non-contiguous spectrum operation):

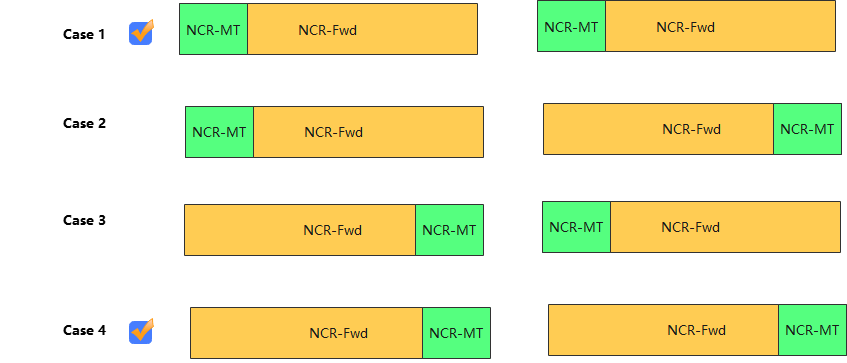
A diagram of a computer network

Description automatically generated

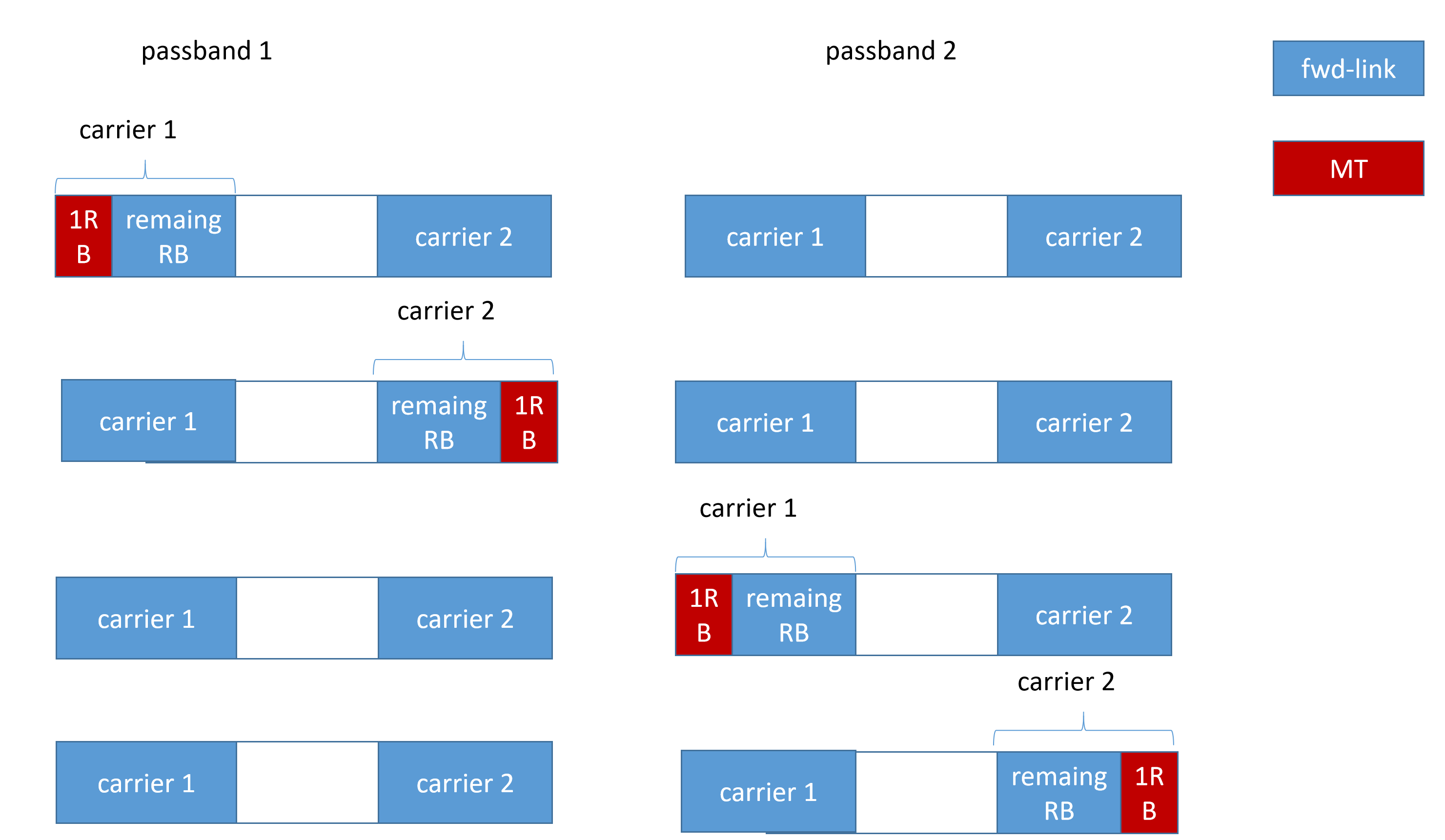
A diagram of a computer network

Description automatically generated

* + Improvement of RTC2 (ZTE):

****

* Option 2 (CMCC):
  + Alternative RTC2:



* Recommended WF
  + Option 1 can be agreed.

Ericsson: Option 1 and 2 are not mutually exclusive. The 1 RB test is complementary.

ZTE: Similar view as Ericsson. We can agree with option1 first and then consider RB configurations as in option 2.

**Issue 3-2: Test signal**

* Proposals in R4-2320259 (Nokia):
  + Reuse test signal used to build Test Configuration already specified in TS 38.115-1 and 38.115-2 as the baseline.
  + For NCR-MT Rx intermodulation test configuration to modify position of f2 for CW interfering signal.

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* Recommended WF
  + Discuss the above proposals in the meeting

ZTE: We already agreed to separate requirements for MT and Fwd, so can skip this issue.

Nokia: We would like more time to consider

**Issue 3-3: Test model**

* Proposal in R4-2320259 (Nokia)
  + Add TM1.1 for both FR1 and FR2 NCR-MT receiver sensitivity requirement.
* Proposal in R4-2318915 (CMCC)
  + At least LA NCR-MT SEM requirements should also be tested under edge\_1PRB\_left and edge\_1PRB\_right RB allocations with max Tx power. Additional test mode beside IAB testing modes should be added.
* Recommended WF
  + Discuss in the meeting

ZTE: Why do we need test mode for receiver side?

Nokia: Will get back to you

**Issue 4-1: Measurement Uncertainty & Test Tolerance**

* Proposals
  + Option 1: (ZTE)
    - NCR-Fwd type 1-C and type 2-O: MU and TT use Rel-17 repeater as starting point
* Recommended WF
  + Option 1 can be agreed.

Huawei: We haven’t considered all the aspects yet including NCR architecture

Ericsson: Agree with Huawei, need more discussion

ZTE: For NCR-FWD only, should be able to reuse since it looks same as Rel-17 repeater

[**R4-2321083**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321083.zip) **WF on [109][312] NR\_netcon\_repeater\_RFConformance**

*Type: other For: Approval  
 Source: CATT*

**Decision: Approved.**

**R4-2318218 Topic summary for [109][326] NR\_netcon\_repeater\_Demod**

*Type: other For: Information  
 Source: Moderator (ZTE)*

**Abstract:**

[109][300] BDaT Session AI 8.28.6

**Decision: Noted.**

**Issue 1-1-1: FRCs for NCR-MT PDSCH FR1 requirements**

* + Option 1: (ZTE, HW, Ericsson, Nokia)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Case 1/2** | **Case 3/4** | **Case 5/6** | **Case 7/8** |
| Channel bandwidth | MHz | 10 | 10 | 40 | 40 |
| Subcarrier spacing | kHz | 15 | 15 | 30 | 30 |
| Allocated resource blocks | PRBs | 52 | 52 | 106 | 106 |
| Number of consecutive PDSCH symbols |  | 12 | 12 | 12 | 12 |
| MCS table |  | 64QAM | 64QAM | 64QAM | 64QAM |
| MCS index |  | 4 | 13 | 4 | 13 |
| Modulation |  | QPSK | 16QAM | QPSK | 16QAM |
| Target Coding Rate |  | 0.30 | 0.48 | 0.30 | 0.48 |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 |
| Number of DMRS REs |  | 12 | 12 | 12 | 12 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 |
| Information Bit Payload per Slot |  | 4096 | 13064 | 8456 | 26632 |
| Transport block CRC per Slot |  | 24 | 24 | 24 | 24 |
| Number of Code Blocks per Slot |  | 1 | 2 | 2 | 4 |
| Binary Channel Bits Per Slot |  | 13728 | 27456 | 27984 | 55968 |

**Issue 1-1-2: FRCs for NCR-MT PDSCH FR2 requirements**

* + Option 1: (ZTE, HW, Ericsson, Nokia)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Case 1** |
| Channel bandwidth | MHz | 100 |
| Subcarrier spacing | kHz | 120 |
| Allocated resource blocks | PRBs | 66 |
| Number of consecutive PDSCH symbols |  | 13 |
| MCS table |  | 64QAM |
| MCS index |  | 4 |
| Modulation |  | QPSK |
| Target Coding Rate |  | 0.30 |
| Number of MIMO layers |  | 1 |
| Number of DMRS REs |  | 12 |
| Overhead for TBS determination |  | 6 |
| Information Bit Payload per Slot |  | 5504 |
| Transport block CRC per Slot |  | 24 |
| Number of Code Blocks per Slot |  | 1 |
| Binary Channel Bits Per Slot |  | 18282 |

