**3GPP TSG RAN WG1 #122 R1-25nnnnn**

**Bengaluru, India, Aug 25th – 29th, 2025**

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

**Title: Session Notes of AI** **9.2**

**Agenda Item: 9.2**

**Document for: Endorsement**

### 9.2 UE features for NR MIMO Phase 5

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

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| 59. NR\_MIMO\_Ph5 | 59-2-1-3-1 | PMI sub-bands with R=2 for extended Rel-16 eType-II codebook for up to 128 ports | 1. Support of PMI sub-bands with R=2 for extended Rel-16 eType-II codebook for up to 128 ports  2. A list of supported combinations, each combination is {Max # of Tx ports in a report, Max # of sets of aggregated resources, and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=2 | 59-2-1-3 | Yes | n/a | PMI sub-bands with R=2 for extended Rel-16 eType-II codebook for up to 128 ports is not supported | Per band and Per BC | n/a | n/a | n/a | Component 2 candidate values  a. {48, 64, 128}  b. {1, …, 64}  c. {64, …, 256, 512, 768, 1024} | Optional with capability signalling |

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

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| 59. NR\_MIMO\_Ph5 | 59-2-1-3-3 | Rank 3,4 for extended Rel-16 eType-II codebook for up to 128 ports | 1. Support of Rank 3,4 for extended Rel-16 eType-II codebook for up to 128 ports  4. Support R=1  5. A list of supported combinations, each combination is {Max # of Tx ports in a report, Max # of sets of aggregated resources, and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=1 | one or more of {59-2-1-3~~, 59-2-1-3a, 59-2-1-3b~~} | Yes | n/a | Rank 3,4 for extended Rel-16 eType-II codebook for up to 128 ports is not supported | Per band and Per BC | n/a | n/a | n/a | Component 5 candidate values  a. {48, 64, 128}  b. {1, 2, …, 64}  c. {64, …, 256, 1024} | Optional with capability signalling |

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

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| 59. NR\_MIMO\_Ph5 | 59-2-1-5f | PMI subband R=2 for extended Rel-18 Type-II Doppler codebook for up to 128 ports | 1. Support PMI subband R=2 for Rel-18 Type-II Doppler codebook enhancement for up to 128 ports  2. A list of supported combinations, each combination is {Max N4, Max # of Tx ports in a report, Max # of sets of aggregated resources or groups of aggregated resource, and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=2 | 59-2-1-5 | Yes | n/a | PMI subband R=2 for extended Rel-18 Type-II Doppler  codebook for up to 128 ports is not supported | Per band and Per BC | n/a | n/a | n/a | Component 2 candidate values  a.{1,2,4,8}  ~~a~~b {48, 64,128}  ~~b~~c. {2,3,4 … 64}  ~~c~~d. {64, …, 256, 1024} | Optional with capability signalling |

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

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| 59. NR\_MIMO\_Ph5 | 59-2-1-5l | Processing timeline for CSI reference slot for extended Rel-18 Type-II Doppler codebook for up to 128 ports | 1. Aperiodic CSI report timing relaxation, w, extended Rel-18 Type-II Doppler codebook for up to 128 ports  2. Aperiodic CSI report timing relaxation, type, for extended Rel-18 Type-II Doppler codebook for up to 128 ports | 59-2-1-5 | Yes | n/a |  | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values:  UE reports candidate value, w, independently for each SCS in unit of symbols: {14\*(KP–1)\*d, 14\*KP\*d}  Note: Kp is according to Component 12 of FG 59-2-1-5  Note: d=4 (minimum periodicity of periodic CSI-RS)  Component 2 candidate values: {CAP1, CAP2}  For N4 = 1  1) For AP CSI-RS: (Z,Z’) = (Z2 + 14\*( KDOPP –1)\*m, Z'2)  2) For P/SP CSI-RS: (Z,Z’) = (Z2 + w, Z'2)  For N4 > 1 and CAP1 in component 2  1) For AP CSI-RS: (Z,Z’) = (Z2 + 14\*( KDOPP –1)\*m, Z'2)  2) For P/SP CSI-RS: (Z,Z’) = (Z2 + w, Z'2)  For N4 > 1 and CAP2 in component 2  1) For AP CSI-RS: (Z,Z’) = (Z2 + 14\*( KDOPP –1)\*m + Z'2, 2Z'2)  2) For P/SP CSI-RS: (Z,Z’) = (Z2 + w + Z'2, 2Z'2)  Z2/Z'2 are defined in Table 5.4-2 in TS38.214  KDOPP is the number of CSI-RS resource groups configured for channel measurement, and each CSI-RS resource groups contain K CSI-RS resources for aggregating up to 128 ports  M = {1,2}, is the offset between two adjacent AP CSI-RS resource groups for the CMR in slots  This FG is not applicable to FR 2-2 | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-2 | UE-initiated/event-driven beam management Mode B | 1. Support of Mode B UE-initiated/event-driven beam report  ~~3~~2. Supported minimum value of X symbols between the last symbol of sending first PUCCH and the first available symbol of transmission occasion of second PUSCH | 59-1-1 ~~FFS for other potential FG(s)~~ | yes | n/a | UEI/ED beam report Mode-B is not supported | Per band | n/a | n/a | n/a | Component ~~3~~2 candidate values: ~~[{0, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512}]~~  15kHz SCS: {0,1,2,4,8,16}  30kHz SCS: {0,2,4,8,16,32}  60kHz SCS: {0,4,8,32,64}  120kHz SCS: {0,8,16,32,64,128}  480kHz SCS: {0,32,64,128,256,512}  960kHz SCS: {0,64,128,256,512} | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-3 | Triggering event determination via detecting ≥ M event instances for at least one new beam within a time window. | ~~Triggering~~ 1. Support of ~~UEI/ED~~ UE initiated/event driven beam report procedure via detecting ≥ M event instance(s) for at least one new beam within a time window, where M>1  2. Maximum number of timers | 59-1-1 ~~FFS for other potential FG(s)~~ | yes | n/a | Triggering event determination via detecting ≥ M event instances within a time window is not supported | Per band | n/a | n/a | n/a | Component 2 candidate values: {1, 2, …, 64} | Optional with capability signalling |

