**3GPP TSG RAN meeting #103 RP-240063**

**Maastricht, Netherlands, March 18-21, 2024**

## Status Report to TSG

**Agenda item:** 9.4.4.1

|  |  |
| --- | --- |
| **WI / SI Name** | NR support for dedicated spectrum less than 5MHz for FR1 |
| included in this status report | Study Item: No | Core part: No | Performance part:Yes | Testing part:No |
| **Acronym** | NR\_FR1\_lessthan\_5MHz\_BW-Perf |
| **Unique ID** | 941212 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-233963 |
| **Target Completion Date****(indicate if changed)** | Study Item:  | Core part:  | Performance part: 06/2024 | Testing part:  |
| **Overall Completion level** | Study Item:  | Core part:  | Performance Part: 70% | Testing part:  |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN4 |
| **Rapporteur** | **Name** | Man Hung Ng |
| **Company** | Nokia |
| **Email** | man\_hung.ng@nokia.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

#### 2.1.2 Remaining Open issues

## 2.2 RAN2

#### 2.2.1 Agreements

#### 2.2.2 Remaining Open issues

## 2.3 RAN3

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

#110 RRM

6 contributions on performance requirements were submitted and summarized in [1].

AH minutes for coffee break discussion was approved in [2].

WF on RRM requirements for NR support for dedicated spectrum less than 5MHz was approved in [3].

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Agreement:**- **Issue 2-2:** **existing SSB based L3 and L1 accuracy requirements applies for less than 5MHz BW UE?*** Existing SSB based L3 and L1 accuracy requirements applies for less than 5MHz BW UE.

**Issue 2-3: further discuss introducing following two types of UEs for specifying test cases for UE capable of operating in LessThan 5 MHz.**No company anymore propose to introduce two types of UE (moderator observation)**Way Forward*** Assume Type 1 UE as a working assumption and RAN4 will specify test cases assuming UE supporting less than 5 MHz CBW may also support other Channel Band widths (CBW).

**Way Forward:**Following grouped Issues will be handled under the detailed test case discussion and setup discussed in the test case list table. Hence, discussion related to following issues is moved to ‘**Way forward**: Further discuss following TC list’ and these issues are closed:Grouped issues:* Issue 2-1: a UEs supporting 12 RB bandwidth also shall support 15 RB bandwidth configuration?
* New Issue: No need to specify additional test cases for 5 MHz UE (MTK)
* New issue: Define the test cases for RRM performance with 15PRB BW configuration (Qualcomm)
* Issue 2-7: For RLM test cases?
	+ Proposals
	+ Option 1: use 12 RB and 15 RB as Tx BW for corresponding new TCs for 3MHz CBW, and use 20 RB as Tx BW for corresponding new TCs for 5MHz CBW. (Huawei)
* Issue 2-9: For BFD test cases?
	+ Proposals
	+ Option 1: use 12 RB and 15 RB as Tx BW for corresponding new TCs for 3MHz CBW, and use 20 RB as Tx BW for corresponding new TCs for 5MHz CBW. (Huawei)
* Issue 2-11: Should the 12 PRB test cases be included as a sub-test case instead of independent test cases?

**Way Forward:**As Issue 2-3 is closed (only one type of UE) following issues are closed:* **Issue 2-5: Introduction HO test cases ~~for UE type 1 and 2 as mentioned in subtopic 2-3~~?**
* **Issue 2-6: Introduction of RLM test cases ~~for UE type 1 and 2 as mentioned in subtopic 2-3~~? Issue 2-8: Introduction of BFD and CBD test cases ~~for UE type 1 and 2 as mentioned in subtopic 2-3~~?**
* **Issue 2-10: Introduction of measurement delay with index reading test cases ~~for UE type 1 and 2 as mentioned in subtopic 2-3~~?**

**Agreement:*** Introduce at least following test cases:
	+ HO test cases
	+ RLM test cases
	+ BFD and CBD test cases
	+ measurement delay with index reading test cases
* Detailed list will be captured in the table.