**Issue 1-2-1: FRCs for NCR-MT PDCCH FR1 requirements**

* + Option 1: (ZTE, HW, Ericsson, Nokia)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Case 1/2** | **Case 3/4** | **Case 5/6** | **Case 7/8** | **Case 9/10** | **Case 11/12** |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 30 | 30 | 30 |
| CORESET frequency domain allocation |  | 24 | 48 | 48 | 102 | 102 | 90 |
| CORESET time domain allocation |  | 2 | 2 | 1 | 1 | 1 | 1 |
| Aggregation level |  | 2 | 4 | 8 | 2 | 4 | 8 |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 | 1\_0 | 1\_1 | 1\_1 |
| Payload (without CRC) | Bits | 39 | 52 | 52 | 41 | 53 | 53 |

**Issue 1-2-2: FRCs for NCR-MT PDCCH FR2 requirements**

* + Option 1: (ZTE, HW, Ericsson, Nokia)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Case 1** | **Case 2** | **Case 3** |
| Subcarrier spacing | kHz | 30 | 30 | 30 |
| CORESET frequency domain allocation |  | 102 | 102 | 90 |
| CORESET time domain allocation |  | 1 | 1 | 1 |
| Aggregation level |  | 2 | 4 | 8 |
| DCI Format |  | 1\_0 | 1\_1 | 1\_1 |
| Payload (without CRC) | Bits | 41 | 53 | 53 |

**Issue 1-3-1: FRCs for NCR-MT CQI FR1 requirements**

* + Option 1: Reusing existing FRCs tables for CQI requirements. (ZTE, HW, Ericsson, Nokia)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reference channel** | | | | **Test 1/2/3/4** | **Test 5/6/7/8** |
| Number of allocated PDSCH resource blocks | | | | 52 | 106 |
| Number of consecutive PDSCH symbols | | | | 12 | 12 |
| Number of PDSCH MIMO layers | | | | 1 | 2 |
| Number of DMRS REs (Note 1) | | | | 24 | 24 |
| Overhead for TBS determination | | | | 0 | 0 |
| Available RE-s for PDSCH | | | | 6240 | 12720 |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot | |
| 0 | OOR | OOR | OOR | N/A | N/A |
| 1 | 0.1523 | 0 | QPSK | 1480 | 2976 |
| 2 | 0.3770 | 1 | 2408 | 4744 |
| 3 | 0.8770 | 3 | 5504 | 11016 |
| 4 | 1.4766 | 5 | 16QAM | 9224 | 18960 |
| 5 | 1.9141 | 7 | 12040 | 24576 |
| 6 | 2.4063 | 9 | 15112 | 30728 |
| 7 | 2.7305 | 11 | 64QAM | 16896 | 34816 |
| 8 | 3.3223 | 13 | 20496 | 42016 |
| 9 | 3.9023 | 15 | 24576 | 49176 |
| 10 | 4.5234 | 17 | 28168 | 57376 |
| 11 | 5.1152 | 19 | 31752 | 65576 |
| 12 | 5.5547 | 21 | 256QAM | 34816 | 69672 |
| 13 | 6.2266 | 23 | 38936 | 79896 |
| 14 | 6.9141 | 25 | 43032 | 88064 |
| 15 | 7.4063 | 27 | 46104 | 94248 |
| NOTE 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  NOTE 2: PDSCH is only scheduled on slots which are full DL | | | | | |

**Issue 1-3-2: FRCs for NCR-MT CQI FR1 requirements**

* + Option 1: Reusing existing FRCs tables for CQI requirements. (ZTE, HW, Ericsson, Nokia)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reference channel** | | | | **Test 1/2** |
| Number of allocated PDSCH resource blocks | | | | 66 |
| Number of consecutive PDSCH symbols | | | | 12 |
| Number of PDSCH MIMO layers | | | | 1 |
| Number of DMRS REs (Note 1) | | | | 24 |
| Overhead for TBS determination | | | | 6 |
| Available RE-s for PDSCH | | | | 7590 |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot |
| 0 | OOR | OOR | OOR | N/A |
| 1 | 0.1523 | 0 | QPSK | 1800 |
| 2 | 0.2344 | 0 | 1800 |
| 3 | 0.3770 | 2 | 2856 |
| 4 | 0.6016 | 4 | 4480 |
| 5 | 0.8770 | 6 | 6528 |
| 6 | 1.1758 | 8 | 8712 |
| 7 | 1.4766 | 11 | 16QAM | 11016 |
| 8 | 1.9141 | 13 | 14343 |
| 9 | 2.4063 | 15 | 17928 |
| 10 | 2.7305 | 18 | 64QAM | 20496 |
| 11 | 3.3223 | 20 | 25104 |
| 12 | 3.9023 | 22 | 29192 |
| 13 | 4.5234 | 24 | 33816 |
| 14 | 5.1152 | 26 | 38936 |
| 15 | 5.5547 | 28 | 42016 |
| NOTE 1: Number of DMRS REs includes the overhead of the DM-RS CDM groups without data  NOTE 2: PDSCH is only scheduled on slots which are full DL | | | | |

[**R4-2321059**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321059.zip) **WF on [109][326] NR\_netcon\_repeater\_Demod**

*Type: other For: Approval  
 Source: ZTE*

**Decision: Approved.**

### 8.29 NR MIMO evolution for downlink and uplink

#### 8.29.1 UE RF requirements for simultaneous transmission with multi-panel (STxMP)

#### 8.29.2 RRM core requirements

#### 8.29.3 RRM performance requirements

#### 8.29.4 Demodulation performance requirements

**R4-2320050 NR MIMO Evolution: Views on UE demodulation and CSI performance requirements**

*Type: discussion For: Discussion  
 Source: QUALCOMM Europe Inc. - Spain*

**Abstract:**

Views on NR MIMO evolution topics are shared.

**Decision: Noted.**

**R4-2320892 NR MIMO Evolution: Views on UE demodulation and CSI performance requirements**

*Type: discussion For: Discussion  
 Source: QUALCOMM Europe Inc. - Spain*

**Abstract:**

Updated version of the NR MIMO evolution proposals for #109

**Decision: Noted.**

##### 8.29.4.1 UE demodulation performance and CSI requirements

**R4-2318560 Discussion on NR MIMO evolution for downlink**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318561 Simulation results of NR MIMO evolution for downlink**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318587 On UE demod and CSI requirements for NR MIMO evolution**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318795 On MIMO\_evo UE demodulation performance and CSI requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

The paper present Nokia's view on the different aspects of UE demodulation performance and CSI requirements for the new topic MIMO Evolution including proposals on where to focus for requirement definition.

**Decision: Noted.**

**R4-2319336 discussion on Rel-18 MIMO UE demodulation performance and CSI requirements**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319747 Discussion on UE demodulation and CSI reporting requirements for MIMO evolution**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the UE demodulation and CSI reporting requirements for WI MIMO evolution.

**Decision: Noted.**

**R4-2320231 Discussion on UE demodulation requirements for MIMO evolution**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

##### 8.29.4.2 BS demodulation performance requirements

**R4-2318054 Discussion on MIMO evolution BS Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This document disucsses some of the features defined in the work item “MIMO evolution” within Rel-18 of 5G NR, specifically those features which have an impact related to the BS demodulation performance requirements, whereby these will be discussed, and o

**Decision: Noted.**

**R4-2318055 Simulations for MIMO evolution BS Demodulation**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

This document provides simulations to help introduces to RAN4 some of the features defined in the work item “MIMO evolution” within Rel-18 of 5G NR, specifically those features which have an impact related to the BS demodulation performance requirements,

**Decision:** The document was **withdrawn**.

**R4-2319312 Discussion on MIMO evo UL demodulation requirements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

Configuration on DM-RS eTypeII, necessary and testability for SDM with STxMP

**Decision: Noted.**

**R4-2319845 Discussion and simulation results on BS demodulation requirements for Rel-18 FeMIMO**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320230 Discussion on BS demodulation requirements for MIMO evolution**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.29.5 Moderator summary and conclusions

**R4-2318219 Topic summary for [109][327] NR\_MIMO\_evo\_DL\_UL\_demod**

*Type: other For: Information  
 Source: Moderator (Samsung)*

**Abstract:**

[109][300] BDaT Session AI 8.29.4.1, 8.29.4.2

**Decision: Noted.**

[**R4-2321056**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321056.zip) **Offline meeting minutes on [109][327] NR\_MIMO\_evo\_DL\_UL\_demod**

*Type: other For: Approval  
 Source: Samsung*

**Decision: Noted.**

**Issue 1-1-1: clarify criteria of feasibility for ‘typeII-Doppler-r18’ codebook**

* Proposals
  + Option 1: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform Rel-16 Type II codebook with the same CSI-RS configurations and medium/high UE speed (MTK, Apple, Nokia, Samsung, Ericsson)
    - Config 1 (K=4, N4=4, Q=2, m=d=2) can outperform Config 3 (K=1, N4=1, Q=1, m=d=8). (MTK)
    - The impairments need to be carefully studied and modelled before the feasibility of channel prediction can be confirmed. (MTK)
    - N4=4, and P-CSI-RS 5 slots and offset 1 slot, FFS adequate Doppler spread characteristics for the chosen propagation channel. Use speed of ~20km/h as starting point. (Nokia)
    - TypeII-Doppler-r18 codebook should get good performance for medium/high UE speed with more than 100Hz maximum Doppler shift. (Samsung)
  + Option 2: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform random precoding based on Single Panel Type I codebook with the same CSI-RS configurations and medium/high UE speed (Ericsson)

Moderator Note: All companies share similar observation that ‘typeII-Doppler-r18’ codebook do have impact on baseband processing, and prefer to consider the criteria of feasibility as option 1 (UE throughput with ‘typeII-Doppler-r18’ codebook could outperform Rel-16 Type II codebook with the same CSI-RS configurations and medium/high UE speed).