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1 | Enhanced Type-I SP codebook for 64 ports – Scheme-A | 1. Support of enhanced Type-I SP codebook for Scheme-A with 64 Tx ports by aggregating multiple NZP CSI-RS resources  within one slot  2. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 2-35 | yes | n/a | Enhanced Type-I SP codebook is not supported for 64 ports – Scheme-A, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Component 3 candidate value {4, 5, 6, 7, 8}  Component 4 candidate value ~~{1:8}~~{2,4}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1a | Enhanced Type-I SP codebook for 48 ports – Scheme-A | 1. Support of enhanced Type-I SP codebook for Scheme-A with 48 Tx ports by aggregating multiple NZP CSI-RS resources within one slot  2. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-1 | yes | n/a | Enhanced Type-I SP codebook is not supported for Scheme-A for 48 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Component 3 candidate value {4, 5, 6, 7, 8}  Component 4 candidate value ~~{1:8}~~{2,3}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1b | Enhanced Type-I SP codebook for 128 ports – Scheme-A | 1. Support of enhanced Type-I SP codebook for Scheme-A with 128 Tx ports by aggregating multiple NZP CSI-RS resources within one slot  2. A list of supported combinations, each combination is Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. ~~Max # of CSI-RS resource in a resource set~~ Support 4 CSI-RS resources in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-1 | yes | n/a | Enhanced Type-I SP codebook is not supported for Scheme-A for 128 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, ~~256~~1024}  Component 3 candidate value {4, 5, 6, 7, 8}  ~~Component 4 candidate value {1:8}~~  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1c | Enhanced Type-I SP codebook for 64 ports – Scheme-B | 1. Support of enhanced Type-I SP codebook for Scheme-B with 64 Tx ports by aggregating multiple NZP CSI-RS resources within one slot  2. A list of supported combinations, each combination is Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 2-35 | yes | n/a | Enhanced Type-I SP codebook is not supported for Scheme-B for 64 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256,1024}  Component 3 candidate value {4, 5, 6, 7, 8}  Component 4 candidate value {~~1:8~~2,4}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1d | Enhanced Type-I SP codebook for 48 ports – Scheme-B | 1. Support of enhanced Type-I SP codebook for Scheme-B with 48 Tx ports by aggregating multiple NZP CSI-RS resources within one slot  2. A list of supported combinations, each combination is Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-1c | yes | n/a | Enhanced Type-I SP codebook is not supported for Scheme-B for 48 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256,1024}  Component 3 candidate value {4, 5, 6, 7, 8}  Component 4 candidate value {~~1:8~~2,3}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-1e | Enhanced Type-I SP codebook for 128 ports – Scheme-~~b~~B | 1. Support of enhanced Type-I SP codebook for Scheme-B with 128 Tx ports by aggregating multiple NZP CSI-RS resources within one slot  2. A list of supported combinations, each combination is Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum rank  4. ~~Max # of CSI-RS resource in a resource set~~ Support 4 CSI-RS resources in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-1c | yes | n/a | Enhanced Type-I SP codebook is not supported for Scheme-B for 128 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, ~~256~~1024}  Component 3 candidate value {4, 5, 6, 7, 8}  ~~Component 4 candidate value {1:8}~~  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-2 | Enhanced Type-I MP codebook for 64 ports | 1. Support of enhanced Type-I MP codebook for 64 ports within 1 slot  2. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum number of panels  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 2-35 | yes | n/a | Enhanced Type-I MP codebook is not supported for 64 ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256,1024}  Component 3 candidate value {2, 4}  Component 4 candidate value {~~1:8~~2,4}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-2a | Enhanced Type-I MP codebook for 48 ports | 1. Support of enhanced Type-I MP codebook for 48 ports within 1 slot  2. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum number of panels  4. Max # of CSI-RS resource in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-2 | yes | n/a | Enhanced Type-I MP codebook is not supported for 48 ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, 256,1024}  Component 3 candidate value {2, 4}  Component 4 candidate value {~~1:8~~2,3}  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-2b | Enhanced Type-I MP codebook for 128 ports | 1. Support of enhanced Type-I MP codebook for 128 ports within 1 slot  2. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  3. Supported maximum number of panels  4. ~~Max # of CSI-RS resource in a resource set~~ Support 4 CSI-RS resources in a resource set  5. Supported processing capability  6. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-2 | yes | n/a | Enhanced Type-I MP codebook is not supported for 128 ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 2 candidate values  a. {1, …, 64}  b. {64, …, ~~256~~1024}  Component 3 candidate value {2, 4}  ~~Component 4 candidate value {1:8}~~  Component 5 candidate value {Capability 1, Capability 2}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-3 | Extended Rel-16 eType-II codebook for 64 Tx ports | 1. Support of extended Rel-16 eType-II codebook for 64 Tx ports by aggregating multiple NZP CSI-RS resources within 1 slot  2. Support of parameter combination 1-6  3. Support of rank 1-2  4. Support R=1  5. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=1  6. supported processing capability  7. Max # of CSI-RS resource in a resource set  8. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 16-3a | yes | n/a | Extended Rel-16 eType-II codebook is not supported for 64 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 5 candidate values  a. {1, …, 64, 256}  b. {64, …, 256, 1024}  Component 6 candidate value {Capability 1, Capability 2}  Component 7 candidate value {2,4}  Component 8 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-3a | Extended Rel-16 eType-II codebook for 48 Tx ports | 1. Support of extended Rel-16 eType-II codebook for 48 Tx ports by aggregating multiple NZP CSI-RS resources within 1 slot  2. Support of parameter combination 1-6  3. Support of rank 1-2  4. Support R=1  5. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=1  6. supported processing capability  7. Max # of CSI-RS resource in a resource set  8. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-3 | yes | n/a | Extended Rel-16 eType-II codebook is not supported for 48 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 5 candidate values  a. {1, …, 64, 256}  b. {64, …, 256, 1024}  Component 6 candidate value {Capability 1, Capability 2}  Component 7 candidate value {2,3}  Component 8 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-3b | Extended Rel-16 eType-II codebook for 128 Tx ports | 1. Support of extended Rel-16 eType-II codebook for 128 Tx ports by aggregating multiple NZP CSI-RS resources within 1 slot  2. Support of parameter combination 1-6  3. Support of rank 1-2  4. Support R=1  5. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with R=1  6. supported processing capability  7. Support 4 CSI-RS resources in a resource set  8. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-3 | yes | n/a | Extended Rel-16 eType-II codebook is not supported for 128 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 5 candidate values  a. {1, …, 64, 256}  b. {64, …, 256, 1024}  Component 6 candidate value {Capability 1, Capability 2}  Component 8 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-4 | Extended Rel-17 FeType-II codebook with 64 Tx ports | 1. Support of extended Rel-17 FeType-II codebook for 64 Tx ports by aggregating multiple NZP CSI-RS resources within 1 slot  2. Support of parameter combinations with M=1  3. Support of rank 1-2  4. Support R=1  5. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with M=1 and R=1  6. Supported processing capability  7. Max # of CSI-RS resource in a resource set  8. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 23-9-1 | yes | n/a | Extended Rel-17 FeType-II codebook is not supported with 64 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 5 candidate values  a. {1, …, 64}  b. {64, …, 256,1024}  Component 6 candidate value {Capability 1, Capability 2}  Component 7 candidate value {2,4}  Component 6 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Component 8 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-4a | Extended Rel-17 FeType-II codebook with 48 Tx ports | 1. Support of extended Rel-17 FeType-II codebook for 48 Tx ports by aggregating multiple NZP CSI-RS resources within 1 slot  2. Support of parameter combinations with M=1  3. Support of rank 1-2  4. Support R=1  5. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously with M=1 and R=1  6. Supported processing capability  7. Max # of CSI-RS resource in a resource set  8. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-4 | yes | n/a | Extended Rel-17 FeType-II codebook is not supported with 48 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 5 candidate values  a. {1, …, 64}  b. {64, …, 256}  Component 6 candidate value {Capability 1, Capability 2}  Component 7 candidate value {2,3}  Component 8 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Reuse legacy Z/Z’ values  OCPU = ceil(P/32)  Capability 2:  Scale the legacy timeline Z/Z’ by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources OCPU = 1 ~~ceil(P/32)~~ | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-5 | Extended Rel-18 eType-II Doppler codebook for 64 Tx ports | 1. Support of extended Rel-18 Type-II Doppler codebook for 64 Tx ports by aggregating multiple NZP CSI-RS resource groups within 1 slot  2. Support X=1 CQI based on the first/earliest slot of the CSI reporting window and the first/earliest predicted PMI (TDCQI=’1-1’)  3. Support PMI subband R=1  4. Support parameter combinations with L=2,4  5. Support rank = 1,2  6. Support 64 ports  7. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  8. Supported processing capability  9. Value of Y for CPU occupation when P/SP-CSI-RS is configured for CMR  10. Value of Y for CPU occupation when A-CSI-RS is configured for CMR  11. Support for the size of DD-basis, N4=1  12. Scaling factor for active resource counting Kp  13. Max # of CSI-RS resource in a resource group for aperiodic CSI-RS resource set or in a resource set for periodic CSI-RS resource set  14. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 40-3-2-1 | yes | n/a | Extended Rel-18 Type-II Doppler codebook is not supported for 64 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 7 candidate values  a. {1, …, 64}  b. {64, …, 256}  Component 8 candidate value {Capability 1, Capability 2}  Component 9 candidate values: {1, 2, 3}  Component 10 candidate values: {1, 2, 3}  Component 12 candidate values: {1, 2, 4}  Component 13 candidate value {2,4}  Component 14 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Legacy timeline  OCPU = YxN4xceil(P/32) ), when P/SP-CSI-RS is configured for CMR  OCPU = Yx KDOPPxceil(P/32)), when A-CSI-RS is configured for CMR  Capability 2:  Scale the legacy timeline by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = YxN4, when P/SP-CSI-RS is configured for CMR  OCPU = Yx KDOPP, when A-CSI-RS is configured for CMR  Note: maximum OCPU is 8  Note: KDOPP is the number of CSI-RS resource groups configured for channel measurement, and each CSI-RS resource groups contain K CSI-RS resources for aggregating up to 128 ports | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-5a | Extended Rel-18 eType-II Doppler codebook for 48 Tx ports | 1. Support of extended Rel-18 Type-II Doppler codebook for 48 Tx ports by aggregating multiple NZP CSI-RS resource groups within 1 slot  2. Support X=1 CQI based on the first/earliest slot of the CSI reporting window and the first/earliest predicted PMI (TDCQI=’1-1’)  3. Support PMI subband R=1  4. Support parameter combinations with L=2,4  5. Support rank = 1,2  6. Support 64 ports  7. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  8. Supported processing capability  9. Value of Y for CPU occupation when P/SP-CSI-RS is configured for CMR  10. Value of Y for CPU occupation when A-CSI-RS is configured for CMR  11. Support for the size of DD-basis, N4=1  12. Scaling factor for active resource counting Kp  13. Max # of CSI-RS resource in a resource group for aperiodic CSI-RS resource set or in a resource set for periodic CSI-RS resource set  14. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-5 | yes | n/a | Extended Rel-18 Type-II Doppler codebook is not supported for 48 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 7 candidate values  a. {1, …, 64}  b. {64, …, 256}  Component 8 candidate value {Capability 1, Capability 2}  Component 9 candidate values: {1, 2, 3}  Component 10 candidate values: {1, 2, 3}  Component 12 candidate values: {1, 2, 4}  Component 13 candidate value {2,3}  Component 14 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Legacy timeline  OCPU = Y x N4 x ceil(P/32) ), when P/SP-CSI-RS is configured for CMR  OCPU = Y x KDOPP x ceil(P/32)), when A-CSI-RS is configured for CMR  Capability 2:  Scale the legacy timeline by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = Y x N4, when P/SP-CSI-RS is configured for CMR  OCPU = Y x KDOPP, when A-CSI-RS is configured for CMR  Note: maximum OCPU is 8  Note: KDOPP is the number of CSI-RS resource groups configured for channel measurement, and each CSI-RS resource groups contain K CSI-RS resources for aggregating up to 128 ports | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-1-5b | Extended Rel-18 eType-II Doppler codebook for 128 Tx ports | 1. Support of extended Rel-18 Type-II Doppler codebook for 128 Tx ports by aggregating multiple NZP CSI-RS resource groups within 1 slot  2. Support X=1 CQI based on the first/earliest slot of the CSI reporting window and the first/earliest predicted PMI (TDCQI=’1-1’)  3. Support of PMI subband R=1 for extended Rel-18 eType II Doppler codebook  4. Support parameter combinations with L=2,4  5. Support for rank = 1,2  6. Support 64 ports  7. A list of supported combinations, each combination is { Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC simultaneously  8. Supported processing capability  9. Value of Y for CPU occupation (OCPU = Y.N4), when P/SP-CSI-RS is configured for CMR  10. Value of Y for CPU occupation (OCPU = Y. KDOPP), when A-CSI-RS is configured for CMR  11. Support for the size of DD-basis, N4=1  12. Scaling factor for active resource counting Kp  13. Support 4 CSI-RS resources in a resource group for aperiodic CSI-RS resource set or in a resource set for periodic CSI-RS resource set  14. A list of supported combinations, each combination is {Max # of resources and total # of Tx ports} per CC simultaneously | 59-2-1-5 | yes | n/a | Extended Rel-18 Type-II Doppler codebook is not supported for 128 Tx ports, aggregated CSI-RS resources within one slot | Per band and per BC | n/a | n/a | n/a | Component 7 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Component 8 candidate value {Capability 1, Capability 2}  Component 9 candidate values: {1, 2, 3}  Component 10 candidate values: {1, 2, 3}  Component 12 candidate values: {1, 2, 4}  Component 14 candidate values  a. {1, …, 64}  b. {64, …, 256, 1024}  Note: For component of processing capability  Capability 1:  Legacy timeline  OCPU = Y x N4 x ceil(P/32) ), when P/SP-CSI-RS is configured for CMR  OCPU = Y x KDOPP x ceil(P/32)), when A-CSI-RS is configured for CMR  Capability 2:  Scale the legacy timeline by ceil(P/32) where P is the total number of ports across all the K aggregated CSI-RS resources  OCPU = Y x N4, when P/SP-CSI-RS is configured for CMR  OCPU = Y x KDOPP, when A-CSI-RS is configured for CMR  Note: maximum OCPU is 8  Note: KDOPP is the number of CSI-RS resource groups configured for channel measurement, and each CSI-RS resource groups contain K CSI-RS resources for aggregating up to 128 ports | Optional with capability signalling |

