**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

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

**Title: Session Notes of AI 7.2.11**

**Agenda Item:** **7.2.11**

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

1.

#### 7.2.11 NR Rel-16 UE Features (19)

R1-2005944 Summary of UE features for IAB Moderator (AT&T)

R1-2005946 Summary of UE features for 5G V2X Moderator (AT&T)

R1-2005947 Summary of UE features for eMIMO Moderator (AT&T)

R1-2005948 Summary of UE features for UE power savings Moderator (AT&T)

R1-2005949 Summary of UE features for NR mobility enhancements Moderator (AT&T)

R1-2006708 Summary on UE features for two-step RACH Moderator (NTT DOCOMO, INC.)

R1-2006709 Summary on UE features for NR-U Moderator (NTT DOCOMO, INC.)

R1-2006710 Summary on UE features for URLLC/IIoT Moderator (NTT DOCOMO, INC.)

R1-2006711 Summary on UE features for NR positioning Moderator (NTT DOCOMO, INC.)

R1-2006712 Summary on UE features for MR-DC/CA Moderator (NTT DOCOMO, INC.)

R1-2006713 Summary on UE features for CLI/RIM Moderator (NTT DOCOMO, INC.)

R1-2006714 Summary on UE features for TEIs Moderator (NTT DOCOMO, INC.)

R1-2006715 Summary on NR UE features for others Moderator (NTT DOCOMO, INC.)

[102-e-NR-UEFeature-LS] Email discussion/approval on updated UE features list and LS for NR (8/19-8/21)

**2-step (1)**

[102-e-NR-UEFeatures-2Step-01] Email discussion/approval on UE features for two-step RACH (17th – 19th August), Hiroki (DCM)

* Whether the note in description field of FG9-1 is removed or not
* Whether FG9-6 is removed or not

**NR-U (2)**

[102-e-NR-UEFeatures-NRU-01] Email discussion/approval on UE features for NR-U (17th – 20th August), Hiroki (DCM)

* Whether the FG10-2f is removed for all deployment scenarios or retained for at least specific scenario(s)
* Whether the term “for NR-U” is replaced by “for operation with shared spectrum channel access” or not for FG10-2i/26/26a/27
* Whether each of FGs10-9/9b/9c/9d/15/16/20a is applicable to licensed bands or not (i.e., the note “the signaling is per band but is only expected for a band where shared spectrum channel access must be used” is added)
	+ Whether the note is added for 10-1/1a/2/2a/2b/2c/2d/2f/2g/2h/2i, 10-19a/b/c/d/e/f, 10-23, 10-25, 10-27, 10-29, 10-30, 10-26/26a, 10-3, 10-3a, 10-12, 10-13a, 10-18, 10-21a/21b, 10-24, 10-31

[102-e-NR-UEFeatures-NRU-02] Email discussion/approval on basic feature groups for NR-U deployment scenarios (after the completion of the NRU-01 email thread) till 8/26 – Hiroki (DCM)

* How to define basic FG(s) for each of particular NR-U deployment scenarios based on completed FGs

**IAB (1)**

[102-e-NR-UEFeatures-IAB-01] Email discussion/approval for remaining issues on UE features for IAB, till 8/20 – Ralf (AT&T)

* whether FG 20-2 and 20-3 are basic IAB feature groups

**V2X (2)**

[102-e-NR-UEFeatures-V2X-01] Email discussion/approval for remaining issues on UE features for NR V2X, till 8/20 – Ralf (AT&T)

* Resolve FFS in FG 15-2, components (9), Notes column
* Resolve FFS in FG 15-2 whether to mandate an SCS
* Resolve FFS in FG 15-6, components (2) incl. consequence if the feature is not supported by the UE
* Whether to add “in the same band per band combination” to “UE supports LTE V2X sidelink” as prerequisite for FG 15-6
* Resolve FFS in FG 15-11 for “Need for the eNB to know if the feature is supported”
* Resolve FFS in FG 15-11 for “Applicable to the capability signalling exchange between UEs”
* Resolve FFS in FG 15-18 for “Applicable to the capability signalling exchange between UEs”