* Recommended WF
  + Use option 1 as the criteria of feasibility, encourage companies to further discuss and evaluate with proper simulation set-up. Introduce PMI reporting requirements with ‘typeII-Doppler-r18’ (FR1 only) if feasibility confirmed.

Agreement: Agreed online

Define PMI reporting requirements with ‘typeII-Doppler-r18’ using option 2 if both option 1 and option 2 could be fulfilled. Otherwise, if only option 1 is fulfilled, further discuss if feasible to define PMI reporting requirement using option 1 only.

Option 1: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform Rel-16 Type II codebook with the same CSI-RS configurations ~~and medium/high UE speed~~.

Option 2: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform random precoding based on Single Panel Type I codebook with the same CSI-RS configurations ~~and medium/high UE speed~~.

Online:

Nokia: What is the definition of medium and high?

Samsung: This is discussed in issue 2-1-1.

Qualcomm: This should be in the WID

Apple: We don’t need to discuss medium and high in RAN4. RAN1 has already defined. We only need to consider the Doppler, not the UE speed. The actual speed depends on the frequency. RAN1 targeted 30 km/hr.

**Issue 1-1-2: clarify test metric for PMI reporting requirements with ‘typeII-Doppler-r18’ codebook**

* Proposals
  + Option 1: test metric defined as , where is X % (e.g. X=90) of the maximum throughput obtained at using the *typeII-Doppler-r18* precoders configured according to the UE reports, and is the throughput measured at with random precoding based on Single Panel Type I codebook. (MTK, Nokia, Samsung, Ericsson)
  + Option 2: test metric defined as , where is Y % (e.g., Y=90) of the maximum throughput obtained at using the *typeII-Doppler-r18* precoders configured according to the UE reports, and is the throughput measured at with using the *typeII-r16* precoders configured according to the UE reports. (Ericsson)
  + Option 3: Further discuss suitable test metric, as random PMI with type II codebook is not feasible. (Apple)

Moderator Note: Option 1 is similar as the PMI reporting requirements of legacy type II codebook, which is based on the random precoding with Single Panel TypeI codebook.

* Recommended WF
  + Use option 1 as the starting point.

Online:

Ericsson: Previous agreement’s option 1 corresponds to option 2 here and vice versa. The proposal is to start with option 1 here which is option 2 in agreement of issue 1-1-1.

Apple: Ok with using option 1 as a starting point. We don’t think it’s a good metric, but for now, we don’t have a better idea so we’re ok to start with this.

**Issue 1-1-3: clarify if CSI requirements are needed for TDCP**

* Proposals
  + Option 1: Do not introduce CSI requirements for TDCP measurement (Apple, Samsung, Ericsson, Huawei)
    - Observation ***#1:*** *It is not feasible to define requirements with TDCP measurement report since there is no defined action at the gNB on how the report will be used.*
    - Observation ***#2:*** *NW could use the TDCP report to change codebook or CSI configuration, but these are not feasible to test with CSI reporting requirements.*
  + Option 2: Keep decision on defining new testcase and requirements for TDCP accuracy reporting FFS pending outcome of RRM feasibility study. (Nokia)
    - *Observation* ***#2:*** *A new type of CSI requirement would need to be introduced for accuracy reporting for Time Domain Channel Properties (TDCP). RRM is still discussing to introduce such requirement.*

Moderator Note: RRM session is discussing the feasibility of TDCP measurement accuracy requirements, it seems the fluctuation range of TDCP amplitude is large when the SNR is not high enough, i.e. lower than 20dB. Meanwhile, it is hard to define and test suitable NW switching algorithm(s) for specified TDCP amplitude reporting from CSI requirement point of view.

* Recommended WF
  + Do not introduce CSI requirements for TDCP measurement

Online:

Nokia: The discussion is ongoing in RRM. If RRM does not define requirements, then we would like to understand the reason why. We would prefer to wait, but in recognition of the timeline, if no other companies want to wait, we are ok to not define the CSI requirement as a compromise.

Apple: We were supposed to conclude at this meeting on TDCP accuracy, but we have more time because this is performance part. Still open as of yesterday’s online session in RRM.

Huawei: There is feasibility issue for testing the TDCP requirement.

ZTE: TDCP is very important and need the CSI feedback from the UE. We would like to define a requirement for this.

Ericsson: It is unclear how it can be tested. For CQI, PMI, RI, it is clear. But for TDCP it is unclear how this is applied to the PDSCH and what metric can be used to judge the UE correctness?

Qualcomm: Same view as Huawei and Ericsson. We typically don’t test dynamic behavior in demod. Even if BS reconfigures CSI-RS, it may not be testable.

MTK: Same view as QC, Huawei and Ericsson. This test should be implemented by RRM.

Samsung: Same view as above. RRM has studied accuracy for a long time and hard to achieve when SNR is low. We prefer not to define a demod requirement.

ZTE: We can further discuss in the RRM session, but we emphasize the important of this issue.

Nokia: We are ok to compromise.

**Issue 1-1-5: clarify if applicability rule are needed for demodulation requirements of Rel-18 DMRS ports**

* Proposals
  + Option 1: Introducing applicability rule for UE to skip legacy case(s) if UE has passed the case(s) with same configuration using the Rel-18 DMRS ports. (MTK, Apple, Samsung, Ericsson, Huawei)
    - Observation: No performance difference between Rel-15 and Rel-18 DMRS configurations as far as 1 or 2 DMRS ports share one resource element. (Ericsson)
    - Observation: There is negligible performance difference between the cases with different DMRS ports. (Huawei)
  + Option 2: FFS: decision to introducing applicability rule for UE to skip legacy case(s) if UE has passed the case(s) with same configuration using the new DMRS ports. (Nokia)

**Issue 1-2-1: clarify the details of applicability rule for Rel-18 DMRS ports**

* Proposals
  + Option 1: Introduce new applicability rule for increased DM-RS port configuration to the section for normal PUSCH. Following text could be considered for further discussion. (Ericsson)
    - Unless otherwise stated, PUSCH requirements with increased DM-RS port configuration shall apply only for a BS declaring support of enhanced DM-RS port type (see D.xxx in table 4.6-1). A BS that passes the tests with increased DM-RS port number can also consider the tests with legacy DM-RS port configuration passed.

|  |  |  |
| --- | --- | --- |
| D.xxx | PUSCH enhanced DM-RS port | Declaration of support PUSCH enhanced DM-RS port configuration enhanced-dmrs-Type\_r18. |

* Recommended WF
  + We already agreed to introduce applicability rule for Rel-18 DMRS ports in last meeting, about the further details, encourage feedback on option 1.

Agreement: Agreed online

Unless otherwise stated, PUSCH requirements with enhanced DM-RS port configuration shall apply only for a BS declaring support of enhanced DM-RS port type (see D.xxx in table 4.6-1).

|  |  |  |
| --- | --- | --- |
| D.xxx | PUSCH enhanced DM-RS port | Declaration of support PUSCH enhanced DM-RS port configuration enhanced-dmrs-Type\_r18. |

[A BS that passes tests with enhanced DM-RS port can consider corresponding legacy PUSCH tests as passed. Definition of "corresponding" needs to be further specified.] FFS on specific wording.

Online:

Nokia: Some legacy test cases might be in wider channel bandwidth. We should not allow bypassing the wider channel bandwidths.

**Issue 1-2-2: clarify if BS demodulation requirements are needed for FR2 STxMP**

* Proposals
  + Option 1: Do not define FR2 STxMP demodulation requirements in Rel-18, postpone the discussion on introduction BS demodulation requirement with UE FR2 STxMP to future release. (Nokia, Ericsson, Samsung, Huawei)
    - RAN4 will require a spatial channel model to define requirements for STxMP. (Nokia)
    - RAN4 is unlikely to be able to agree a spatial channel model for STxMP within Rel-18. (Nokia)
    - The definition of TRP is not clear in RAN4 scope. (Ericsson)
    - The OTA test cost for STxMP with SDM would be very high no matter how to interpret TRP. (Ericsson)
    - For single-DCI based SDM scheme, the different layers LLR information from one PUSCH CW combination is required among two TRPs into one decoder for PUSCH demodulation. (Samsung)
    - For single-DCI based SFN scheme, the same PUSCH signal from each panel can be combined among two TRPs for PUSCH demodulation. (Samsung)
    - For multi-DCI based scheme, the different PUSCH signal can be processed separately. (Samsung)
    - For single-DCI based SFN scheme, the same PUCCH signal from each panel can be combined among two TRPs for PUSCH demodulation. (Samsung)
    - From performance requirement aspect, PUSCH and PUCCH requirements with UE FR2 STxMP should be introduced. (Samsung)
    - How to handle the multiple TRPs reception for UL CoMP is transparent to UE, up to gNB implementation, without requirement for UL CoMP in 3GPP. (Samsung)
    - New test method is required for BS conformance test to support PUSCH and PUCCH requirements with UE FR2 STxMP. (Samsung)
    - No specific UE RF requirements with two UL beams simultaneously transmission introduced in RF session. (Samsung)
* Recommended WF
  + Following majority view, option 1?

Agreement: Agreed online

Do not define FR2 STxMP demodulation requirements in Rel-18, postpone the discussion on BS performance requirement introduction with UE FR2 STxMP to future release.

**Issue 2-1-1:** **Propagation channel**

* Proposals
  + Option 1: TDLA30-100 (Nokia, Samsung, Qualcomm)
    - Use 100MHz, FFS if lower Doppler values are to be considered (Nokia)
  + Option 2: need further study to find feasible test scenario (MTK)
  + Option 3: TDLA30-10, TDLA30-30, TDLA30-50 (Apple)
  + Option 4: TDLC300-100 (Ericsson)
* Recommended WF
  + More discussion needed

Online:

Moderator: Propose to start with TDLA30-30 and TDLA30-50 and TDLA30-100

Qualcomm: Is this a generic agreement or tied to Rank discussion?