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

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| 59. NR\_MIMO\_Ph5 | 59-2-2-1 | Hybrid BF (CRI-based) with Rel-15 Type-I SP codebook | 1. The maximal supported number of CRI report M  2. A list of supported combinations, each combination is {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} across all CCs simultaneously.  3. The maximum value of KS | ~~FFS~~ 2-36 | yes | n/a | Hybrid BF (CRI-based) with Rel-15 Type-I SP codebook is not supported | Per band and per BC | n/a | n/a | n/a | Component 1 candidate values: {1,2,3,4}  Component 2 candidate values: a. {2,4,8,12,16, 24, 32}  b. {1,2,3,4 … 256}  c. {64, …, 256, 1024}  Component 3 candidate values: {2,3,4,5,6,7,8} | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-2-2 | Hybrid BF (CRI-based) with Rel-16 eType-II codebook | 1. The maximal supported number of CRI report M  2. A list of supported combinations, each combination is {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} across all CCs simultaneously.  3. The maximum value of KS | ~~FFS~~ 16-3a | yes | n/a | Hybrid BF (CRI-based) with Rel-16 eType-II codebook is not supported | Per band and per BC | n/a | n/a | n/a | Component 1 candidate values: {1,2}  Component 2 candidate values: a. {2,4,8,12,16, 24, 32}  b. {1,2,3,4 … 256}  c. {64, …, 256, 1024}  Component 3 candidate values: {2,3,4,5,6,7,8} | Optional with capability signalling |

**Agreement: Introduce the following Rel. 19 UE FGs (yellow highlighting, if any, shows text that’s not yet agreed)**

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| 59. NR\_MIMO\_Ph5 | 59-4-11 | Support of including PL offset in the calculation of Type 1 PHR based on actual PUSCH transmission and Type 1 PHR based on reference PUSCH | Support including PL offset in the calculation of Type 1 PHR based on actual PUSCH transmission and Type 1 PHR based on reference PUSCH |  | Yes | n/a | PL offset in the calculation of Type 1 PHR is not supported | Per Band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-3-3 | 3T6R Antenna switching | 1. Support of 3T6R SRS Tx port switching with port 1003 disabled when 4 port SRS resources with port 1003 disabled are configured to the UE  2. Report the entry number of the first-listed band with UL in the band combination that affects this DL  3. Report the entry number of the first-listed band with UL in the band combination that switches together with this UL  ~~[4. Support of 3T6R antenna switching configuration(s) as an allowing downgrading configuration of 4T8R]~~ | ~~FFS~~ 2-53 | yes | n/a | 3TX 3T6R antenna switching is not supported | Per FS | n/a | n/a | n/a | Component 2 candidate value: {1,2, … 32}  Component 3 candidate value: {1,2, … 32}  ~~[FFS: New component for downgrade antenna switching configurations or a new~~ Note: This UE feature can be signalled together with srs-AntennaSwitching8T8R-r18, srs-AntennaSwitchingBeyond4RX-r17, supportedSRS-TxPortSwitch-v1610, or supportedSRS-TxPortSwitch to indicate SRS antenna switching downgrading capability ~~for a UE with 4Rx, 6Rx or 8Rx~~.~~]~~ | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-1 | UE-initiated/event-driven beam management for Event-2 based measurement and report for Mode A | 1. Support of UE-initiated/event-driven beam report based on one event instance  2. Support of Event-2 based measurement and report  3. Support of Mode A UE-initiated/event-driven beam report  4. Maximum number of the configured RS(s) for new beam in the RS resource set  5. Support of current beam measurement by using QCL RS in the indicated TCI state and the corresponding QCL SSB for Scheme-1 and Scheme-2, respectively  6. Support the first PUCCH and second PUSCH from the same PUCCH group | ~~FFS~~ | yes | n/a | UEI/ED beam report is not supported for Event-2 and Mode A | Per band | n/a | n/a | n/a | Component 4 candidate values: {1, 2, …, 64}  Note For Component 4 and Component 5, an SSB can be associated with the serving cell PCI or a PCI other than the serving cell PCI | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-5 | UE-initiated/event-driven beam management for Event-7 based measurement and report for Mode A | 1. Support of Event-7 based measurement and report for Mode A that L1-RSRP of at least one new beam becomes a threshold value better than the RS derived from the activated TCI state with the Q-th best quality based on one event instance  2~~3~~. Support of the RS derived from the activated TCI state with the Q-th best quality measurement by using QCL RS in the activated TCI state with the Q-th best quality and the corresponding QCL SSB for the activated TCI state with the Q-th best quality for Scheme-1 and Scheme-2, respectively | 59-1-1 | yes | n/a | UE-initiated/event-driven beam management for Event-7 based measurement is not supported for Mode A | Per Band | n/a | n/a | n/a | Component 1 candidate values for Q: bitmap of size 8, the n-th bit signals support for Q=n, n = 1,2,…,8, zero means no support, 1 means support  Note: The UE does not expect that the configured Q is greater than the number of the activated DL/joint TCI state(s)  Note: For Component 2, an SSB can be associated with the serving cell PCI or a PCI other than the serving cell PCI | Optional with capability signalling |

