**3GPP TSG RAN WG1 #109-e R1-2nnnnn**

**e-Meeting, May 9th – 20th, 2022**

**Source: Ad-Hoc Chair (AT&T)**

**Title: Session Notes of AI 8.16.1**

**Agenda Item:** **8.16.1**

**Document for:** **Endorsement**



#### 8.16.1 UE features for further enhancements on NR-MIMO

[109-e-R17-UE-features-MIMO-01] Email discussion on UE features for further enhancements on NR-MIMO – Ralf (AT&T)

* 1st check point for LS to RAN2: May 13
* Final check point for any remaining issues: May 20

**Agreement: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 23. NR\_FeMIMO | 23-1-1b | Unified TCI with joint DL/UL TCI update for intra- [and inter-cell] beam management with more than one MAC-CE activated joint TCI state per CC | 1. TCI state indication ~~[mode]:~~ for update and activation ~~[in case of updates]~~ b) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 with DL assignment) c) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 without DL assignment) 2. ~~[~~The minimum beam application time ~~between PUCCH of ACK and the first slot~~ in Y symbols per SCS~~]~~ 3. The maximum number of MAC-CE activated joint TCI states per CC ~~[~~in a band~~] [in a band combination]~~ 4. ~~[The minimum time gap between the beam indication PDCCH and first slot where beam is applied]~~ | 23-1-1 | Yes |  | Unified TCI with joint DL/UL TCI update for intra- [and inter-cell] beam management with more than one MAC-CE activated joint TCI state per CC is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {1, 2, 4, 7, 14, 28, 42, 56, 70, 84, 98, 112, 224, 336}, where {84, 98, 112, 224, 336 } only can be indicated in FR2  Component 3 candidate values: ~~[~~{2,3,4,5,6,7,8 ~~…~~}~~]~~  Note: The maximum number of MAC-CE activated joint TCI states across all CC(s) in a band for more than one MAC-CE activated joint TCI state is signaled in 23-1-1, component 5  Note: activated joint TCI state(s) include all PDCCH/PDSCH receptions and PUSCH/PUCCH | Optional with capability signalling |

* Note: Additional values for component 2 candidate values for FR 2-2 to be discussed in agenda item 8.16.2

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| 23. NR\_FeMIMO | 23-1-1 | Unified TCI with joint DL/UL TCI update for intra-cell ~~[and inter-cell]~~ beam management | 1. Joint DL/UL TCI update with their components: (configuration mechanism, QCL rules, applicable source and target signals) 2. WA: The maximum number of configured joint TCI states [per BWP per CC] [in a band] [in a band combination] 3. One MAC-CE activated joint TCI state per CC [in a band] [in a band combination] 4. TCI state indication [mode]: update and activation [in case of updates]a) MAC CE based TCI state indication [for one active TCI state] 5. The maximum number of MAC-CE activated joint TCI states across all CC(s) in a band |  | Yes |  | Unified TCI with joint DL/UL TCI update for intra-cell ~~[and inter-cell]~~ beam management is not supported | Per band | n/a | n/a | n/a | FFS: how to count the MAC-CE activated joint TCI    If a UE supports FG 23-1-1k, the signalled component values [(except component 5)] also apply to inter-cell beam management | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-1-1k | Unified TCI with joint DL/UL TCI update for inter-cell beam management | 1. Support of unified TCI with joint DL/UL TCI update for inter-cell beam management  [2. Support K additional MAC-CE indicated joint TCI states in PCell [in a band] [in a band combination]]  [3. Support K additional MAC-CE activated joint TCI states across all CC(s) in a band] |  | Yes |  | Unified TCI with joint DL/UL TCI update for inter-cell beam management is not supported | Per band | n/a | n/a | n/a | FFS: a UE that supports FG 23-1-1 must also support this FG | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-1-1b | Unified TCI with joint DL/UL TCI update for intra- ~~[~~and inter-cell~~]~~ beam management with more than one MAC-CE activated joint TCI state per CC | 1. TCI state indication for update and activation  b) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 with DL assignment) c) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 without DL assignment) 2. The minimum beam application time in Y symbols per SCS 3. The maximum number of MAC-CE activated joint TCI states per CC in a band | 23-1-1 | Yes |  | Unified TCI with joint DL/UL TCI update for intra- ~~[~~and inter-cell~~]~~ beam management with more than one MAC-CE activated joint TCI state per CC is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {1, 2, 4, 7, 14, 28, 42, 56, 70, 84, 98, 112, 224, 336}, where {84, 98, 112, 224, 336 } only can be indicated in FR2  Component 3 candidate values: {2,3,4,5,6,7,8}  Note: The maximum number of MAC-CE activated joint TCI states across all CC(s) in a band for more than one MAC-CE activated joint TCI state is signaled in 23-1-1, component 5  Note: activated joint TCI state(s) include all PDCCH/PDSCH receptions and PUSCH/PUCCH | Optional with capability signalling |