Samsung: For typeII doppler, we only propose Rank 2

Apple: Is this for defining the requirement , or only for feasibility study?

Samsung: Only for feasibility study

WF: Start with TDLA30-30 and TDLA30-50 and TDLA30-100 for TypeII Doppler feasibility study

**Issue 2-1-2:** **Correlation configurations**

* Proposals

For 16Tx:

* + Option 1: XP Medium as a starting point for Rel-18 TypeII Doppler PMI test. (MTK, Nokia, Samsung, Ericsson, Apple)

For 4Tx and 8Tx:

* + Option 1: XP-High (Apple)
* Recommended WF
  + Option 1?

Online:

WF: Start with 16 Tx, where XP Medium as a starting point for Rel-18 TypeII Doppler PMI test. Deprioritize 4Tx and 8Tx.

[**R4-2321141**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321141.zip) **WF on [109][327] NR\_MIMO\_evo\_DL\_UL\_demod**

*Type: other For: Approval  
 Source: Samsung*

**Decision: Approved.**

### 8.30 NR sidelink evolution

#### 8.30.1 General aspects (TR/big CR)

#### 8.30.2 UE RF requirements

#### 8.30.3 RRM core requirements

#### 8.30.4 RRM performance requirements

#### 8.30.5 UE demodulation performance requirements

**R4-2318938 SL enhancement demod discussion**

*Type: discussion For: Approval  
 Source: Qualcomm, Inc.*

**Decision: Noted.**

**R4-2319266 Discussion on work scope and test cases for SL evolution demodulation performance**

*Type: discussion For: Discussion  
 Source: LG Electronics Inc.*

**Decision: Noted.**

**R4-2320195 Discussions on sidelink UE demodulation requirements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320584 NR Sidelink Evolution: UE Demodulation Performance Requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our views on UE demodulation performance requirements for NR Sidelink Evolution

**Decision: Noted.**

#### 8.30.6 Moderator summary and conclusions

**R4-2318220 Topic summary for [109][328] NR\_SL\_enh2\_demod**

*Type: other For: Information  
 Source: Moderator (LGE)*

**Abstract:**

[109][300] BDaT Session AI 8.30.5

**Decision: Noted.**

[**R4-2321065**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321065.zip) **Ad-hoc meeting minutes for [109][328] NR\_SL\_enh2\_demod**

*Type: other For: Information  
 Source: LGE*

**Decision: Noted.**

**Issue 1-1-1: NR sidelink CA scenario**

* Agreements (agreed online)
  + PSSCH performance requirements - Support
  + HARQ buffer test – Not support
  + PSCCH decoding capability test – Support
  + PSFCH decoding capability test – Support

**Issue 1-1-2: Test parameters for NR sidelink CA**

* Agreements (agreed online)
* Table 2-1: Proposed common test parameters for CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Value |
| Carrier configuration | | Offset between Point A and the lowest usable subcarrier on this carrier (Note 1) | | RBs | 0 |
| Subcarrier spacing | | kHz | 30 |
| SL BWP configuration #1 | | Cyclic prefix | |  | Normal |
| RB offset | | RBs | 0 |
| Number of contiguous PRB | | PRBs | Maximum transmission bandwidth configuration as specified in clause 5.3.2 of TS 38.101-1 [6] for tested channel bandwidth and subcarrier spacing |
| PT-RS configuration | | | |  | PT-RS is not configured |
| 2nd stage SCI format 2-A configuraion | | | Payloads | Bits | 35 |
| *α* |  | 1 |
| *βoffset* |  | 5 |
| Resource pool configuration | PSCCH Time resource | | | Symbols | 2 |
| PSCCH Frequency resource | | | PRBs | 10 |
| PSFCH number of cyclic shift pairs | | |  | n1 |
| PSFCH hopping ID | | |  | 0 |
| PSFCH candidate resource type | | |  | allocSubCH |
| Set of PRBs for PSFCH transmission | | |  | ones(1,100) for 40 MHz  ones(1,70) for 30 MHz  ones(1,20) for 10 MHz |
| PSSCH RSRP threshold | | |  | 66 (infinity dBm) |
| Synchronization reference | | |  | GNSS |
| Subchannel size | | | PRBs | 10 |
| Number of sub-channels | | |  | 2 for 10MHz, 7 for 30MHz and 10 for 40 MHz |
| Start PRB for first sub-channel | | |  | 0 |
| Time resource bitmap | | |  | ones(1, 160) |
| Note 1: Point A coincides with minimum guard band as specified in Table 5.3.3-1 from TS 38.101-1 [6] for tested channel bandwidth and subcarrier spacing. | | | | | |

* Table 2-2: Proposed test parameters for SL CA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz)/ Subcarrier spacing(kHz) | Modulation format and code rate | Propagation condition | Reference value | |
| PSSCH BLER (%) | SNR(dB) of PSSCH |
| 1 | TBD | 20 / 30 | 16QAM, 0.37 | TDLA30-1400 | 10% | TBD |

**Issue 1-1-3: NR sidelink CA Bandwidth combination**

* Agreements

Online:

Huawei: We should focus only on CA. We should focus on PSSCH requirements for different bandwidths. The additional work is 10, 30, and 40 MHz. Agree with moderator proposal.

Qualcomm: PSCCH decoding only has 40 MHz, so we also need 20 MHz for PSCCH. We need to cover 10, 20, 30, 40 MHz for all channels. These requirements would be applicable for each CC. We list CA combinations, but RAN5 chooses among these on what to test. So we don’t define individual requirements. We mostly agree, just need to find the right wording.

Huawei: The WF is only for PSSCH. We would like to focus only on the PSSCH.

**Issue 1-1-4: NR sidelink CA capability**

* + Option 1:
    - Keep number of allocated RBs for each CC for PSSCH CA performance requirements open until the RAN1’s discussions on capability of “maximum number of non-overlapping RBs UE attempts to decode” is finalized. (HW)
    - RAN4 to keep tracking on the RAN1 progress on following CA capability discussion and start the discussion once it is finalized by RAN1. (HW)
      * Maximum number of receiving PSCCHs in a slot
      * Maximum number of receiving PSFCHs in a slot
* Agreements (agreed online)
  + Option 1 is agreed

**Issue 1-2-2: Whether to introduce new requirement for PSFCH in SL-U**

* Proposals
  + Option 1: Consider to introduce requirement for PSFCH in SL-U if significant algorithm difference is identified, or enhancement is required, w.r.t. the legacy PSFCH processing. (Qualcomm)
  + Option 2: RAN4 to introduce performance requirements for PSFCH with interlaced RB allocation. (HW, LGE)
  + Option 3: RAN4 may consider PSFCH if there is sufficient performance gap in PSFCH between interlaced RBs and non-interlaced RB. (Nokia)
* Recommended WF
  + Moderator’s view: Need further discussion

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | HW | Nokia | LGE | Qualcomm |
| PSSCH in SL-U | OK | OK | OK | ~~NOK~~ OK |
| PSCCH in SL-U | OK | - | - | NOK |
| PSFCH in SL-U | OK | ~~Conditional~~ OK | OK | Conditional OK |

Online:

Nokia: If we decide to define requirements, PSSCH is the most important one.

Qualcomm: We can compromise on PSSCH and define a requirement for this.

Qualcomm: For PSFCH unique part is the combining. Is this something that needs to be tested?

Huawei: For PSCCH because of interlacing, the channel estimation is per RB that might have degraded performance. The per RB channel estimation uses different filter coefficients.

Qualcomm: Propose PSSCH for interlacing and PSFCH for combining, and these are the only two tests needed.

Huawei: PSCCH is still needed due to different filter coefficients.

Nokia: We need stronger justification to test PSCCH in addition to PSSCH and PSFCH

**Issue 1-2-3: Features of SL-U to be evaluated for performance Test**

* Proposals
  + Option 1: Consider interlacing RB mapping and the two candidate starting point in slot. (LGE)
  + Option 2: Consider interlacing RB mapping only. (Nokia)
  + Option 3: RAN4 shall focus on interlace RB allocation. Starting point depends on discussion of LBT model design (Huawei)
* Recommended WF
  + Moderator’s view: If decided to support SL-U performance, every company have same view that the interlacing RB mapping should be evaluated. But regarding two candidate starting point in slot, need further discussion.
* Tentative agreements

Online:

LGE: We don’t have a strong view, but it may impact the performance. One method is Huawei’s. We can agree to option 3.

Huawei: Two starting points does not have impact on performance, we should discuss this together with LBT model.

Qualcomm: Do we need two starting points, two tests?

Huawei: We cannot decide whether two starting points is needed without understanding of the LBT model.

Moderator: LBT model will be a long discussion.

**Issue 1-2-4: Test set-up for SL-U physical channel performance test**

* Proposals
  + Option 1: Consider following test setup for SL-U test: (HW)
    - Carrier center frequency: 6.5 GHz
    - Operation mode: Mode2 (Standalone)
    - Synchronization source: GNSS based
    - Carrier frequency offset with respect to GNSS: 650Hz
    - Carrier frequency offset for simulation assumption: 1300Hz
    - Time offset with respect to GNSS: CP/2-12\*64\*Tc
    - Time offset for simulation assumption: 24\*64\*Tc
    - SCS: 30kHz
    - Antenna configuration: 1T2R Low
    - Channel bandwidth: 20MHz
    - Propagation conditions: Select from {~~TDLA30-2900, TDLA30-1500,~~ TDLA30-195}
    - Channel estimation: MMSE based interpolation in frequency domain and linear interpolation in time domain
    - Only consider 1 interlace (1 sub-channel) with RB index 0,5,10,15,…50

Online:

Qualcomm: Sidelink is expected to be used in indoor scenarios so high speed is not needed. Is frequency offset needed? For low speed, the doppler shift should also be lower. What is the difference between option 1 and option 2? We prefer option 2, but we don’t see a real difference between option 1 and option 2.