**Agreement:** Adopt the following changes highlighted in red

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| 15-6 | Short-term time-scale TDM for in-device coexistence | 1. Support prioritization between LTE sidelink transmission/reception and NR sidelink transmission/reception
 | At least one of 15-1, 15-2, 15-3UE supports LTE V2X sidelink in the band combination | No | No | ~~FFS~~ When LTE V2X sidelink operates in the same band, UE supports TDM for in-device coexistence only when resource pool of NR sidelink does not overlap with resource pool of LTE sidelink in time domain. UE does not support subframe boundary alignment for in-device coexistence when the bands in the band combination are different | per band combination | N.A. | N.A. | N.A. |  | Optional without capability signalling |

**Conclusion:**

For all 15-x features and for all 5-x features, replace “5.2E-1” with “Table 5.2E.1-1”

**Proposed Conclusion:**

Regarding Q2 in R1-2007266, RAN1 has [no] concern.

**Proposed Conclusion:**

Regarding Q4 in R1-2007266, RAN1 has [no] concern.

**Proposal:** In FG 15-16 (for NR) / 5-11 (for LTE) on simultaneous transmission of uplink and sidelink

Alt. 1: a separate capability for simultaneous reception of downlink and sidelink is defined

Alt. 2: simultaneous reception is automatically supported if the same Uu-BC/PC5-BC is reported to support simultaneous transmission of uplink and sidelink

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| 5-11 | Simultaneous transmission of uplink and sidelink | 1) UE supports simultaneous transmission of LTE uplink and NR sidelink (in different bands) in a band combination for which the UE indicated simultaneous sidelink and uplink support in a band combination. | At least one of 5-2 and 5-3 | Yes | N/A |  | Per band combination | N.A. | N.A. |  | Optional with capability signalling |

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| 15-16 | Simultaneous transmission of uplink and sidelink | 1) UE supports simultaneous transmission of NR uplink and NR sidelink (in different bands) in a band combination for which the UE indicated simultaneous sidelink and uplink support in a band combination. | At least one of 15-2 and 15-3 | Yes | No |  | Per band combination | N.A. | N.A. | N.A. |  | Optional with capability signalling. |

**Proposal:** Adopt the following changes highlighted in red

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| 15-2 | Transmitting NR sidelink mode 1 scheduled by NR Uu | 1) UE can transmit PSCCH/PSSCH using dynamic scheduling or configured grant type 1 and 2 in NR sidelink mode 1 scheduled by NR Uu. Up to 8 configured grants can be configured for a UE. Up to C sidelink HARQ processes are supported including those for configured grants2) UE can transmit PSSCH according to the normal 64QAM MCS OFDM table.3) UE supports PT-RS transmission in FR2.4) UE can monitor DCI format 3\_0 for NR sidelink dynamic scheduling and configured grant type 2.6) UE can transmit using the subcarrier spacing and CP length it reports.8) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to ~~{~~#PSSCH symbols} = {10,7} for slots w/wo PSFCH.9) Support downlink pathloss based open loop power control11) UE can report sidelink HARQ-ACK to gNB via PUCCH and PUSCH when it is operating in NR sidelink mode 1 |  | Yes | No |  | Per band | N.A. | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.This is the basic FG for sidelink in licensed spectrum where gNB is operating on or managing that spectrum and optional FG otherwiseCandidate values for C are {8,16}Note: the UE supports up max(B, C) as the total number of sidelink HARQ processes across both Mode 1 and Mode 2Component-6 candidate value set in FR1:{{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}Component-6 candidate value set in FR2:{{60 kHz}, {120 kHz}, {60, 120 kHz}}Component-6 candidate value set for CP length: {NCP,NCP and ECP} (ECP only applies to SCS of 60 kHz)Note: For Component 6, if a band is not indicated with only the PC5 interface in 38.101-1 Table 5.2E-1, the reported numerology shall be the same for sidelink and uplink.Component (9) is only required to be supported in a band not indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 11 is not required to be supported in a band indicated with the PC5 interface in 38.101-1 Table 5.2E-1~~FFS: whether to mandate an SCS.~~In a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1, the UE supports at least 30 kHz with normal CP in FR1, and at least 120 kHz with normal CP in FR2 | Optional with capability signallingFor UE supports NR sidelink in licensed spectrum where gNB is defined, UE must indicate this FG is supported. |