**Way Forward:**Further discuss Issue 2-13: define new RMC table for PDSCH, RMSI, and UE specific PDCCH?**Way Forward:**Further discuss Issue 2-14: define new OCNG table which is similar as legacy table?**Way Forward:**Further discuss Issue 2-15: Io values should be used for 2.16 MHz and 2.7 MHz. New Io values to be discussed during CR phase?**Way forward**: Further discuss following TC list:* Please fill in the company view regarding the proposed TC list.
* Based on the company views moderator will suggest final verdict: Support/Not support

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TC# | Description | Company supporting | Company not supporting | Agreement: [FFS, Support or Not support] |
| Cell reselection |  | Qualcomm: Are there any enhancements here? |  |
| 1 | Intra-frequency cell reselection in IDLE mode | Huawei | Qualcomm, MTK | FFS |
| RRC Re-establishment |  | Qualcomm: Are there any enhancements here? |  |
| 2 | RRC Re-establishment, Intra-frequency | Huawei | Qualcomm, MTK | FFS |
| RLM |  |  |  |
| Moderator  | Moderator suggest:Use 12 PRB and 15 PRB in the RLM tests.(15 and 20 PRBs will be used in BFD and link recovery | Nokia: * 12 PRB, 15 PRB and 20 PRB PDCCH BWs should have at least one test covering them

Huawei: same view as Nokia |  |
| RLM-1 | Radio Link Monitoring (SSB-based, FR1):Test 1* DRX
* Out-of-sync
* 12 PRBs
 | Nokia, Ericsson, HW, MTK: Fine to add this to allow 12 PRB testing | Qualcomm | FFS |
| RLM-2 | Radio Link Monitoring (SSB-based, FR1):Test 2* DRX
* In-sync
* 12 PRBs
 | Nokia, Ericsson, HW, MTK: Fine to add this to allow 12 PRB testing | Qualcomm | FFS |
| RLM-3 | Radio Link Monitoring (SSB-based, FR1):Test 3* Non-DRX
* Out-of-sync
* 15 PRBs
 | NokiaQualcommEricssonHWMTK |  | Agreed, Support |
| RLM-4 | Radio Link Monitoring (SSB-based, FR1):Test 4* Non-DRX
* In-sync
* 15 PRBs
 | NokiaQualcommEricssonHWMTK |  | Agreed, Support |
| BFD |  |  |  |
| Moderator  | Moderator suggest:Use 12 PRB and 15 PRB in the RLM tests.(15 and 20 PRBs will be used in BFD and link recovery | NokiaQualcomm: Any UE that supports less than 5 MHz operation has to mandatorily support 15PRB CORESET0, 12PRB is only for n100 band. Furthermore, 15PRB is a stricter test case. A UE that passes 15PRB test case can pass 12 PRB test case as well. So, there is no need for the UE to pass two test-cases. Also we don’t specify channel frequency in RRM test cases, so there’s no way to specify that a particular test case is applicable only for a particular frequency.HW: AL is different for 12 and 15 RB and it lead to different Qout levels. Limited number of TC is reasonable |  |
| BFD-1 | BFD and link recovery (SSB-based, FR1):Test 1* DRX
* 15 PRB
 | NokiaQualcommEricssonHWMTK |  | Agreed, Support |
| BFD-2 | BFD and link recovery (SSB-based, FR1):Test 1* Non DRX
* 20 PRB
 | NokiaHW | QualcommMTK: no need because it tested in 15PRB and 12 PRBs of RLM OOS | FFS |
| Event triggered reporting |  | Qualcomm: HW: one TC for intra-f without gap, one TC for inter-f with gap |  |
| Moderator  | Moderator:For measurement requirements RAN4 agreed following new requirements:Index reading requirements were relaxed for:- intra-f- inter-fFor both cases:- without gaps- with gapsFor:Time period for time index detection (Frequency range FR1) [for a target cell with 12 or 15 PRB SSB |  |  |
| Event-1 | SA event triggered reporting, SSB based, Time period for time index detection:* Intra-frequency
* non-DRX,
* no gaps,
* 15 PRBs
 | NokiaQualcommEricssonHW,MTK |  | Agreed, Support |
| Event-2 | SA event triggered reporting, SSB based, Time period for time index detection:* Intra-frequency
* DRX,
* no gaps,
* 12 PRBs
 |  | QualcommHWMTK | Agreed, Not support |
| Event-3 | SA event triggered reporting, SSB based, Time period for time index detection:* Inter-frequency
* Non-DRX,
* gaps,
* 12 PRBs
 | Nokia* n100 specific