Huawei: Option 1 has more details, but otherwise the same.

LGE: The frequency offset is not related to UE speed but rather 0.1ppm Tx offset.

[**R4-2321131**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321131.zip) **WF on [109][328] NR\_SL\_enh2\_demod**

*Type: other For: Approval  
 Source: LGE*

**Decision: Approved.**

### 8.31 Enhanced support of reduced capability NR devices

### 8.32 Enhanced NR Sidelink Relay

### 8.33 Mobile IAB (Integrated Access and Backhaul) for NR

#### 8.33.1 Co-existence study

**R4-2320254 mIAB RF co-existence**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

#### 8.33.2 RF core requirements

**R4-2319784 CR to TS 38.174 on RF core requirements for NR Mobile IAB**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0076 rev Cat: B (Rel-18)  
  
 Source: Qualcomm Germany, Ericsson*

**Abstract:**

Introduce mobile IAB feature and its associated RF core requirements

**Decision: Noted.**

**R4-2319785 Big CR to TS 38.174 on RF core requirements for NR Mobile IAB**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0077 rev Cat: B (Rel-18)  
  
 Source: Qualcomm Germany, Ericsson, Nokia, NEC*

**Abstract:**

Big CR to introduce mobile IAB feature and its associated RF core requirements

**Decision: Agreed.**

**R4-2320256 CR to TS 38.174 on RF core requirements for NR Mobile IAB**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0078 rev Cat: B (Rel-18)  
  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Endorsed.**

Moderator: This CR is incorporated in the big CR. This should be endorsed.

**R4-2320417 CR to TS 38.174 on RF core requirements for NR Mobile IAB**

*Type: CR For: Agreement  
 38.174 v18.2.0 CR-0085 rev Cat: B (Rel-18)  
  
 Source: Qualcomm Incorporated, Ericsson*

**Decision: Endorsed.**

Moderator: This CR is incorporated in the big CR. This should be endorsed.

**R4-2320531 CR for clarifying RF requirements for mIAB**

*Type: draftCR For: Endorsement  
 38.174 v18.2.0 CR- rev Cat: B (Rel-18)  
  
 Source: Ericsson*

**Abstract:**

In this CR, some text in previous endorsed CR is updated based on WF.

**Decision: Endorsed.**

#### 8.33.3 RF conformance testing

**R4-2319783 Discussion on mobile-IAB RF conformance**

*Type: discussion For: Approval  
 Source: Qualcomm Germany*

**Decision: Noted.**

**R4-2320156 Draft CR on TS 38.174: Suffix information for mIAB node**

*Type: draftCR For: Endorsement  
 38.174 v18.2.0 CR- rev Cat: F (Rel-18)  
  
 Source: NEC*

**Decision: Endorsed.**

**R4-2320255 Discussion on mobile IAB conformance testing**

*Type: other For: Approval  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320530 On mIAB RF Conformance test**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

In this paper, we present our view on mIAB RF conformance scope.

**Decision: Noted.**

#### 8.33.4 RRM core requirements

#### 8.33.5 RRM performance requirements

#### 8.33.6 Demodulation performance requirements

**R4-2319225 Overview on demodulation requirements for mIAB-MT and mIAB-DU**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution provides overview for mIAB demodulation

**Decision: Noted.**

**R4-2319782 Discussion on mobile-IAB demodulation performance requirements**

*Type: discussion For: Approval  
 Source: Qualcomm Germany*

**Decision: Noted.**

**R4-2319827 On Mobile IAB Demodulation Performance Requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2320232 Discussion on demodulation performance requirements for mobile IAB**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 8.33.7 Moderator summary and conclusions

**R4-2318205 Topic summary for [109][313] NR\_mobile\_IAB\_RF**

*Type: other For: Information  
 Source: Moderator (Qualcomm)*

**Abstract:**

[109][300] BDaT Session AI 8.33.1, 8.33.2, 8.33.3

**Decision: Noted.**

Sub-topic 1: CRs to TS 38.174

* Proposals:
  + Option 1: Merge the above CRs into the draft Big CR (R4-2319785) entailing the following corrections:
    - Remove the text which says suffix A is used at 2nd level clause. Add a note to state subclause 5.3A is not dedicated to mobile IAB-node (R4-2320156)
    - Correct the subclause number. (R4-2320156 and R4-2320256)
    - Addition of mIAB in clauses: definitions in clause 3.1, clause number correction in 4.13, typos in 6.2.1A and 9.3.1A (R4-2320256)
    - Adding Clarificaion on mobile IAB only apply LA IAB-MT (R4-2320531)
* Recommended WF
  + Agree with option 1.

Qualcomm: Propose to endorse the draft CR’s R4-2320156, R4-2320256, R4-2320531 submitted this meeting and endorse the big CR as well

Ericsson: There may be a better way to implement this. There is already a suffix A for CA. For BS specification structure, we haven’t fully explained suffixes. There is only one clause, CBW for CA. One way is to void this clause.

Chair: For formal CR submitted, we can endorse it (not agree it) and then capture its contents in big CR.

NEC: In R4-2320356, the definition is not correct.

Sub-topic 1: General RF conformance requirements

* Proposals:
  + Option 1A: Add a new section in TS 38.176-1 and 38.176-2 to state that RF conformance requirements for mIAB-MT, unless otherwise stated, follows Local area IAB-MT conformance requirements and new conformance requirements for mIAB-MT will be captured in an additional suffix.
  + Option 1B: Both IAB conducted (TS 38.176-1) and radiated (TS 38.176-2) test specifications require introduction of mobile IAB.
  + Option 1C: At least updates to following conformance test are needed: output power and relative power tolerance for mIAB-MT type 1-H, OTA output power and relative EIRP tolerance for IAB-MT type 1-O and type 2-O.
* Recommended WF
* Agree options 1A, 1B, and 1C.

Ericsson: We have concern with 1A using additional suffix. Even if used in core spec, we don’t need to use it in conformance. We aren’t ready to agree now.

[**R4-2321039**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321039.zip) **WF on [109][313] NR\_mobile\_IAB\_RF**

*Type: other For: Approval  
 Source: Qualcomm*

**Decision: Approved.**

**R4-2318221 Topic summary for [109][329] NR\_mobile\_IAB\_demod**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 8.33.6

**Decision: Noted.**

[**R4-2321136**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321136.zip) **Offline meeting minutes for [109][329] NR\_mobile\_IAB\_demod**

*Type: other For: Information  
 Source: Ericsson*

**Abstract:**

This contribution provides the summary of topics and recommended summary.

**Decision: Noted.**

**Issue 1-1: Work plan for Rel-18 mIAB demodulation**

Agreement: (agreed online)

|  |  |
| --- | --- |
| **Meeting** | **Works** |
| RAN4#109  (November 2023) | * Agree the demodulation workplan * Discuss the work scope and the list of performance test cases |
| RAN4#110  (February 2024) | * Discuss applicability of demodulation performance requirements from legacy IAB and UE sides * Discuss simulation assumptions, if applicable |
| RAN4#110bis  (April 2024) | * Discuss the DraftCR for demodulation performance requirements * Collect simulation results for alignment, if applicable |
| RAN4#111  (May 2024) | * Discuss the remaining issues * Collect Simulation results with impairment, if applicable * Submit the BigCR and finalize the work |

**Issue 2-1-1: How to define demodulation requirements for mIAB-MT ?**

* Proposals
  + Option 1: Define new requirements. (Huawei)
  + Option 2: Reuse UE demodulation requirement in 38.101-4.
    - Option 2a: Reuse UE demodulation requirements with TDLC300-100 in 38.101-4. (Ericsson)
    - Option 2b: Reuse UE demodulation requirements in 38.101-4 with modified fading channel model. (QC, Nokia, Ericsson)
  + Option 3: Other options are not precluded.

Agreement: (agreed online)

Reuse applicable UE demodulation requirements in 38.101-4, and further discuss how to choose corresponding test cases.

**Issue 2-1-2: Test case scope**

* Proposals
  + Option 1: PDSCH, PDCCH, CSI report. (Ericsson)
  + Option 2: PDSCH, PDCCH. (Huawei)
  + Option 3: Other options are not precluded.

Agreement: (agreed online)

Introduce mIAB-MT demodulation requirements for PDSCH and PDCCH.

FFS on CSI reporting:

Option 1: Apply IAB-MT CSI requirement.

Option 2: Reuse applicable legacy UE CSI requirements.

**Issue 2-2-1: Frequency range**

*This issue is raised by moderator since it is mentioned by some companies implicitly in proposal.*

* Proposals
  + Option 1: Both FR1 and FR2-1.
  + Option 2: Only FR1.
  + Option 3: Only FR2.
* Recommended WF
  + Companies to check if Option 1 could be agreed.

Online:

Nokia: RRM has defined requirements for FR1 and FR2-1. So we support option 1.

Qualcomm: Same view as Nokia, both frequency ranges.

Ericsson: Same view.

Huawei: Also same as the above.

**Issue 2-2-3: Antenna configuration for conducted test**

* Proposals
  + Option 1: 4Rx. (Nokia)
  + Option 2: 2x4 for PDSCH, 1x4 for PDCCH. (Huawei)
  + Option 2: Other options are not precluded.
* Agreement (agreed online)
  + 4Rx agreed as the start point.
  + FFS on 1 or 2 TX.