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| 23. NR\_FeMIMO | 23-1-2 | Inter-cell beam measurement and reporting ~~[~~(for inter-cell BM ~~[~~and mTRP~~]~~)~~]~~ | 1. Support of L1-RSRP measurement and reporting on SSB(s) with PCI(s) different from serving cell PCI  2. Support of up to K~~[=4]~~ SSBRI-RSRP ~~[~~pairs~~/beams]~~ in one report ~~[~~where ~~at least one~~ a ~~[~~pair~~/beam]~~ is associated with a PCI different from serving cell PCI can be reported~~]~~ ~~(FFS: if K is a component candidate value)~~  3. The maximum number of ~~[~~RRC-configured~~]~~ PCI(s) different from serving cell PCI for L1-RSRP measurement~~]~~ ~~(FFS: whether to split this for FR1 and FR2) (FFS: whether/how to capture different values/behaviors for periodic/aperiodic/semi-persistent L1-RSRP measurement)~~  4. The max number of SSB resources configured to measure L1-RSRP within a slot with PCI(s) same as or different from serving cell PCI ~~[~~across all CC~~]~~  [5. The max number of SSB resources configured to measure L1-RSRP with PCI(s) same as or different from serving cell PCI [across all CC]]  ~~[6. Support on that SSB(s) with PCI(s) different from serving cell PCI configured for L1 beam measurement and report are not included in SSBs with PCIs configured for L3 mobility measurement]~~  ~~[7. Supported mode inter-cell measurement: {inside SMTC, both inside and outside SMTC}]~~  ~~[8. Supported mode of measurement over overlapped SSBs: {overlapped, both overlapped and non-overlapped}]~~  ~~[9. Maximum number of overlapped SSBs in one SSB resource for L1-RSRP measurement]~~ | ~~[2-24, 2-29]~~ | Yes |  | Inter-cell beam measurement and reporting ~~[~~(for inter-cell BM ~~[~~and mTRP~~]~~)~~]~~ is not supported | per band | n/a | n/a | n/a | Component 3 candidate values: {1, 2, 3, 4, 5, 6, 7}  Component 4 candidate values: {1, 2, 4, 8}  Note: K is equal to *maxNumberNonGroupBeamReporting*  ~~[~~Note: ~~Whether~~ component 4 [and/or 5 are/is] also counted in FG16-1g/16-1g-1~~]~~ | Optional with capability signalling |