**Agreement: Introduce the following Rel. 19 UE FGs (yellow highlighting, if any, shows text that’s not yet agreed)**

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| 59. NR\_MIMO\_Ph5 | 59-2-3-1a | CJTC Dd report processing | 1. Maximum number of configured TRS resource sets for delay offset report  2. Maximum number of configured TRS resource sets for delay offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  3. Maximum number of simultaneously active CSI-RS resources for delay offset report per CC  4. Maximum number of simultaneously active CSI-RS resources for delay offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  5. Value of X for CPU occupation (OCPU=X⋅NTRP) | 59-2-3-1 | yes | n/a |  | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values: {2, 4, 6, 8, 10, 12}  Component 2 candidate values: {2, 4, 6, 8, 12, … 64}  Component 3 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32}  Component 4 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32, …, 64}  Component 5 candidate values: {1, 2} | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-3-2a | CJTC FO report processing | 1. Maximum number of configured TRS resource sets for frequency offset report  2. Maximum number of configured TRS resource sets for frequency offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  3. Maximum number of simultaneously active CSI-RS resources for frequency offset report per CC  4. Maximum number of simultaneously active CSI-RS resources for frequency offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  5. Value of X for CPU occupation (OCPU=X⋅NTRP) | 59-2-3-2 | yes | n/a | CJTC FO report is not supported | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values: {2, 4, 6, 8, 10, 12}  Component 2 candidate values: {2, 4, 6, 8, 12, … 64}  Component 3 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32}  Component 4 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32, …, 64}  Component 5 candidate values: {1, 2} |  |
| 59. NR\_MIMO\_Ph5 | 59-2-3-3a | CJTC wideband PO report processing | 1. Maximum number of configured CSI-RS resources for phase offset report  2. Maximum number of configured CSI-RS resources for phase offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  3. Maximum number of simultaneously active CSI-RS resources for phase offset report per CC  4. Maximum number of simultaneously active CSI-RS resources for phase offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  5. Value of X for CPU occupation (OCPU=X⋅NTRP) | 59-2-3-3 | yes | n/a | CJTC PO report is not supported | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values: {2, 4, 6, 8, 10, 12}  Component 2 candidate values: {2, 4, 6, 8, 12, … 64}  Component 3 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32}  Component 4 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32, …, 64}  Component 5 candidate values: {1, 2} | Optional with capability signalling |
| 59. NR\_MIMO\_Ph5 | 59-2-3-5a | CJTC Dd+FO report processing | 1. Maximum number of configured TRS resource sets for joint delay and frequency offset report  2. Maximum number of configured TRS resource sets for joint delay and frequency offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  4. Maximum number of simultaneously active CSI-RS resources for joint delay and frequency offset report per CC  4. Maximum number of simultaneously active CSI-RS resources for joint delay and frequency offset report across all CCs in a band when reported per band, and across all CCs in a band combination when reported per BC  5. Value of X for CPU occupation (OCPU=2X⋅NTRP) | 59-2-3-5 | yes | n/a | CJTC Dd+FO report is not supported | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values: {2, 4, 6, 8, 10, 12}  Component 2 candidate values: {2, 4, 6, 8, 12, … 64}  Component 3 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32}  Component 4 candidate values: {2, 4, 6, 8, 12, 16, 20, 24, 28, 32, …, 64}  Component 5 candidate values: {1, 2} | Optional with capability signalling |