Online

Qualcomm: Ok with moderator’s WF

Huawei: Also fine with recommended WF

**Issue 2-2-4: Antenna configuration for OTA test**

* Proposals
  + Option 1: 2Rx. (Nokia)
  + Option 2: Other options are not precluded.

Online:

Nokia: For radiated test, the typical configuration is 2Rx.

Ericsson: Support 2Rx. We also propose 2Tx

Huawei: For PDCCH, we may use 1Tx. Ok to consider 2Tx for PDSCH, but would like to further discuss for PDCCH.

Nokia: Agree with Huawei.

Agreement:

* 2Rx antenna configuration for OTA.
* For PDSCH, 2Tx antenna configuration for OTA
* For PDCCH, further discussion on 1Tx and/or 2Tx

**Issue 2-3-1: How to add mIAB-MT requirement to current specification?**

* Proposals
  + Option 1: Add a new section in TS 38.174 to state that demodulation performance requirements for mIAB-MT. (QC)
  + Option 2: Other options are not precluded.

Online:

Qualcomm: Since this is the first meeting, we can look at the requirements first before decide where to put them

Nokia: We don’t expect to introduce new specs. But we don’t know what would the other options be. We can agree that 38.174 would be used.

Moderator: Encourage companies to consider this for the next meeting.

**Issue 3-1: Whether to define new additional demodulation requirements for mIAB-DU?**

* Proposals
  + Option 1: No (Ericsson, Nokia, Huawei)
  + Option 2: Yes.

Online:

Qualcomm: We also support option 1

Samsung: We also support option 1

**Issue 3-2: Which legacy IAB-DU demodulation requirements could be reused for mIAB-DU?**

* Proposals
  + Option 1: Reuse legacy IAB-DU requirements with TDLA30-10 channel condition. (Ericsson)
  + Option 2: Other options are not precluded.
* Recommended WF
  + Companies to discuss based on test cases defined for IAB-DU in 38.174.

Online:

Nokia: The justification is the users of mIAB travel together with the mIAB. We would like to check whether the assumption is valid that the users will travel together with the mIAB.

Qualcomm: We would like more time to check.

Samsung: We don’t see any reason to limit the scenarios for mIAB. We would like to consider both low and high speed.

Huawei: Same view as Samsung. The Rel-16 requirements for IAB can be applied to mIAB.

Ericsson: We are ok to continue this discussion at the next meeting.

[**R4-2321144**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321144.zip) **WF on [109][329] NR\_mobile\_IAB\_demod**

*Type: other For: Approval  
 Source: Ericsson*

**Decision: Approved.**

### 8.34 Network energy saving for NR

#### 8.34.1 BS RF requirements

#### 8.34.2 BS conformance testing requirements

#### 8.34.3 RRM core requirements

#### 8.34.4 RRM performance requirements

#### 8.34.5 UE demodulation performance and CSI requirements

**R4-2318353 Discussion on Network energy saving for NR UE demodulation performance and CSI requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2318354 Simulation results on Network energy saving for NR UE demodulation performance and CSI requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Decision: Noted.**

**R4-2318678 Discussion on UE demodulation performance and CSI requirements for Network Energy Savings for NR**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2319337 discussion on demodulation and CSI requirements for NES**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2319552 Discussion on demodulation requirements for Network energy saving**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2319748 Discussion on UE demodulation and CSI reporting requirements for NES**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the UE demodulation and CSI reporting requirements for WI network energy saving.

**Decision: Noted.**

**R4-2320196 Discussions on Rel-18 NES demodulation and CSI requirements**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320798 Discussion paper on UE Demod tests for Network Energy Savings**

*Type: discussion For: Approval  
 Source: Qualcomm Inc.*

**Decision: Noted.**

#### 8.34.6 Moderator summary and conclusions

**R4-2318222 Topic summary for [109][330] Netw\_Energy\_NR\_demod**

*Type: other For: Information  
 Source: Moderator (Huawei)*

**Abstract:**

[109][300] BDaT Session AI 8.34.5

**Decision: Noted.**

**Issue 1-1-1: Whether to introduce SSB less Scell requirements for inter-band CA**

Online:

Nokia: Should not have much impact in AWGN channel. RTD is timing offset error between PCell and SCell. In demod we use more realistic channel models, if we have RTD near CP, then we expect significant performance degradation. Using TRS instead of SSB has limited capture range to 0.6 CP with FFT window in the middle of timing window. A Rel-15 UE only uses SSB.

Qualcomm: This would not depend on the UE, only the channel. In most scenarios, RTD is small enough that the UE can lock onto TRS. We don’t expect any UE algorithm improvement to handle this case.

Nokia: There are better TRS estimation algorithms that can be implemented. This would improve reliabililty across wider range of scenarios.

Apple: SSB-less is intended to save network energy. Would we really have CA and 2 PDSCH, but not transmitting SSB on SCell doesn’t seem to save much energy. We don’t understand the legacy Rel-15 UE concern. For Rel-16 we have intra-cell without SSB and don’t see any issues there.

Nokia: The feature was already discussed in RAN1. The energy savings is not the radiated, but the energy for computational burden in the BS. In Rel-15, there was uncertainly that TRS was needed for time tracking but only for frequency tracking, so it is unknown whether the Rel-15 UE will actually use TRS for time tracking. For mTRP, we are not sure if we had studied the capture behavior of the loop or just the steady-state.

Huawei: In R15 time tracking was up to UE implementation. There is some degradation in corner cases, but expect BS to minimize RTD for co-located scenario.

Nokia: RTD may come from different frequency for each CC and different channel delay and reflection for each frequency

Ericsson: RAN4 RF confirmed was SSB-less is beneficial to BS for power savings and then sent an LS to RAN2.

Apple: Do we have a scenario with SSB-less and PDSCH transmission on the SCell and still see power savings.

Nokia: What does it mean to not have a requirement? The UE would be held against the legacy CA requirement, but without the benefit of the SSB?

Possible WF: Define a SSB-less requirement, but with RTD = 0.

**Issue 1-2-1: Whether to introduce CSI requirements for power/spatial domain adaption**

Online:

Huawei: We expect different behavior from Rel-16 so would like to check the performance

Ericsson: We still aren’t convinced, for example Huawei suggests PMI and CQI may be different from legacy but this is up to UE implementation. Consideration minimum requirement, it may not be needed.

Nokia: Similar view as Ericsson. There are advanced algorithms to reuse the older measurements, but this rather advanced. The minimum implementation that works would not have such impact.

Qualcomm: Same view as Ericsson and Nokia. This should be up to UE implementation.

Huawei: Advanced algorithm should be applied for this feature. Otherwise, the processing timeline would not be sufficient.

Apple: Same as Nokia and Ericsson. We don’t share the view of Huawei about UE timeline.

Ericsson: We aren’t sure RAN1 assumed advanced algorithm for the UE to report the capability. We don’t think RAN1 considered how the UE performs the calculation. Even with the legacy calculation, the UE can pass the test.

Nokia: The basic implementation is feasible due to the capability of how many sets of ports the UE can be configured with.

[**R4-2321130**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321130.zip) **WF on [109][330] Netw\_Energy\_NR\_demod**

*Type: other For: Approval  
 Source: Huawei, Ericsson*

**Decision: Approved.**

### 8.35 NR Support for UAV

### 8.36 Enhancement of NR dynamic spectrum sharing

#### 8.36.1 General and work plan

#### 8.36.2 UE demodulation performance requirements

**R4-2318588 UE demodulation performance requirements for NR dynamic spectrum sharing**

*Type: discussion For: Discussion  
 Source: Apple*

**Decision: Noted.**

**R4-2318664 Discussion on PDCCH requirements for DSS enhancements**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318729 Discussion on the demodulation performance requirements for enhanced NR dynamic spectrum sharing**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2319222 On UE demodulation requirement for enhancement of Dynamic Spectrum Sharing**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the parameter assumption for initial evaluations

**Decision: Noted.**

**R4-2319545 Discussion on NR DSS demodulation requirements**

*Type: other For: Approval  
 Source: ZTE Corporation*

**Decision: Noted.**

**R4-2320200 Discussions on performance requirements for Rel-18 DSS**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**R4-2320585 Enhancement of NR Dynamic Spectrum Sharing: UE Demodulation Performance Requirements**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In this paper, we provide our views on UE demodulation performance requirements for Enhanced NR DSS

**Decision: Noted.**

#### 8.36.3 Moderator summary and conclusions

**R4-2318223 Topic summary for [109][331] NR\_DSS\_enh**

*Type: other For: Information  
 Source: Moderator (Ericsson)*

**Abstract:**

[109][300] BDaT Session AI 8.36.1, 8.36.2

**Decision: Noted.**

**Issue 1-1-1: CRS rate matching pattern assumption**

* Agreement
  + Option 1 (MediaTek, ZTE, Ericsson, Huawei): Single ~~non-overlapping~~ rate matching pattern
    - Huawei: CRS patterns with different vShift leads to same number of punctured REs per RB which leads to same performance.

Online:

Qualcomm: Ok with option 1

Apple: Single pattern is fine, it is not overlapping with anything

**Issue 1-1-2: UE receiver assumption**

* Proposals
  + Option 1 (Huawei): For performance requirements definition, consider receiver assumption: UE set LLR of PDCCH data to 0 for CRS REs.
* Recommended WF
  + Previous agreements: PDCCH channel estimation is assumed to use only the clean PDCCH symbol.
  + Discuss whether option 1 can be further assumed.

Online:

Qualcomm: We prefer to leave it to implementation rather than to assume erasure of punctured RE’s.

Apple: Same view as Qualcomm.

MTK: Same view as QC and Apple. We can revisit if we encounter alignment issues.

Huawei: We are ok with this approach.

Agreement: Leave the receiver design to implementation for evaluation purposes. We can check after seeing the results if there is a large variation in results. If so, then we can talk about receiver assumptions.