Not mandating is supported by:

HW/HiSi, ZTE

Mandating in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1 is supported by:

QC, LGE, OPPO, E//, Nokia

[102-e-NR-UEFeatures-V2X-02] Email discussion/approval for basic UE feature groups for NR V2X, till 8/26 – Ralf (AT&T)

* resolve any open issue in the last two columns of a FG pertaining to, if applicable, whether such a FG is a basic NR V2X feature (e.g., “FFS: This is the basic FG for NR sidelink”).

**Agreement:** Adopt the following changes highlighted in red

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| 15-2 | Transmitting NR sidelink mode 1 scheduled by NR Uu | 1) UE can transmit PSCCH/PSSCH using dynamic scheduling or configured grant type 1 and 2 in NR sidelink mode 1 scheduled by NR Uu. Up to 8 configured grants can be configured for a UE. Up to C sidelink HARQ processes are supported including those for configured grants2) UE can transmit PSSCH according to the normal 64QAM MCS OFDM table.3) UE supports PT-RS transmission in FR2.4) UE can monitor DCI format 3\_0 for NR sidelink dynamic scheduling and configured grant type 2.6) UE can transmit using the subcarrier spacing and CP length it reports.8) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to ~~{~~#PSSCH symbols} = {10,7} for slots w/wo PSFCH.9) Support downlink pathloss based open loop power control11) UE can report sidelink HARQ-ACK to gNB via PUCCH and PUSCH when it is operating in NR sidelink mode 1 |  | Yes | No |  | Per band | N.A. | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.~~FFS:~~ This is the basic FG for sidelink in licensed spectrum where gNB is operating on or managing that spectrum and optional FG otherwiseCandidate values for C are {8,16}Note: the UE supports up max(B, C) as the total number of sidelink HARQ processes across both Mode 1 and Mode 2Component-6 candidate value set in FR1:{{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}Component-6 candidate value set in FR2:{{60 kHz}, {120 kHz}, {60, 120 kHz}}Component-6 candidate value set for CP length: {NCP,NCP and ECP} (ECP only applies to SCS of 60 kHz)Note: For Component 6, if a band is not indicated with only the PC5 interface in 38.101-1 Table 5.2E-1, the reported numerology shall be the same for sidelink and uplink.Component (9) is only required to be supported in a band not indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 11 is not required to be supported in a band indicated with the PC5 interface in 38.101-1 Table 5.2E-1FFS: whether to mandate an SCS. | Optional with capability signalling~~FFS:~~ For UE supports NR sidelink in licensed spectrum where gNB is defined, UE must indicate this FG is supported. |

**Agreement:** Adopt the following changes highlighted in red

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| 15-3 | Transmitting NR sidelink mode 2  | 1) UE can transmit PSCCH/PSSCH using NR sidelink mode 2 configured by NR Uu or preconfiguration. Up to B sidelink processes are supported.2) UE can transmit PSSCH according to the normal 64QAM MCS table.3) UE supports PT-RS transmission in FR2.4) UE can perform mode 2 sensing and resource allocation operations6) UE can transmit using the subcarrier spacing and CP length it reports for FG 15-18) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to ~~{~~#PSSCH symbols} = {10,7} for slots w/wo PSFCH.10) UE can transmit using 30 kHz and normal CP subcarrier spacing in FR1, 120 kHz subcarrier spacing with normal CP FR211) DL pathloss based open loop power control when mode 2 is configured by NR Uu | 15-1 | Yes | No |  | Per band | N.A. | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1This is the basic FG for NR sidelink ~~[in ITS spectrum where gNB is not defined in spectrum where pre-configuration is applied and optional FG for licensed spectrum where gNB is defined]~~Candidate values for B are {8,16}Note: the UE supports up max(B, C) as the total number of sidelink HARQ processes across both Mode 1 and Mode 2Note: Component 6 is not required to be signalled in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 10 is only required in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Note: Component 11 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1  | Optional with capability signallingFor UE supports NR sidelink, ~~[for UE supports NR sidelink in ITS spectrum where gNB is not defined in spectrum where pre-configuration is applied, UE must indicate this FG is supported,]~~ UE must indicate this FG is supported. |