Ericsson | QualcommThere is no way to specify carrier frequency in RRM test cases.HW,MTK | FFS |
| Event-4 | SA event triggered reporting, SSB based, Time period for time index detection:* Inter-frequency
* DRX,
* gaps,
* 15 PRBs
 | NokiaQualcommEricssonHW,MTK |  | Agreed, Support |
| Handover |  |  |  |
|  | Moderator:For handover RAN4 defined new requirements for unknown target cell (intra-f and inter-f). <Agreement>:* Unknown intra-frequency target cell:
* [3]\*Trs ms (target cell Es/Iot≥-2 dB)
* Unknown inter-frequency target cell:
	+ Unknown intra-frequency target cell:
	+ [3]\*Trs ms (target cell Es/Iot≥-2 dB)
	+ Unknown inter-frequency target cell:
 | Nokia: In the CR we have: * If the target cell is an unknown intra-frequency cell with 12 PRB SSB bandwidth, then Tsearch = [3]\*Trs ms.
* If the target cell is an unknown inter-frequency cell with 12 PRB SSB bandwidth and, then Tsearch = [5] \*Trs ms

Both [3] and [5] should be tested at least in one test case. We can use HO-1 and HO-2 for that. Qualcomm: The delay extension is the same in both the cases. Why do we need to test the same delay extension twice?HW: we raised the issue of known cell this meeting. If it is confirmed in next meeting, we may want to change one TC to be for known case. |  |
| HO-1 | SA FR1-FR1 Handover,* Intra-frequency
* Unknown target cell
 | NokiaQualcommEricssonHW,MTK |  | Agreed, Support |
| HO-2 | SA FR1-FR1 Handover,* Inter-frequency
* Unknown target cell
 | NokiaEricsson | Qualcomm,MTK: as long as the UE passes the intra-f HO it seems obvious that the UE would pass the inter-f HO. It is just a matter of rf retuning. Besdies, this UE has already passed legacy TC, hence, selected TC is encouraged. | FFS |
| L1-RSRP reporting |  |  |  |
|  | Moderator:RAN4 agreed that existing L1 measurement accuracy applies also for LessThan-5MHz | Nokia: * Accuracy tests for L1-RSRP

Qualcomm: There are no new accuracy requirements, why do we need new test? |  |
| L1-RSRP-1 | Intra-frequency, FR1, SSB based L1-RSRP measurement when DRX is not used | Nokia | Huawei,QualcommMTK | FFS |
| L1-RSRP-2 | Intra-frequency, FR1, SSB based L1-RSRP measurement when DRX is used | Nokia | Huawei,QualcommMTK | FFS |
| MeasurementAccuracy |  |  |  |
|  | Moderator:RAN4 agreed that existing L3 measurement accuracy applies also for LessThan-5MHz | Qualcomm: There are no new accuracy requirements, why do we need new test? |  |
| L3-Meas-1 | SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell | Ericsson, Nokia | QualcommHW,MTK | FFS |
| L3-Meas-2 | SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell | Ericsson, Nokia | QualcommHW,MTK | FFS |

 |

#110 Demodulation

13 contributions on UE demodulation and 8 contributions on BS demodulation were submitted and summarized in [4].

Ad-hoc meeting minutes was noted in [5].

WF on NR\_FR1\_lessthan\_5MHz\_BW\_demod was approved in [6].

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Topic#1: UE DemodSub-topic#1-1: General**Issue 1-1-1: CR work split****Way forward:*** Use the table below to decide about the CR work split:

|  |  |  |
| --- | --- | --- |
| **Section** | **Requirements** | **Company** |
| 5 Demodulation performance requirements(Conducted requirements) | 5.1.1 Applicability of requirements | Apple |
| 5.3 PDCCH demodulation requirements | 5.3.2 2RX requirements,5.3.2.1 FDD,5.3.2.1.x Minimum requirements for less than 5 MHz CBW | MTK |
| 5.3.3 4RX requirements5.3.3.1 FDD,5.3.3.1.x Minimum requirements for less than 5 MHz CBW |
| 5.4 PBCH demodulation requirements | 5.4.2 2RX requirements,5.4.2.1 FDD,Table 5.4.2.1-2: Minimum performance PBCH in case SS/PBCH block index is not known | QC |
| 5.4.3 4RX requirements5.4.3.1 FDDTable 5.4.3.1-2: Minimum performance PBCH in case SS/PBCH block index is not known |
| A.3 DL reference measurement channels | A.3.3 Reference measurement channels for PDCCH performanceRequirements,A.3.3.1 FDD,A.3.3.1.1 Reference measurement channels for SCS 15 kHz FR1 | Huawei |
| **BigCR to 38.101-4** | Nokia |