**Issue 1-1-3: Common parameters**

* Agreement
  + - DCI format: 1\_0 (Qualcomm)
    - CCE to REG mapping: Non-interleaved
    - REG bundle size: 6 PRB
    - Precoder: Random precoder with precoder cycling per REG bundle
    - LTE CRS: 4 Ports
    - TX assumption for overlapping REs: Puncture PDCCH and DMRS REs overlapping with LTE CRS
    - LTE PDCCH, PDSCH: No transmission
    - Slots with LTE PBCH/PSS/SSS: No PDCCH transmission
    - Channel estimation: PDCCH CE only on clean symbols

Online:

Apple: We support DCI format 1\_0 with payload size of 39.

MTK: Also ok with 1\_0.

Ericsson: Agree with the above.

**Issue 1-1-5: Antenna configuration**

* Proposals
  + Option 1 (MTK): 2x2, 2x4 low
  + Option 2 (Apple, Qualcomm, Huawei): 4x2, 4x4 low
  + Option 3 (Ericsson, Nokia): 1x2, 1x4, 2x2, 2x4 low

Online:

MTK: We can agree with option 2 with 4Tx

Ericsson: Based on previous PDCCH requirement with 1Tx and 2Tx. Not sure we need to align LTE CRS ports to use 4Tx.

Qualcomm: If there are 4 ports available, expect the BS would use all of them.

Apple: LTE would be transmitted on 4 ports as well as NR. Can use random precoder to transmit 4Tx. Doesn’t make sense to have 4Tx LTE and 2Tx NR.

Nokia: Same view as Ericsson. Although we have 4 port LTE, we don’t need to limit NR to 4 port.

Huawei: Same view as Apple and Qualcomm.

ZTE: Same view as Ericsson and Nokia.

Apple: This is single port 4Tx, i.e., TxD

Huawei: 4Tx was used in RAN1 evaluation

**Issue 1-1-7: Aggregation level**

* Proposals
  + Option 1 (Nokia): 1, 2, 4, 8 and 16
  + Option 2 (Ericsson): 2, 4, 8, 16 (for evaluation purpose)
  + Option 3 (Apple, MTK): 4, 8
  + Option 4 (Huawei): 4 only (For requirements definition purpose)
* Recommended WF
  + Moderator recommends to first discuss a set of aggregation levels for evaluations purpose, and to make further down selection (if needed) for defining requirements in the next meeting.

Online:

Qualcomm: Can we consider channel model and AL together?

Huawei: We are open to all candidate options; we don’t have strong view. We didn’t evaluate each AL in our contribution.

MTK: There is no AL=1 in legacy spec. We can use 4 and 8 as starting point.

Ericsson: Similar view as MTK. We are ok with 2, 4, and 8 since 16 is usually used in URLLC. For AL=2, BLER cannot drop below 1%, so we are ok with option 3.

Nokia: From RAN1, it was observed AL=1, puncturing is always better than superpositioning, but vice versa for other AL. This is why we want to include AL1 in the evaluation.

Apple: Don’t think AL1 is reasonable. We cannot define requirements for this, so there is no point to evaluating. AL2 with 1 symbol and puncturing, the performance will also be very poor. With single symbol and puncturing, we think AL = 4 and 8 is reasonable. For AL=16 we can get good performance, but we aren’t sure this is the target scenario for DSS as we expect AL = 16 for URLLC.

ZTE: Prefer AL4, but open to 8.

Agreed: AL = 4 and 8 for evaluation purposes

**Issue 1-1-8: Channel model**

* Proposals
  + Option 1 (Qualcomm): TDLA30-10 only
  + Option 2 (Apple, MTK, ZTE): TDLA30-10 for AL=4, TDLC300-100 for AL=8
  + Option 3 (Ericsson): For 1Tx, TDLA30-10; For 2Tx, TDLC300-100
  + Option 4 (Huawei): TDLC300-100 only
* Recommended WF
  + Discuss options.

Online:

Apple: We are ok for TDLA30-10, but not practical to use only flat fading. We suggest TDLC for AL=8. We used A, B, and C for requirements in Rel-15. We can downselect to A and C.

Huawei: We prefer TDLC. We would like to be able to verify advanced channel estimation implementation.

Qualcomm: We prefer a minimal test case, we are only testing DSS functionality. We don’t need to evaluate for all channels which are already tested in standalone non-DSS.

Nokia: Since we agreed AL=8, we need TDLC300-100. If we include 1Tx and 2Tx, then we need option 2 and option 3.

Apple: Advanced channel estimation uses only one symbol so will be worse than legacy – we shouldn’t call it advanced. Whether we have 1 symbol or 2 symbol will not be impacted much by TDLA vs. TDLC. For lower AL and frequency selective fading, we expect a very large performance impact.

Agreed:

For evaluation: TDLA30-10 and TDLC300-100

Whether to downselect can be discussed in the next meeting.

[**R4-2321139**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321139.zip) **WF on [109][331] NR\_DSS\_enh**

*Type: other For: Approval  
 Source: Ericsson*

**Decision: Approved.**

## 9 Rel-18 on-going work Items for LTE

### 9.1 Rel-18 LTE-Advanced Carrier Aggregation for x bands (2<=x<= 6) DL with y bands (y=1, 2) UL

### 9.2 Additional LTE bands for UE categories M1/M2/NB1/NB2 in Rel-18

### 9.3 Introduction of the Extended L-band (UL 1668-1675, DL 1518-1525) for IoT NTN

### 9.4 Introduction of a new FDD band (L+S band) for IoT NTN operation

### 9.5 High Power UE (Power Class 2) for LTE FDD Band 14

### 9.6 IoT (Internet of Things) NTN (non-terrestrial network) enhancements

#### 9.6.1 General aspects

#### 9.6.2 UE RF requirements

#### 9.6.3 SAN RF requirements

#### 9.6.4 RRM core requirements

#### 9.6.5 RRM performance requirements

#### 9.6.6 Demodulation performance requirements

**R4-2318232 Discussion on IoT NTN**

*Type: discussion For: Discussion  
 Source: Nokia, Nokia Shanghai Bell*

**Abstract:**

In the following contribution we will provide Nokia’s view on the background and scope for RAN4 to specify demodulation performance requirements related to IOT NTN Enhancements

**Decision: Noted.**

**R4-2318666 Workplan on demodulation requirements for IoT-NTN enhancement**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318667 Discussion on UE requirements for IoT-NTN enhancement**

*Type: discussion For: Discussion  
 Source: MediaTek inc.*

**Decision: Noted.**

**R4-2318734 Discussion on the performance requirements for IoT NTN enhancements**

*Type: discussion For: Discussion  
 Source: Qualcomm India Pvt Ltd*

**Decision: Noted.**

**R4-2319749 Discussion on demodulation requirements for IoT-NTN enhancements**

*Type: discussion For: Discussion  
 Source: Ericsson*

**Abstract:**

This contribution discusses the UE and SAN demodulation requirements for Rel-18 IoT-NTN enhancements.

**Decision: Noted.**

**R4-2319847 View on SAN demodulation requirement for Rel-18 IoT over NTN**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2320229 Discussion on demodulation performance requirements for IoT NTN enhancement**

*Type: discussion For: Discussion  
 Source: Huawei,HiSilicon*

**Decision: Noted.**

#### 9.6.7 Moderator summary and conclusions

**R4-2318224 Topic summary for [109][332] IoT\_NTN\_Demod**

*Type: other For: Information  
 Source: Moderator (MediaTek)*

**Abstract:**

[109][300] BDaT Session AI 6.2.4.1.4, 9.6.6

**Decision: Noted.**

**Issue 1: Work plan**

|  |
| --- |
| **UE Demodulation performance part (36.102)**   * **November, 2023 (RAN4#109)**   + Approve the work plan.   + Discuss UE demodulation requirements for IoT-NTN enhancement.   + Discuss simulation assumptions. * **February 2024 (RAN4#110)**   + Continue discussion on UE demodulation requirements for IoT-NTN enhancement.   + Agree on simulation assumptions.   + Discuss possible work split for the CR work, if needed. * **April 2024 (RAN4#110bis)**   + Collect the simulation results.   + Provide CR/Draft CR based on work split and discuss CRs/Draft CRs. * **May 2024 (RAN4#111)**   + Update simulation assumptions if necessary.   + Finalize CRs and close the performance part.   **SAN Demodulation performance part (36.108)**   * **November, 2023 (RAN4#109)**   + Approve the work plan.   + Discuss SAN demodulation requirements for IoT-NTN enhancement.   + ~~Discuss simulation assumptions.~~ * **~~February 2024 (RAN4#110)~~**   + ~~Continue discussion on SAN demodulation requirements for IoT-NTN enhancement.~~   + ~~Agree on simulation assumptions.~~   + ~~Discuss possible work split for the CR work, if needed.~~ * **~~April 2024 (RAN4#110bis)~~**   + ~~Collect the simulation results.~~   + ~~Provide CR/Draft CR based on work split and discuss CRs/Draft CRs.~~ * **~~May 2024 (RAN4#111)~~**   + ~~Update simulation assumptions if necessary.~~   + ~~Finalize CRs and close the performance part.~~ |

Online:

Ericsson: The work plan depends on the scope of the work. If no requirements are needed, then the work plan can be shortened.

Agreement: Work plan above is agreed assuming requirements will be defined. If it is later agreed that requirements will not be defined, then the work plan can be revised accordingly. SAN part can be removed since it was agreed not to define SAN requirements.