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

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| 59. NR\_MIMO\_Ph5 | 59-1-7 | 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI for Event-2 | Support of 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI for Event-2 | ~~FFS~~ 59-1-3 | yes | n/a | 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI is not supported for Event-2 | Per Band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-1-6 | CSI-RS resource time domain restriction for extended Type-I and Type II codebook ~~enhancement~~ for up to 128 ports | Support of the K CSI-RS resources configured within two slots for Type-I and Type II codebook enhancement for up to 128 ports | ~~FFS~~ One or more of {59-2-1-1,1c, 2, 3, 4, 5} | yes | n/a | 2-slot resource aggregation is not supported | Per band and per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-1-7 | Group-specific 3-bit scaling factors for up to 128 ports | Support of group-specific 3-bit scaling factors | ~~FFS~~ One or more of {59-2-1-1, 59-2-1-1c} | yes | n/a | Group-specific 3-bit scaling factors is not supported | Per band and per BC | n/a | n/a | n/a | Candidate values: {’rank-1’, ‘rank-1 and rank-2’}  Note: 3-bit scaling applies only to the Type-I SP codebook | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-1-8 | SRS Port Grouping | Support of SRS port grouping | ~~FFS~~ 23-8-3 | yes | n/a | SRS Port Grouping is not supported | Per FS | n/a | n/a | n/a | Candidate values: {xT8R, xT6R, both}  Note: If a UE supports this FG, then the UE supports the corresponding antenna switching configurations and port groupings | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-2-3a | Configuration of MR always-reported resources with Rel-15 Type-I SP codebook | Support MR={1,2} for hybrid BF (CRI-based) with Rel-15 Type-I SP codebook | ~~FFS~~ 59-2-2-1 | yes | n/a | Configuration of MR always-reported resources is not supported, i.e. MR=0 with Rel-15 Type-I SP codebook | Per band and per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-2-3b | Configuration of MR always-reported resources with Rel-16 eType-II codebook with R=1 | Support MR={1} for hybrid BF (CRI-based) with Rel-16 eType-II codebook with R=1 | ~~FFS~~ 59-2-2-2 | Yes | n/a | Configuration of MR always-reported resources is not supported, i.e. MR=0 with Rel-16 eType-II codebook with R=1 | Per band and per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-6a | New CJT QCL assumptions for PDSCH pre-compensation for Scheme-C | The PDSCH DMRS port(s) are QCLed with the DL-RS associated with the first TCI state with respect to QCL-TypeA and QCLed with the DL-RS in the second TCI state with respect to QCL-TypeA except for {Doppler shift} | ~~FFS~~ 40-1-1 | yes | n/a | New QCL assumptions for PDSCH pre-compensation is not supported for Scheme-C | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-6b | New CJT QCL assumptions for PDSCH pre-compensation for Scheme-D | 1. The PDSCH DMRS port(s) are QCLed with the DL-RS associated with the first TCI state with respect to QCL-TypeA and QCLed with the DL-RS in the second TCI state with respect to QCL-TypeA except for {average delay} | ~~FFS~~ 40-1-1 | yes | n/a | New QCL assumptions for PDSCH pre-compensation is not supported for Scheme-D | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-6c | New CJT QCL assumptions for PDSCH pre-compensation for Scheme-E | 1.The PDSCH DMRS port(s) are QCLed with the DL-RS associated with the first TCI state with respect to QCL-TypeA and QCLed with the DL-RS in the second TCI state with respect to QCL-TypeA except for {Doppler shift, average delay} | ~~FFS~~ 40-1-1 | yes | n/a | New QCL assumptions for PDSCH pre-compensation is not supported for Scheme-E | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-7 | Linkage of CJTC Dd and Rel-18 eType-II CJT with joint triggering | 1. Support of joint triggering for linked CJTC Delay offset reporting and Rel-18 eType-II CJT CSI | ~~FFS~~ 59-2-3-1 and 40-3-1-1 | yes | n/a | Linkage of CJTC Dd and Rel-18 eType-II CJT with joint triggering is not supported | Per band and Per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-7a | Linkage of CJTC Dd and Rel-18 eType-II CJT with separate triggering | Support separate triggering for linked CJTC Delay offset reporting and Rel-18 eType-II CJT CSI | ~~FFS~~ 59-2-3-1 and 40-3-1-1 | yes | n/a | Separate triggering for linked CJTC Delay offset reporting and Rel-18 eType-II CJT CSI is not supported | Per band and Per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-8 | Separate triggering with configuration of 1-bit indicator per CSI trigger state | Support of 1 bit indicate per trigger state for separate triggering of linked DO reporting and Type II CJT reporting | ~~FFS~~ 59-2-3-7a | yes | n/a | Separate triggering with configuration of 1-bit indicator per CSI trigger state is not supported | Per band and Per BC | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-10 | Relaxed timeline for joint triggering of CJTC Dd and Rel-18 eType-II CJT | Support of relaxed timeline for joint triggering of CJTC Dd and Rel-18 eType-II CJT, i.e., Drelax = drelax | ~~FFS~~ 59-2-3-7 | yes | n/a | Relaxed timeline for joint triggering od CJTC Dd and Rel-18 eType-II CJT is not supported, i.e., Drelax = 0 | Per band and per BC | n/a | n/a | n/a | Component candidate values:  15kHz SCS: {2, 4, 8}  30kHz SCS: {4, 8, 14, 28}  60kHz SCS: {8,14, 28}  120kHz SCS: {14,28, 56}  480kHz SCS: {56, 112, 224}  960kHz SCS: {112, 224, 448} | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-3-1 | Non-codebook based PUSCH transmission for 3TX for single TRP | 1. Maximal number of supported layers (non-codebook transmission scheme)  2. Maximum number of SRS resource per set (SRS set use is configured as for non-codebook transmission)  3. Maximum number of simultaneous transmitted SRS resources at one symbol | ~~FFS~~ | yes | n/a | Non-codebook based PUSCH transmission for 3TX is not supported | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: {1, 2, 3}  Component 2 candidate values: {1,2,3}  Component 3 candidate