**Agreement: Introduce the following new FGs**

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| 23. NR\_FeMIMO | 23-10-1 | Unified TCI with separate DL/UL TCI update for intra- [and inter-] cell beam management | 1. Separate DL/UL TCI update with their components: (configuration mechanism, QCL rules, applicable source and target signals) 2. The maximum number of configured DL TCI states [across all CC in a band/ per BWP per CC] 3. The maximum number of configured UL TCI states [across all CC in a band/ per BWP per CC] 4. One MAC-CE activated DL TCI state per CC in a band 5. One MAC-CE activated UL TCI state per CC in a band 6. TCI state indication for update and activationa) MAC CE based TCI state indication for one active DL/UL TCI state 7. The maximum number of MAC-CE activated DL TCI states across all CC(s) in a band 8. The maximum number of MAC-CE activated UL TCI states across all CC(s) in a band | 23-1-1 | Yes |  | Unified TCI with separate DL/UL TCI update for intra- [and inter-] cell beam management is not supported | per band | n/a | n/a | n/a |  | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-10-1b | Unified TCI with separate DL/UL TCI update for intra- and inter-cell beam management with more than one MAC-CE activated separate TCI state per CC | 1. TCI state indication for update and activation b) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 with DL assignment) c) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 without DL assignment) 2. The minimum beam application time between PUCCH of ACK and the first slot in Y symbols per SCS 3. The maximum number of MAC-CE activated DL TCI states per CC in a band 4. The maximum number of MAC-CE activated UL TCI states per CC in a band |  | Yes |  | Unified TCI with separate DL/UL TCI update for intra- and inter-cell beam management with more than one MAC-CE activated separate TCI state per CC is not supported | per band | n/a | n/a | n/a |  | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-10-1e | TCI state pool configuration with DL/UL-TCI pool sharing for CA mode | 1. Support of reference BWP/CC configured with reference TCI state pool shared by a set of BWP/CC 2. The maximum number of configured DL TCI state pools across all BWPs and all CCs in a band 3. The maximum number of configured UL TCI state pools across all BWPs and all CCs in a band |  | Yes |  | TCI state pool configuration with DL/UL-TCI pool sharing for CA mode is not supported | per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 23. NR\_FeMIMO | 23-10-1b | Unified TCI with separate DL/UL TCI update for intra- ~~and inter-~~cell beam management with more than one MAC-CE activated separate TCI state per CC | 1. TCI state indication for update and activation b) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 with DL assignment) c) MAC-CE+DCI-based TCI state indication (use of DCI formats 1\_1/1\_2 without DL assignment) 2. The minimum beam application time ~~between PUCCH of ACK and the first slot~~ in Y symbols per SCS 3. The maximum number of MAC-CE activated DL TCI states per CC in a band 4. The maximum number of MAC-CE activated UL TCI states per CC in a band | 23-10-1 | Yes |  | Unified TCI with separate DL/UL TCI update for intra- ~~and inter-~~cell beam management with more than one MAC-CE activated separate TCI state per CC is not supported | per band | n/a | n/a | n/a | If a UE supports FG 23-10-1m, the signalled component values also apply to inter-cell beam management | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-10-1m | Unified TCI with separate DL/UL TCI update for inter-cell beam management with more than one MAC-CE activated separate TCI state per CC | Support of unified TCI with separate DL/UL TCI update for inter-cell beam management with more than one MAC-CE activated separate TCI state per CC  [2. Support K additional MAC-CE activated DL TCI states in PCell [in a band] [in a band combination]]  [3. Support K additional MAC-CE activated UL TCI states per CC in a band [in a band combination]]  [4. Support K additional MAC-CE activated DL TCI states across all CC(s) in a band [in a band combination]]  [5. Support K additional MAC-CE activated UL TCI states across all CC(s) in a band [in a band combination]] | 23-10-1 | Yes |  | Unified TCI with separate DL/UL TCI update for inter-cell beam management with more than one MAC-CE activated separate TCI state per CC is not supported | per band | n/a | n/a | n/a | FFS: a UE that supports FG 23-10-1 must also support this FG | Optional with capability signalling |

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| 23. NR\_FeMIMO | 23-10-1e | TCI state pool configuration with DL/UL-TCI pool sharing for CA mode | 1. Support of reference BWP/CC configured with reference TCI state pool shared by a set of BWP/CC 2. The maximum number of configured DL TCI state pools across all BWPs and all CCs in a band 3. The maximum number of configured UL TCI state pools across all BWPs and all CCs in a band | 23-10-1 | Yes |  | TCI state pool configuration with DL/UL-TCI pool sharing for CA mode is not supported | per band | n/a | n/a | n/a | FFS: a UE that supports FG 23-10-1 must also support this FG | Optional with capability signalling |
| 23. NR\_FeMIMO | 23-10-1d | Per BWP DL/UL-TCI state pool configuration for CA mode | 1. Support of DL/UL TCI state pool configuration per BWP for CA mode | 23-10-1 | Yes |  |  | per band | n/a | n/a | n/a | FFS: a UE that supports FG 23-10-1 must also support this FG | Optional with capability signalling |