**Issue 2-1: Whether to define PDSCH requirements with HARQ disabled?**

* Proposals
  + Option 1 (Nokia, QC): Yes
  + Option 2 (MTK, Ericsson, HW): No
* Recommended WF
  + Moderator recommends discussing this issue first.
    - Nokia: Disabling of HARQ will impact PDSCH performance.
    - MTK: The operation of disabled HARQ feedback is to turn off the ACK/NACK for HARQ process. It is kind of some functionality and not related to the UE demodulation performance.
    - Huawei: No impact on demodulation since only HARQ feedback is different comparing to the legacy procedure.

Online:

Ericsson: We don’t believe requirements are needed for HARQ disabled. For Rel-17 NR NTN, the difference is the large number of HARQ processes of 16 or 32. For IoT, there are only 2 HARQ processes. It will be difficult to calculate throughput with small number of HARQ compared to disabled.

Qualcomm: The test is not about performance, but rather about functionality that the UE can operate with HARQ processes disabled. For CatM can support up to 4 HARQ processes. We are concerned if the UE is not tested with HARQ disabled, then it would only be tested with HARQ and we wouldn’t know the behavior with HARQ disabled.

MTK: How to verify? There is no ACK/NAK with HARQ disabled.

Qualcomm: We recognize this problem and were considering CatM where there is more flexibility to disable some HARQ processes and measure the throughput on others.

Ericsson: 2 HARQ is the maximum for Cat M CE mode B. Disabling is only applicable to CE mode B. RAN1 decided HARQ disabling is not applicable to CE mode A.

Nokia: We are ok to not define the requirements after hearing Ericsson’s explanation.

Qualcomm: We would like more time to consider. Why do we even have this WI if no requirements will be defined?

**Issue 3-1: Whether to define PUSCH requirements with HARQ disabled**

* Proposals
  + Option 1 (Nokia, Samsung): Yes
    - Option 1a (Samsung):
      * eMTC PUSCH CE mode A
      * eMTC PUSCH CE mode B
      * NPUSCH format 1 with 15KHz, 12 tones
      * NPUSCH format 1 with 3.75KHz, 1 tone
  + Option 2 (Ericsson, Huawei): No

Online:

Ericsson: We would like to understand why requirements are needed. HARQ disabled feature is only for DL, so no impact to UL.

Samsung: UE would not feedback ACK/NAK so could impact UL side since HARQ A and B were defined in Rel-17.

Nokia: We are ok with option 2.

Ericsson: The HARQ A and B are related to timing to receive the PDCCH on the UE so do not expect demodulation performance impact.

Samsung: Without the UE retransmission, the performance might be different

Huawei: Agree with Ericsson, there is no impact

Samsung: Since all companies do not support requirement, we can compromise and accept not to have requirement for PUSCH with HARQ disabled.

Agreement: Do not define PUSCH requirements with HARQ disabled

**Maintenance for IoT-NTN demodulation requirements**

* SAN demod:
  + The simulation results in R4-2319848 and R4-2320228 are the same as pervious meeting. RAN4 can discuss whether to remove brackets in this meeting.

Samsung: The WI finished in RAN4 #108 but only 3 companies had provided results and so we added margin and brackets. We prefer to keep the brackets for now to give further time. We provided simulation results but the results are not very well aligned, so we’d like to take some more time to find a better approach.

Ericsson: The results provided were the same as last meeting.

Samsung: During the period before the next meeting, companies can work offline to align the results.

[**R4-2321145**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321145.zip) **WF on [109][332] IoT\_NTN\_Demod**

*Type: other For: Approval  
 Source: MediaTek*

**Decision: Approved.**

### 9.7 Enhanced LTE Support for UAV

## 10 Rel-18 feature list

## 11 Liaison and output to other groups

### 11.1 R18 related

#### 11.1.1 LS on combination of HST and RRM relaxation (R2-2311435)

#### 11.1.2 LS on the CA Aggregated BW capability signaling by the UE (R2-2311440)

### 11.2 R17 related

#### 11.2.1 Applicability of pre-configured measurement gaps for RedCap UE (R3-233478)

#### 11.2.2 Monitoring of paging occasions for CG-SDT with HD-FDD Redcap UEs (R2-2304562)

#### 11.2.3 LS on CG-SDT RRM test procedure (R5-235340)

#### 11.2.4 Reply LS on monitoring of paging occasions for CG-SDT with HD-FDD Redcap UEs (R2-2311424)

#### 11.2.5 Power class related topics

#### 11.2.6 Others

### 11.3 R15, R16 related

#### 11.3.1 LS on RRM test cases with testability issues (R5-233782)

#### 11.3.2 LS on SRS antenna switching for TDD-FDD band combinations (R1-2308582)

#### 11.3.3 Reply LS on intraBandENDC-Support (R2-2308855)

#### 11.3.4 Reply LS on update for “interBandMRDC-WithOverlapDL-Bands-r16” in 38.306 (R2-2309218)

#### 11.3.5 Reply LS on report quantity parameter setting for CQI reporting with 1Tx (R1-2310649)

#### 11.3.6 Reply LS on power scaling and PHR in 38.213 (R1-2310555)

#### 11.3.7 Others

### 11.4 Moderator summary and conclusions

## 12 RAN task

### 12.1 NTN testing work for NGSO deployments

**R4-2318072 CR on clarification on test condition for IoT NTN**

*Type: CR For: Agreement  
 36.133 v18.3.1 CR-7255 rev Cat: F (Rel-18)  
  
 Source: MediaTek inc., Samsung, Qualcomm*

**Decision: Revised to R4-2321035 (from R4-2318072).**

[**R4-2321035**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321035.zip) **CR on clarification on test condition for IoT NTN**

*Type: CR For: Agreement  
 36.133 v18.3.1 CR-7255 rev Cat: F (Rel-18)  
  
 Source: MediaTek inc., Samsung, Qualcomm*

**Decision: Revised to R4-2321186 (from R4-2321035).**

[**R4-2321186**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321186.zip) **CR on clarification on test condition for IoT NTN**

*Type: CR For: Agreement  
 36.133 v18.3.1 CR-7255 rev Cat: F (Rel-18)  
  
 Source: MediaTek inc., Samsung, Qualcomm*

**Decision: Agreed.**

**R4-2318396 [NR\_NTN\_solutions-Perf] CR to TS 38.133 Annex for NTN test condition (CAT F, Rel-17)**

*Type: CR For: Agreement  
 38.133 v17.11.0 CR-3666 rev Cat: F (Rel-17)  
  
 Source: Samsung, MediaTek, Qualcomm*

**Decision: Revised to R4-2321033 (from R4-2318396).**

[**R4-2321033**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321033.zip) **[NR\_NTN\_solutions-Perf] CR to TS 38.133 Annex for NTN test condition (CAT F, Rel-17)**

*Type: CR For: Agreement  
 38.133 v17.11.0 CR-3666 rev Cat: F (Rel-17)  
  
 Source: Samsung, MediaTek, Qualcomm*

**Decision: Agreed.**

**R4-2318397 [NR\_NTN\_solutions-Perf] CR to TS 38.133 Annex for NTN test condition (CAT A, Rel-18)**

*Type: CR For: Agreement  
 38.133 v18.3.0 CR-3667 rev Cat: A (Rel-18)  
  
 Source: Samsung*

**Decision: Agreed.**

**R4-2318399 Rel-17 NTN UE conformance test issues**

*Type: discussion For: Discussion  
 Source: Samsung*

**Decision: Noted.**

**R4-2318441 CR to 38.101-5 on clarification for non-zero Doppler condition for frequency error**

*Type: CR For: Agreement  
 38.101-5 v17.5.0 CR-0041 rev Cat: F (Rel-17)  
  
 Source: Apple, Ericsson*

**Decision: Revised to R4-2321032 (from R4-2318441).**

[**R4-2321032**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_109/Inbox/R4-2321032.zip) **CR to 38.101-5 on clarification for NR NTN UE RF and Demod requirements test conditions**

*Type: CR For: Agreement  
 38.101-5 v17.5.0 CR-0041 rev Cat: F (Rel-17)  
  
 Source: Apple, Ericsson, Samsung, MediaTek*

**Decision: Agreed.**

Ericsson: Unsure about activation and deactivation of precompensation. Prefer to deactivate precompensation now, but we can accept if there are concerns related to testing.

Ericsson: The UE currently does not need to deactivate precompensation in Rel-18 because of constant zero doppler condition. In Rel-19 the UE needs to deactivate precompensation to fulfil Rel-18 requirement.

MTK: For now, the CR is ok. The concern is related to future release.

Chair: Is there a Rel-18 Cat A CR?

**R4-2318442 CR to 38.101-5 on clarification for NR NTN UE RF and Demod requirements test conditions**

*Type: CR For: Agreement  
 38.101-5 v18.3.0 CR-0042 rev Cat: A (Rel-18)  
  
 Source: Apple, Ericsson, Samsung, MediaTek*

**Decision: Agreed.**

**R4-2320549 On NTN frequeny error test**

*Type: other For: Approval  
 Source: Ericsson*

**Abstract:**

in this paper, we provide our view on RAN task on frequency error test

**Decision: Noted.**

**R4-2320975 Summary of SIB19/SIB31 parameters for NGSO and GSO NTN UE/NTN IoT testing**

*Type: discussion For: Information  
 Source: THALES*

**Abstract:**

This document presents examples of ephemeris generation and related examples of Doppler and Delay values. Please also refer to R5-237216 (THALES, “NGSO satellite Ephemeris file generation methodology for NTN NR UE testing”) and R5-237213 (THALES, “GSO sat

**Decision: Noted.**

**R4-2318229 Topic summary for [108][337] RAN\_task\_NTN\_test**

*Type: other For: Information  
 Source: Moderator (MediaTek)*

**Abstract:**

[109][300] BDaT Session AI 12.1

**Decision: Noted.**

## 13 Revision of the Work Plan

## 14 Any other business

## 15 Close of the meeting