values: {1,2,3} | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-3-2 | Codebook based PUSCH transmission for 3TX for single TRP | 1. Maximal number of PUSCH MIMO layers for codebook-based PUSCH  2. Maximum number of 4-port SRS resources per SRS resource set with usage set to 'codebook’ for codebook-based 3Tx PUSCH  4. Codebook based PUSCH transmission with port 1003 disabled when 4 port SRS resources with port 1003 disabled are configured to the UE | ~~FFS~~ | yes | n/a | Codebook based PUSCH transmission for 3TX is not supported | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: {1, 2,3}  Component 2 candidate values: {1,2}  Note: When configured according to Component 4, the number of ports supported by UE for transmission in an SRS resource is 3 | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-3-3a | 3T3R antenna switching | 1. Support of 3T3R SRS Tx port switching with port 1003 disabled when 4 port SRS resources with port 1003 disabled are configured to the UE  2. Report the entry number of the first-listed band with UL in the band combination that affects this DL  3. Report the entry number of the first-listed band with UL in the band combination that switches together with this UL | ~~FFS~~ 2-53 | yes | n/a | 3TX 3T3R antenna switching is not supported | Per FS | n/a | n/a | n/a | Component 2 candidate value: {1,2, … 32}  Component 3 candidate value: {1,2, … 32}  Note: This UE feature can be signalled together with srs-AntennaSwitching8T8R-r18, srs-AntennaSwitchingBeyond4RX-r17, supportedSRS-TxPortSwitch-v1610, supportedSRS-TxPortSwitch or 59-3-3 to indicate SRS antenna switching downgrading capability for a UE with 4Rx, 6Rx or 8Rx  Note: ‘3T3R’ is only applicable for the UE equipped with 4Rx, 6Rx, or 8Rx antenna ports. | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-3-4 | M-TRP PUSCH repetition (type A) of 3-antenna-port PUSCH transmission – codebook based | 1. Support of M-TRP PUSCH repetition for 3-antenna-port PUSCH transmission with type A for codebook based  - sequential mapping for repetitions larger than 2  - cyclic mapping for 2 repetitions  2. Support of two SRS resource sets with usage set to 'codebook'  3. Supported number of SRS resources in one SRS resource set | ~~FFS~~ 59-3-2 | yes | n/a | M-TRP PUSCH repetition is not supported for 3TX PUSCH transmission with type A for codebook based | Per FS | n/a | n/a | n/a | Component 3 candidate values: {1,2} | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-3-4a | M-TRP PUSCH repetition (type A) of 3-antenna-port PUSCH transmission – non-codebook based | Support of M-TRP PUSCH repetition for 3-antenna-port PUSCH transmission with type A for non-codebook based  - sequential mapping for repetitions larger than 2  - cyclic mapping for 2 repetitions  2. Support of two SRS resource sets with usage set to 'non-codebook'  3. Supported number of SRS resources in one SRS resource set | ~~FFS~~ 59-3-1 | yes | n/a | M-TRP PUSCH repetition is not supported for 3TX PUSCH transmission with type A for non-codebook based | Per FS | n/a | n/a | n/a | Component 3 candidate values: {1,2,3} | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-3-5 | M-TRP PUSCH repetition (type B) of 3-antenna-port PUSCH transmission – codebook based | Support of M-TRP PUSCH repetition for 3-antenna-port PUSCH transmission with type B for codebook based  - sequential mapping for repetitions larger than 2  - cyclic mapping for 2 repetitions  2. Support of two SRS resource sets with usage set to 'codebook'  3. Supported number of SRS resources in one SRS resource set | ~~FFS~~ 59-3-2, 11-5 | yes | n/a | M-TRP PUSCH repetition is not supported for 3TX PUSCH transmission with type B for codebook based | Per FSPC | n/a | n/a | n/a | Component 3 candidate values: {1,2} | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-3-5a | M-TRP PUSCH repetition (type B) of 3-antenna-port PUSCH transmission – non-codebook based | Support of M-TRP PUSCH repetition for 3-antenna-port PUSCH transmission with type B for non-codebook based  - sequential mapping for repetitions larger than 2  - cyclic mapping for 2 repetitions  2. Support of two SRS resource sets with usage set to 'non-codebook'  3. Supported number of SRS resources in one SRS resource set | ~~FFS~~ 59-3-1, 11-5 | yes | n/a | M-TRP PUSCH repetition is not supported for 3TX PUSCH transmission with type B for non-codebook based | Per FSPC | n/a | n/a | n/a | Component 3 candidate values: {1,2,3} | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-3-6 | PTRS of 3-antenna-port PUSCH transmission | Number of supported PTRS ports for PUSCH transmission | ~~[~~59-3-1 or~~]~~ 59-3-2 | yes | n/a | PTRS is not supported for 3TX PUSCH transmission | Per FS | n/a | n/a | n/a | Candidate values: {1,2} | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-3 | Two SRS closed-loop power control adjustment states separatefrom PUSCH | Support of two separate SRS closed loop indices separate from PUSCH | ~~FFS~~ | yes | n/a | Two separate SRS closed loop indexes is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-4d | PDCCH ordered sent by one TRP triggers RACH procedure towards a different TRP based on CRFA for inter-cell without CORESETPoolIndex | Support of PDCCH ordered sent by one TRP triggers RACH procedure towards a different TRP based on CRFA for inter-cell | ~~FFS~~ 59-4-4b | yes | n/a | PDCCH ordered sent by one TRP triggers RACH procedure towards a different TRP based on CRFA for inter-cell is not supported without CORESETPoolIndex | Per FS | No | No | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-5 | Overlapping UL transmission reduction | Support of reducing the overlapping duration of the later of the two time-domain overlapping UL transmissions when the UE is with two TA enhancement | ~~FFS~~ 59-4-4a or 59-4-4b | yes | n/a | Reducing the overlapping duration of the later of the two time-domain overlapping UL transmissions is not supported | Per band | n/a | n/a | n/a | Note: If UE does not support this feature, UE does not expect the two UL transmissions to overlap | Optional with capability signalling |