**Agreement:** Adopt the following changes highlighted in red

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| 15-5 | Sidelink congestion control | 1) UE can report CBR measurement to gNB when operating in Mode 1 and mode 2 2) UE can adjust its radio parameters based on CBR measurement and CRlimit.3) UE can process CBR and CR within the time it indicates | 15-1 and at least one of 15-2 and 15-3 | Yes | No |  | Per band | N.A. | N.A. | N.A. | ~~FFS:~~ This is the basic FG for NR sidelink Note: component 1 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E-1Component-3 candidate value set{Congestion process time 1, Congestion process time 2} whereCongestion process time 1: 2, 2, 4, 8 slots for 15, 30, 60, 120 kHz subcarrier spacing.Congestion process time 2: 2, 4, 8, 16 slots for 15, 30, 60, 120 kHz subcarrier spacing | Optional with capability signalling~~FFS:~~ For UE supports NR sidelink, UE must indicate this FG is supported. |

**Agreement:** Adopt the following changes highlighted in red

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| 15-19 | Support of rank 2 reception | 1) UE additionally supports rank 2 PSSCH reception | 15-1 | No | Yes | UE supports rank 1 PSSCH reception only. | Per band |  N.A. | N.A. | N.A. | RAN1 does not see a need for the gNB to know if the feature is supported but would like to leave final decision to RAN2 ~~FFS: This is the basic FG for NR sidelink~~ | ~~[~~Optional with capability signalling~~]~~  |

**Agreement:** Adopt the following changes highlighted in red

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| 15-22 | Support of fewer than 14 consecutive sidelink symbols in a slot  | 1. UE additionally supports transmission/reception of SL slot configured with 7, 8, 9, 10, 11, 12, 13 consecutive symbols and all the corresponding DMRS patterns
 | At least one of 15-1, 15-2, 15-3 | Yes | No | UE supports SL only in a SL slot configured with 14 consecutive symbols. | Per band |  N.A. | N/A | N.A. | ~~FFS: This is the basic FG for NR sidelink~~  | Optional with capability signalling |

**Agreement:** Adopt the following changes highlighted in red

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| 15-23 | Support of open loop SL power control and RSRP report | 1. Support sidelink pathloss based open loop power control and RSRP report in case of unicast
 | 15-1 and at least one of 15-2 and 15-3 | Yes  | Yes |  | Per band |  N.A. | N/A | N.A. | ~~Working assumption:~~ This ~~FG~~ is the ~~a~~ basic ~~UE~~ FG ~~[at least]~~ for ~~UEs supporting mode 1~~ NR sidelink~~FFS: whether this is a basic FG also for UEs not supporting mode 1~~ | Optional with capability signallingFor UE supports NR sidelink, UE must indicate this FG is supported. |

**Proposal:** Adopt the following changes highlighted in red

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| 15-14 | Sidelink CSI report | 1) UE can transmit and receive sidelink CSI-RS with up to P antenna port(s).2) UE supports RI ~~and CQI feedback~~ on sidelink3) UE supports CQI feedback on sidelink | 15-1 and at least one of 15-2 and 15-3 | No | Yes |  | Per band | N.A. | N.A. | N.A. | ~~FFS:~~ This is the basic FG for NR sidelinkNote: Component 1 candidate values are P = {1,2}Note: P=2 is not a basic functionalityNote: Component (2) is not a basic functionality   | Optional with capability signalling.FF~~S:~~ For UE supports NR sidelink, UE must indicate this FG is supported  |

**URLLC/IIoT (2)**

[102-e-NR-UEFeatures-URLLC/IIoT-01] Email discussion/approval on UE features for URLLC/IIoT (17th – 20th August) – Hiroki (DCM)