**Agreement: Introduce the following new FG**

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| 23. NR\_FeMIMO | 23-10-1f | Common multi-CC DL/UL-TCI state ID update and activation with separate DL/UL TCI update | Common multi-CC DL/UL-TCI state ID update and activation | 23-10-1 | Yes |  | Common multi-CC DL/UL-TCI state ID update and activation with separate DL/UL TCI update is not supported | per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 23. NR\_FeMIMO | 23-1-1c | SCell BFR with unified TCI framework | 1. Support of SCell BFR with unified TCI framework  ~~[~~2. Maximum number of CCs configured with SCell BFR with unified TCI framework [in a band with SpCell BFR~~]~~ |  | Yes |  | SCell BFR with unified TCI framework is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {0, 1, 2, 4} | Optional with capability signalling |

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| 23. NR\_FeMIMO | 23-7-1 | Basic Features of CSI Enhancement for Multi-TRP | 1. Support of NZP CSI-RS resource pairs used as CMR (channel measurement resource) pairs for NCJT measurement hypothesis: Support of N=1 2. Maximum number of NZP CSI-RS resources in one CSI-RS resource set: Ks,max 3. CSI report mode selection of mode 1 with X=0 and/or mode 2 4. A list of supported combinations, up to 16, across all CCs simultaneously, where each combination is 5. Maximum number of Tx ports in one NZP CSI-RS resource associated with an NCJT measurement hypothesis 6. Maximum total number of CMRs for NCJT measurement 7. Maximum total number of Tx ports of NZP CSI-RS resources associated with NCJT measurement hypotheses 8. ~~[~~A list of (Y1,Y2): UE can process Y1 NCJT CSI and Y2 sTRP CSI measurement hypothesis simultaneously in a CC~~]~~ 9. ~~[~~A list of (X1,X2): UE can process X1 NCJT CSI and X2 sTRP CSI measurement hypothesis simultaneously across all CCs~~]~~ 10. Supported codebook modes for NCJT CSI |  | Yes |  | CSI Enhancement for Multi-TRP is not supported | Per band and per BC | n/a | n/a | n/a | Component 2 candidate value set: {2, 3, 4, 5, 6, 7, 8}  Component 3 candidate value set: { mode 1 with X=0, mode 2, both}  Component 4 candidate values:   1. {2, 4, 8, 12, 16, 24, 32} 2. {2,3,4 … 64} 3. {2,3,4, …, 256}   ~~[~~Component 5: The list can have maximum of 16 pairs.  - Y1: {1 to 4}  - Y2: {1 to 8}~~]~~  ~~[~~Component 6: The list can have maximum of 16 pairs.  - X1: {1 to 16}  - X2: {1 to 32}~~]~~  Component 7 candidate values: {mode 1, both mode 1 and mode 2}  ~~Note: ‘NCJT’ is not used in RAN1 specifications and will be aligned with 38.214~~ | Optional with capability signalling |