**Issue 1-1-3: Applicability rules****Agreement:**Create the UE demodulation requirement applicability table for UE supporting NR\_FR1\_lessthan\_5MHz\_BW.Sub-topic#1-2: PDSCH**Issue 1-2-1: Introduction of PDSCH requirements in non-HST conditions****Agreement:*** Do not introduce new PDSCH requirements for 3MHz CBW in non-HST conditions.

**Issue 1-2-2: Introduction of PDSCH requirements in HST conditions****Agreement:*** Do not introduce new PDSCH requirements for 3MHz CBW in HST conditions.

**Issue 1-2-4: SDR requirements****Agreement:*** Do not introduce new SDR requirements for 3MHz CBW

Sub-topic#1-3: PDCCH**Issue 1-3-1: PDCCH requirements for 5MHz CBW, 20 PRB****Agreement:*** Do not introduce PDCCH requirements for 5MHz CBW, 20PRB if requirements for 3MHz on punctured PDCCH are defined.

**Issue 1-3-2: Requirements for punctured PDCCH (non-HST conditions)****Agreement:*** Define punctured PDCCH demodulation requirements with 15PRBs for UE supporting NR\_FR1\_lessthan\_5MHz\_BW with the following parameters:
	+ 15PRBs, 3 symbols, non-interleaved, AL4, DCI 1\_0 (35 bits for 15 PRBs), 2Rx/4Rx;
	+ Use CCEs #4, #5, #6, and #7 to transmit PDCCH with DCI 1\_0

**Way forward:*** Consider the following requirements’ parameters:
	+ Reuse Table 5.3-1: Common test Parameters and Table 5.3.2.1-1: Test Parameters for FDD for 2RX and Table 5.3.3.1-1: Test Parameters for 4RX for the FR1 less than 5MHz PDCCH requirements.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of Tx** | **Bandwidth (MHz)** | **CORESET RB** | **CORESET duration** | **Aggregation level** | **Reference Channel** | **Propagation Condition** | **Antenna configuration and correlation Matrix** | **Reference value** |
| **Pm-dsg (%)** | **SNR (dB)** |
| 1 | 3  | 15 | 3 | 4 | [R.PDCCH. 1-2.x FDD] | TDLA30-10 | 1x2 Low | 1 | [TBA] |
| 2 | 3 | 15 | 3 | 4 | [R.PDCCH. 1-2.x FDD] | TDLC300-100 | 2x2 Low | 1 | [TBA] |
| 1 | 3 | 15 | 3 | 4 | [R.PDCCH. 1-2.x FDD] | TDLA30-10 | 1x4 Low | 1 | [TBA] |
| 1 | 3 | 15 | 3 | 4 | [R.PDCCH. 1-2.x FDD] | TDLC300-100 | 2x4 Low | 1 | [TBA] |

* Further discuss whether to define requirements with 1TX and/or 2TX.

**Issue 1-3-3: PDCCH requirements in HST conditions**Way forward:Further discussion is needed:* Option 1: Introduce PDCCH requirements at 3MHz CBW in HST conditions.
* Option 2: Not to introduce HST scenario for PDCCH requirements.

Sub-topic#1-4: PBCH**Issue 1-4-3: PBCH requirement in HST conditions****Agreement:*** Not to introduce HST scenario for PBCH requirements.

Topic#2: BS DemodSub-topic#2-1: General**Issue 2-1-1: CR work split****Way forward:*** Use the table below to decide about the CR work split:

|  |  |  |
| --- | --- | --- |
| **Section** | **Requirements** | **Company** |
| **BigCR to TS 38.104** | Nokia |
| 8 Conducted performance requirements,8.3 Performance requirements for PUCCH | 8.3.4 Performance requirements for PUCCH format 2 |
| **BigCR to TS 38.141-1** | Ericsson |
| 8 Conducted performance characteristics8.1.2 Applicability rule: | 8.1.2.2 Applicability of PUCCH performance requirements8.1.2.3 Applicability of PRACH performance requirements | ZTE |
| 8 Conducted performance requirements,8.3 Performance requirements for PUCCH | 8.3.3 Performance requirements for PUCCH format 2 | Ericsson |
| **BigCR to TS 38.141-2** | Samsung |
| 8 Radiated performance requirements8.1.2 Applicability rule | 8.1.2.2 Applicability of PUCCH performance requirements8.1.2.3 Applicability of PRACH performance requirements | ZTE |
| 8 Radiated performance requirements8.3 OTA performance requirements for PUCCH | 8.3.3 Performance requirements for PUCCH format 2 | Samsung |