* Whether/how to define a new FG for “TB CRC for cancelled initial PUSCH with CBG based re-transmission” based on outcome of discussion in maintenance email discussion
* Whether/how to define FG11-3c/d/e/f/g and 11-4c/d/e/f/g/h/i
* Whether the component 3 of FG11-3 is kept, removed or replaced by another component
* Whether the component 4 of FG11-4/4a and the component 1 of FG12-1 are kept, removed or replaced by other component(s)
* Whether the component 6 of FG11-4/4a is kept, removed or modified, and what are candidate values for the component 6

[102-e-NR-UEFeatures-URLLC/IIoT-02] Email discussion/approval on UE features for URLLC/IIoT (17th – 20th August) – Hiroki (DCM)

* Whether to add licensed/unlicensed differentiation for FG11-6 or not
* Whether to add components for the restriction on the number of monitoring occasions per slot/half-slot to FG11-2 or not
* Whether/how to add new FGs for the reference cell number for DC PDCCH BD/CCE limit
* Whether/how to add new FG for independent cancellation of the overlapping channels in an intra-band UL CA

**MIMO (1)**

[102-e-NR-UEFeatures-eMIMO-01] Email discussion/approval for remaining issues on UE features for NR MIMO enhancements, till 8/20 – Ralf (AT&T)

* Finalize open issues of FG 16-1a-1: component descriptions, component candidate values, default values if any, how CSI-RS is counted when it is configured as CMR without dedicated IMR, whether/how capability of SP L1-SINR reporting is supported
* Finalize open issues of FG 16-1g: component descriptions, component candidate values, type
* Finalize open issues of FG 16-2a: component descriptions, component candidate values, type, prerequisites, FFS in component (5)
* Finalize open issues of FG 16-2a-0: type
* Finalize open issues of FG 16-2a-1: type
* Finalize open issues of FG 16-2a-2: type
* Finalize open issues of FG 16-2a-3: type and note per Section  3.1 in R1-2005947
* Finalize open issues of FG 16-2a-10: prerequisites per Section  3.2 in R1-2005947
* Finalize open issues of FG 16-2c: component descriptions
* Finalize open issues of FG 16-2b-1: type
* Finalize open issues of FG 16-2b-1b: prerequisites per Section  3.3 in R1-2005947
* Finalize open issues of FG 16-2b-2: type
* Finalize open issues of FG 16-2b-3: type
* Finalize open issues of FG 16-2b-3a: type
* Finalize open issues of FG 16-2b-4: type
* Finalize open issues of FG 16-2b-5: component descriptions, type
* Finalize open issues of FG 16-3a: component descriptions, component candidate values
* Finalize open issues of FG 16-3b: component descriptions, component candidate values
* Finalize open issues of FG 16-5b: component descriptions
* Finalize open issues of FG 16-5c-2: component descriptions
* Finalize open issues of FG 16-5c-3: component descriptions
* Finalize open issues of FG 16-8: prerequisites and the following FFS
	+ whether introduce codebook 3, where codebook 3 is down selected from {Type II, Type II PS, eType II R=1, eType II R=2, eType II PS R=1, eType II PS R=2, NULL}
	+ the max number of combinations can be signaled in component 1
	+ the minimum requirement for component 2
* Maximum number of unicast PDSCHs for FDMSchemeB / TDMSchemeA per Section  3.5 in R1-2005947

**Agreement:**

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| 16-2a-10 | Value of BD factor | Value of R for BD/CCE  | 16-2a | Yes | N/A |  | Per BC | No | No |  | Component: {1,2} | Optional with capability signalling |

**Agreement:**

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| 16-2b-1b | Single-DCI based SDM scheme – Support of new DMRS port entry | 1. Support of new DMRS port entry {0, 2, 3}
 | 16-2b-1 | Yes | N/A |   | Per band | N/A | N/A |   |   | Optional with capability signaling |