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-2-1b] | PDCCH repetition with PDCCH  monitoring on any span of up to 3 consecutive OFDM symbols of a slot | Support of PDCCH repetition for PDCCH monitoring on any span of up to 3 consecutive OFDM symbols of a slot | 3-2  23-2-1 | Yes |  | PDCCH repetition with PDCCH  monitoring on any span of up to 3 consecutive OFDM symbols of a slot is not supported |  | Per Band | n/a | FR1 only | n/a | Applicable to 15KHz SCS only | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-2-1c] | PDCCH repetition with PDCCH monitoring with a single span of three contiguous OFDM symbols that is within the first four OFDM symbols in a slot | Support of PDCCH repetition for PDCCH monitoring with a single span of three contiguous OFDM symbols that is within the first four OFDM symbols in a slot | 22-12  23-2-1 | Yes |  | PDCCH repetition with PDCCH monitoring with a single span of three contiguous OFDM symbols that is within the first four OFDM symbols in a slot is not supported |  | Per UE | No | FR1 only | No | Applicable to 15KHz SCS only | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-2-1d] | PDCCH repetition for Case 2 PDCCH monitoring with a span gap | 1. Support of PDCCH repetition for PDCCH monitoring of any occasions with span gap as defined in FG 3-5b.  2. Supported mode of PDCCH repetition  3. X per CC  4. X across all CCs | 3-5b  23-2-1 | Yes |  | PDCCH repetition for Case 2 PDCCH monitoring with a span gap is not supported |  | Per FS | n/a | n/a | n/a | This capability is necessary for each SCS.  Component2: {intra-span, inter-span, both}  Component3: {4, 8, 16, 32, 64, no limit}  Component 4: {4, 8, 16, 32, 64, 128, 256, 512, no limit}  Note:   * Components 3 and 4 are reported only if UE supports inter-span PDCCH repetition. * The limit (X) is associated with the total number of linked candidates of which the first candidate is received and the second one has not been received at any given span, where “received” and “not been received” is wrt the end of the corresponding span of PDCCH candidate. * The limit X is indicated as a total count assuming count 1 for AL=1; 2 for AL=2; 4 for AL=4 or 8 or 16. | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-2-1e] | PDCCH repetition for Rel-16 PDCCH monitoring | 1. Support of PDCCH repetition with Rel-16 PDCCH monitoring capability as defined in FG 11-2 family.  2. Supported mode of PDCCH repetition  3. X per CC  4. X across all CCs | 11-2  23-2-1 | Yes |  | PDCCH repetition for Rel-16 PDCCH monitoring is not supported |  | Per FS | n/a | n/a | n/a | This capability is signalled for SCS 15 kHz and 30 kHz.  Component2: {intra-span, inter-span, both}  Component3: {4, 8, 16, 32, 64, no limit}  Component 4: {4, 8, 16, 32, 64, 128, 256, 512, no limit}  Note:   * Components 3 and 4 are reported only if UE supports inter-span PDCCH repetition. * The limit X is associated with the total number of linked candidates of which the first candidate is received and the second one has not been received at any given span, where “received” and “not been received” is wrt the end of the corresponding span of PDCCH candidate. * The limit X is indicated as a total count assuming count 1 for AL=1; 2 for AL=2; 4 for AL=4 or 8 or 16. | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-2-3] | UE memory requirements for linked PDCCH candidates | 1.Support a limit (X) associated with the total number of linked candidates of which the first candidate is received and the second one has not been received at any given span.2.The limit X is indicated as a total count assuming count 1 for AL=1; 2 for AL=2; 4 for AL=4 or 8 or 16.  3.The limit X is indicated per CC and also across all CCs  The FG is applicable for the inter-span case and intra-span case. | 23-2-1 | Yes |  | UE memory requirements for linked PDCCH candidates are not supported | Per band | n/a | n/a | n/a | Component 1 candidate value: FFS | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-2-5] | Inter-span PDCCH repetition | Support of Inter-span repetition for PDCCH | 23-2-1 | Yes |  | Inter-span PDCCH repetition is not supported | FFS | FFS | FFS | FFS |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-3-x] | Multi-TRP PUSCH repetition for *fullpowerMode2* | 1. Support multi-TRP PUSCH repetition for fullpowerMode2  2. Supported number of SRS resources in one SRS resource set | 16-5c，23-3-1 | Yes |  | Multi-TRP PUSCH repetition for *fullpowerMode2* is not supported | per FS | n/a | n/a | n/a | Component 4 candidate values: {1,2 4} | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-3-1-1k] | Beam indication for inter-cell BM | 1. The number of MAC-CE activated PCI(s) different from serving cell PCI for beam indication. | 23-1-1 | Yes |  | Beam indication for inter-cell BM is not supported | FFS | FFS | FFS | FFS |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-3-1-x] | Non-consecutive slot based PUSCH repetition Type A | Support non-consecutive slot based M-TRP PUSCH repetition Type A | 23-3-1, 23-3-1-2, 30-2 | Yes |  | Non-consecutive slot based PUSCH repetition Type A is not supported | FFS | FFS | FFS | FFS |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-3-2d] | Updating two Spatial relation or two sets of power control parameters for PUCCH group | Support of updating two Spatial Relation Info’s / two sets of power control parameters for a group of PUCCH resources in a CC by MAC-CE | 23-3-2 | Yes |  | Updating two Spatial relation or two sets of power control parameters for PUCCH group is not supported |  | Per Band | n/a | n/a | n/a |  | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-3-2e] | Maximum number of power control parameter sets configured for multi-TRP PUCCH repetition in FR1 | Maximum number of power control parameter sets configured for multi-TRP PUCCH repetition in FR1 | 23-3-2 | Yes |  | Maximum number of power control parameter sets configured for multi-TRP PUCCH repetition in FR1 is not supported |  | Per Band | n/a | FR1 only | n/a | Candidate values: {3 to 8} | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-5-1b] | Two QCL TypeD for group based L1-RSRP reporting enhancements | 1. Simultaneous reception of CSI-RS/SSB across two CMR sets with different Type-D |  | Yes |  | Two QCL TypeD for group based L1-RSRP reporting enhancements | Per Band | n/a | FR2 only | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-5-2c] | MAC-CE based update of explicit BFD-RS | 1. Support of MAC-CE based update of explicit BFD-RS for mTRP BFR 2. Maximum number of configured candidate BFD-RS per BWP for MAC-CE based update | 23-5-2 | Yes |  | MAC-CE based update of explicit BFD-RS is not supported | Per UE | No | Yes | No |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-6-5 | Maximum number of activated TCI states for HST [/URLLC] | 1. The maximal number of activated TCI states per BWP per CC including data and control  2. The maximal number of activated TCI states all BWPs all CCs including data and control |  | Yes |  | Maximum number of activated TCI states for HST [/URLLC] is not supported |  | FFS | FFS | FFS | FFS | Candidate values for Component 1: {1,2,4,8,16}  Candidate values for Component 2: {1,2,4,8,16, 32} | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-6-6] | PDSCH processing capability for HST [/URLLC] | 1. The maximal number of PDSCH per slot |  | Yes |  | PDSCH processing capability for HST [/URLLC] is not supported |  | FFS | FFS | FFS | FFS | Candidate values for Component 1: {1,2,3,4,7} | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-6-5] | Support of Rel-17 SFN PDCCH scheme 1 and single-TRP PDSCH combination | Support combination of Rel-17 SFN PDCCH scheme 1 and single-TRP PDSCH |  | Yes |  | Support of Rel-17 SFN PDCCH scheme 1 and single-TRP PDSCH combination | FFS | FFS | FFS | FFS | {Supported, Not supported} | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-6-5] | Support implicit/explicit configuration of RS(s) with two TCI states for beam failure detection | Support RS(s) with two TCI states configured, either implicitly or explicitly, for beam failure detection enhancement for HST |  | Yes |  | Support implicit/explicit configuration of RS(s) with two TCI states for beam failure detection is not supported |  | Per band | n/a | n/a | n/a |  | Optional with capability signalling |
| 23. NR\_FeMIMO | [23-6-6] | QCL-TypeD collision handling with CORESET with 2 TCI states | Support of identifying two QCL-TypeD properties for multiple overlapping CORESETs When a CORESET is activated with two TCI states which overlaps with another CORESET. |  | Yes |  | QCL-TypeD collision handling with CORESET with 2 TCI states is not supported |  | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 23. NR\_FeMIMO | [23-7-6] | Simultaneous reception of CSI-IM with different Type-D | Supports simultaneous reception with different QCL Type-D over CSI-IM resources for Multi-TRP CSI | 23-7-1 | Yes |  | Simultaneous reception of CSI-IM with different Type-D is not supported | Per UE | No | FR2 only | No |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-7-6] | Support of CSI-IM for CSI enhancement for Multi-TRP | Support CSI-IM for CSI enhancement for Multi-TRP | 23-7-1 | Yes |  | Support of CSI-IM for CSI enhancement for Multi-TRP is not supported | Per UE | No | Yes | No |  | Optional with capability signalling |