**Issue 2-1-2: Manufacturer declaration for 3MHz CBW****Agreement:*** Reuse existing declarations (D.14 “NR supported channel bandwidths and SCS in TS 38.141-1” and D.7 “BS channel band width and SCS support” in TS 38.141-2 in Table 4.6-1) for less than 5 MHz CBW.

Sub-topic#2-2: PUSCH requirements**Issue 2-2-1: A need for PUSCH requirements with less than 5MHz CBW****Agreement:*** Don’t define PUSCH requirements with 3MHz bandwidth (both in HST and non-HST conditions)

**Issue 2-2-7: A need for UL timing adjustment requirement with UE speed up to 500 km/h****Agreement:*** Do not define new 3MHz requirements on UL TA in HST conditions.

Sub-topic#2-3: PUCCH requirements**Issue 2-3-1: Introduction of PUCCH requirements for formats other than 2****Agreement:*** Only introduce new demodulation requirement for PUCCH format 2 with 3MHz CBW.

**Issue 2-3-2: Applicability rules****Agreement:*** An Applicability rule shall be introduced into TS 38.141-1/2 to enable a base station declaring to support less than 5MHz to conduct a new UCI BLER performance test with only Format 2 for PUCCH, and skip the corresponding legacy 5MHz PUCCH Format 2 test.

Sub-topic#2-4: RACH requirements**Issue 2-4-1: Applicability rule for RACH sequences****Agreement:*** For BS supporting less than 5MHz carrier bandwidth, only test requirements relating to RACH preamble formats with 15kHz SCS with sequence length LRA=139, and PRACH formats with 1.25kHz SCS with sequence length LRA=839 shall apply.
 |

#### 2.4.2 Remaining Open issues

Specify necessary UE/BS performance requirements for NR operation in dedicated FDD FR1 spectrum allocations from approximately 3MHz up to below 5MHz, corresponding to the core requirements:

* Specify necessary RRM performance requirements (RAN4)
* Specify necessary UE demodulation performance and CSI reporting requirements (RAN4)
* Specify necessary BS demodulation performance requirements (RAN4)
* Specify necessary BS conformance tests (RAN4)

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

[1] R4-2400752, “Topic summary for [110][216] NR\_FR1\_lessthan\_5MHz\_BW”, Moderator (Nokia).

[2] R4-2403486, “AH minutes for coffee break on NR\_FR1\_lessthan\_5MHz\_BW”, Nokia.

[3] R4-2403487, “WF on NR\_FR1\_lessthan\_5MHz\_BW”, Nokia.

[4] R4-2402658, “Topic summary for [110][318] NR\_FR1\_lessthan\_5MHz\_BW\_demod”, Moderator (Nokia, Nokia Shanghai Bell).

[5] R4-2403006, “Ad-hoc meeting minutes for [110][318] NR\_FR1\_lessthan\_5MHz\_BW\_demod”, Nokia.

[6] R4-2402863, “Way forward on [110][318] NR\_FR1\_lessthan\_5MHz\_BW\_demod”, Nokia.

 02.08.2023 minor adaptations for RAN #101

 26.04.2023 minor adaptations for RAN #100

 01.02.2023 minor adaptations for RAN #99

 27.10.2022 minor adaptations for RAN #98e

 01.08.2022 minor adaptations for RAN #97e

 21.05.2022 minor adaptations for RAN #96

 10.01.2022 minor adaptations for RAN #95e

 04.10.2021 minor adaptations for RAN #94e

 08.08.2021 minor adaptations for RAN #93e

 17.05.2021 minor adaptations for RAN #92e

 28.01.2021 minor adaptations for RAN #91e

 09.11.2020 minor adaptations for RAN #90e

 31.08.2020 minor adaptations for RAN #89e

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

 21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template