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| NR MIMO Phase 5 | 59-4-6 | MAC-CE update of PL offset value(s) | Support of MAC-CE update of the configured PL offset value(s) | ~~FFS~~ one or more of {59-4-1a, 59- 59-4-2a, 59-4-1b, 59-4-2b} | yes | n/a | MAC-CE update of the configured PL offset value(s) is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-7b | DCI format 2\_3 to indicate TPC for one of two separate SRS closed loop indexes | Support DCI format 2\_3 to indicate TPC for one of two separate SRS closed loop indexes. | ~~FFS~~ 59-4-3 | yes | n/a | The function of DCI 2\_3 indicating TPC command for one of two separate SRS closed loop indexes is not supported. | Per band | n/a | n/a | n/a |  | Optional with capability signaling |

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| 59. NR\_MIMO\_Ph5 | 59-4-8 | DCI format 1\_1 to indicate TPC command for SRS associated with a separate SRS CLPC adjustment state | Support of DCI format 1\_1 to indicate TPC command for SRS associated with a separate SRS CLPC adjustment state | ~~FFS~~ 59-4-3 | yes | n/a | DCI 1\_1 indicating TPC command for SRS associated with a separate SRS CLPC adjustment state is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-9a | DCI format 1\_1 to indicate one of two separate SRS closed loop indexes under separate DL/UL TCI state mode | Support of DCI format 1\_1 to indicate one or two separate SRS closed loop index(es) under separate DL/UL TCI state mode | ~~FFS~~ 59-4-8 | yes | n/a | DCI 1\_1 indicating one of two separate SRS closed loop indexes under separate DL/UL TCI state mode is not supported | Per band | n/a | n/a | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-4-9b | DCI format 1\_1 to indicate one of two separate SRS closed loop indexes under joint TCI state mode | Support of DCI format 1\_1 to indicate one or two separate SRS closed loop index(es) under joint TCI state mode | ~~FFS~~ 59-4-8 | yes | n/a | DCI 1\_1 indicating one of two separate SRS closed loop indexes under joint TCI state mode is not supported | Per band | n/a | FR1 only | n/a |  | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-3 | CJTC wideband PO report | 1. Configured maximum resolution (number of steps) for the quantization alphabet for CJTC WB PO reporting  2. Supported value of scaling factor X for OCPU calculation  3. Supported maximum slot duration for NTRP P/SP CSI-RS occasions being confined in | 2-35 | yes | n/a | CJTC PO report is not supported | Per band and per BC | n/a | n/a | n/a | Component 1 candidate values: {16, 32}  Component 2 candidate values: {1, 2}  Component 3 candidate values: {1, 2}  Note：OCPU =X.NTRP | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-2-3-4 | CJTC subband PO report | 1. Configured maximum resolution (number of steps) for the quantization alphabet for CJTC SB PO reporting  2. Configured minimum subband size in resource blocks for the CJTC subband PO report  3. Supported value of scaling factor X for OCPU calculation  4. Supported maximum slot duration for NTRP P/SP CSI-RS occasions being confined in | 2-35 | yes | n/a | CJTC subband PO report is not supported | Per band and Per BC | n/a | n/a | n/a | Component 1 candidate values: {16, 32}  Component 2 candidate values: {1, 2, 4, 8, 16}  Component 3 candidate values: {1, 2}  Component 4 candidate values: {1, 2}  Note：OCPU =X.NTRP | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-1 | UE-initiated/event-driven beam management for Event-2 based measurement and report for Mode A | 1. Support of UE-initiated/event-driven beam report based on one event instance  2. Support of Event-2 based measurement and report  3. Support of Mode A UE-initiated/event-driven beam report  4. Maximum number of the configured RS(s) for new beam in the RS resource set  5. Support of current beam measurement by using QCL RS in the indicated TCI state and the corresponding QCL SSB for Scheme-1 and Scheme-2, respectively  6. Support the first PUCCH and second PUSCH from the same PUCCH group |  | yes | n/a | UEI/ED beam report is not supported for Event-2 and Mode A | Per band | n/a | n/a | n/a | Component 4 candidate values: {1, 2, …, 64}  Note For Component 4 and Component 5, an SSB can be associated with the serving cell PCI or a PCI other than the serving cell PCI  Note: Regarding Event-2, QCL RS(s) in indicated TCI state(s) and resources configured for component 4 are also counted in FG 16-1g, and 16-1g-1 | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-4 | UE-initiated/event-driven beam management for Event-1 based measurement and report for Mode A | 1. Support of Event-1 based measurement and report for Mode A that L1-RSRP of the current beam becomes worse than a configured threshold based on one event instance | 59-1-1 | yes | n/a | UE-initiated/event-driven beam management for Event-1 based measurement is not supported for Mode A | Per Band | n/a | n/a | n/a | Note: the event definition  Event 1: Quality of the current beam is worse than a certain threshold  Note: Regarding Event-1, QCL RS(s) in indicated TCI state(s) and resources configured for component 4 of FG 59-1-1 are also counted in FG 16-1g, and 16-1g-1 | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-5 | UE-initiated/event-driven beam management for Event-7 based measurement and report for Mode A | 1. Support of Event-7 based measurement and report for Mode A that L1-RSRP of at least one new beam becomes a threshold value better than the RS derived from the activated TCI state with the Q-th best quality based on one event instance  2. Support of the RS derived from the activated TCI state with the Q-th best quality measurement by using QCL RS in the activated TCI state with the Q-th best quality and the corresponding QCL SSB for the activated TCI state with the Q-th best quality for Scheme-1 and Scheme-2, respectively | 59-1-1 | yes | n/a | UE-initiated/event-driven beam management for Event-7 based measurement is not supported for Mode A | Per Band | n/a | n/a | n/a | Component 1 candidate values for Q: bitmap of size 8, the n-th bit signals support for Q=n, n = 1,2,…,8, zero means no support, 1 means support  Note: The UE does not expect that the configured Q is greater than the number of the activated DL/joint TCI state(s)  Note: Regarding Event-7, the number of QCL RS(s) in activated TCI state(s) and resources configured for component 4 of FG 59-1-1 are also counted in FG 16-1g, and 16-1g-1  Note: For Component 2, an SSB can be associated with the serving cell PCI or a PCI other than the serving cell PCI | Optional with capability signalling |

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| 59. NR\_MIMO\_Ph5 | 59-1-7 | 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI for Event-2 and Event-7 | Support of 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI for Event-2 and Event-7 | 59-1-3 | yes | n/a | 1-bit condition met indication in RSRP report format for each report of CRI/SSBRI is not supported for Event-2 and Event-7 | Per Band | n/a | n/a | n/a |  | Optional with capability signalling |

R1-2505190 NR MIMO Phase 5 UE features Nokia

R1-2505272 Discussion on UE features for NR MIMO Phase 5 ZTE Corporation, Sanechips

R1-2505287 UE features for NR MIMO Phase 5 MediaTek Inc.

R1-2505335 Remaining issues on UE features for NR MIMO Phase 5 CATT

R1-2505344 UE features for NR MIMO Phase 5 Huawei, HiSilicon

R1-2505395 UE features for NR MIMO Phase 5 vivo

R1-2505444 Discussion on UE features for NR MIMO Phase 5 Xiaomi

R1-2505561 UE features for NR MIMO Phase 5 Samsung

R1-2505610 UE features for NR MIMO Phase 5 Ericsson

R1-2505668 Views on UE features for NR MIMO Phase 5 Ofinno

R1-2505739 UE features for NR MIMO Phase 5 OPPO

R1-2505894 Views on UE features for NR MIMO Phase 5 Apple

R1-2506196 UE features for NR MIMO phase 5 Qualcomm Incorporated

R1-2506227 Summary of UE features for NR MIMO Phase 5 Moderator (AT&T)

R1-2506285 Discussion on MIMO UE feature NTT DOCOMO, INC.