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**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-7-6] | Slot offset of CMRs in a CMR pair | Support of two CMRs in a CMR pair transmitted in two contiguous slots | 23-7-1 | Yes |  | Slot offset of CMRs in a CMR pair is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-7-7] | Codebook type I Mode 2 in Multi-TRP CSI | Support for Codebook type I Mode 2 in Multi-TRP CSI | 23-7-1 | Yes |  | Codebook type I Mode 2 in Multi-TRP CSI is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-8-10] | 1 aperiodic SRS resource set for 1T4R | Support of 1 aperiodic SRS resource sets for 1T4R. | 10-11, 2-55 | Yes |  | 1 aperiodic SRS resource set for 1T4R is not supported | Per FS | n/a | n/a | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-8-11] | Partial frequency sounding of SRS for non-frequency hopping case | Support of partial frequency sounding for SRS for non-frequency hopping case. | 23-8-6 | Yes |  | Partial frequency sounding of SRS for non-frequency hopping case is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-8-10] | Partial frequency sounding of SRS | Support of non-frequncy hopping for partial frequency sounding of SRS | 2-52 | Yes |  | RPFS for non-FH is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-8-10] | Extension of aperiodic SRS configuration for 1T4R | Support of 1 aperiodic SRS resource sets for 1T4R. | 2-53, 2-55 | Yes |  | Extension of aperiodic SRS configuration for 1T4R is not supported | Per FS | n/a | n/a | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

**Proposal: Introduce the following new FG**

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| 23. NR\_FeMIMO | [23-8-6a] | Partial frequency sounding of SRS for non-frequency hopping | Support of partial frequency sounding for SRS for non-frequency hopping case | 23-8-6 | Yes |  | Partial frequency sounding of SRS for non-frequency hopping case is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

* Note: Final FG ID set by moderator

[R1-2203107](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203107.zip) Rel-17 UE features for further NR MIMO enhancements Huawei, HiSilicon

[R1-2203262](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203262.zip) UE features for feMIMO ZTE

[R1-2203529](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203529.zip) Discussion on UE features for further enhancements on NR-MIMO vivo

[R1-2203777](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203777.zip) Discussion on FeMIMO UE features xiaomi

[R1-2203877](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203877.zip) Views on UE features for Rel-17 NR FeMIMO Samsung

[R1-2203951](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2203951.zip) UE features for further enhancements on NR-MIMO OPPO

[R1-2204032](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204032.zip) Discussion on UE features for FeMIMO Ericsson

[R1-2204140](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204140.zip) Discussion on Rel-17 UE feature for NR FeMIMO LG Electronics

[R1-2204218](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204218.zip) Views on Rel-17 FeMIMO UE features Apple

[R1-2204356](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204356.zip) Discussion on Rel-17 FeMIMO UE features NTT DOCOMO, INC.

[R1-2204586](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204586.zip) On UE features for further enhancements on NR-MIMO Nokia, Nokia Shanghai Bell

[R1-2204690](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204690.zip) UE Features for further enhancements on NR MIMO MediaTek Inc.

[R1-2204779](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204779.zip) UE features for NR feMIMO Intel Corporation

R1-2204849 Summary of UE features for further enhancements on NR-MIMO Moderator (AT&T)

[R1-2204998](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_109-e\Docs\R1-2204998.zip) Discussion on FeMIMO UE features Qualcomm Incorporated