**Agreement:**

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| 16-8 | Active CSI-RS resources and ports for mixed codebook types in any slot | 1. Report a list of codebook combinations as {codebook 1, codebook 2, codebook 3}
2. For each codebook combination, report a list of {max number of ports per resource, max number of resources, max number of total ports}
 | ~~[2-35]~~ 2-36/2-40/2-41/2-43 in Rel-15, and 16-3a, 16-3a-1, 16-3b, 16-3b-1 in Rel-16 | Yes | N/A |   | per band and per BC | N/A | N/A |   | Component-1 candidate values:Codebook 1 = {Type I SP, Type I MP}~~codebook 2 = {Type II, Type II PS, eType II R=1, eType II R=2, eType II PS R=1, eType II PS R=2 }~~(Codebook 2, Codebook 3) = {(Type II, NULL), (Type II PS, NULL), (eType II R=1, NULL), (eType II R=2, NULL), (eType II PS R=1, NULL), (eType II PS R=2, NULL), (Type II, Type II PS)}~~FFS: whether introduce codebook 3, where codebook 3 is downselected from {Type II, Typed II PS, eType II R=1, eType II R=2, eType II PS R=1, eType II PS R=2, NULL}~~Note 3：if a UE reports one or more codebook combinations in 16-8, then usage of active CSI-RS resources and ports for multiple codebooks in any slot is allowed only within those combinationsNote 4: For coexisting of mixed codebooks in any slot, gNB need to honor 16-8 and per-codebook capability 2-36/40/41/43 and 16-3a/b~~FFS: the max number of combinations can be signaled in component 1~~Note 5: Up to 4 combinations for component 1~~FFS: the minimum requirement for component 2~~ Component-2 candidate values:* Maximum 16 triplets for each codebook combination
* Max # of Tx ports in one resource: {4,8,12,16,24,32}
* Max # resources: {1 to 64}
* Max # total ports: {4 to 256}
 | Optional with capability signaling |

**Agreement:** Agree the following revisions for the following FGs (i.e., only the type):

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| 16-2a | Multi-DCI based multi-TRP | 1. The maximum number of CORESETs configured per “PDCCH-Config”
2. The maximum number of CORESETs configured per CORESETPoolIndex ( if CORESETPoolIndex is not configured, it is assumed CORESETPoolIndex = 0) per “PDCCH-Config”
3. Support fully/partially overlapping PDSCHs in time and non-overlapping in frequency
4. Maximum number of unicast PDSCHs per CORESETPoolIndex per slot
5. [PDSCH processing capability for CC]
 | FFS | Yes | N/A |  | ~~FFS~~ per FSPC | No | No |  | Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPFFS: component (5) only applies to UE processing capability #1Component 1: Candidate values {[2,] 3,4,5}Component 2: Candidate values {1,2,3}Component 4: Candidate values {1,2,4,7}Note: per SCS, similar with Rel-15 | Optional with capability signaling |
| 16-2a-0 | Overlapping PDSCHs in time and fully overlapping in frequency and time | 1. Support PDSCHs with fully overlapping REs, i.e. the allocated REs for PDSCH scheduled by DCI in CORESET configured with CORESETPoolIndex = 0 and PDSCH scheduled by DCI in CORESET configured with CORESETPoolIndex = 1 are exactly the same REs
2. The maximal number of PDSCH scrambling sequences per serving cell
 | 16-2a | Yes | N/A |  | ~~FFS~~ per band | No | No |  | Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPComponent 2: Candidate values {1, 2} | Optional with capability signalling |
| 16-2a-1 | Overlapping PDSCHs in time and partially overlapping in frequency | 1. Support PDSCHs with partially overlapping REs, i.e. the allocated REs for PDSCH scheduled by DCI in CORESET configured with CORESETPoolIndex = 0 and PDSCH scheduled by DCI in CORESET configured with CORESETPoolIndex = 1 are partially overlapped, with at least one RE

  | 16-2a-0 | Yes | N/A |  | ~~FFS~~ per band | No | No |  |  | Optional with capability signalling |
| 16-2a-2 | Out-of-order operation for DL | 1. Support out-of-order operation for PDCCH to PDSCH2. Support out-of-order operation for PDSCH to HARQ-ACK | 16-2a | Yes | N/A |  | ~~FFS~~ per band | No | No |  |  | Optional with capability signalling |
| 16-2a-3 | Out-of-order operation for UL | 1. Support out-of-order operation for PDCCH to PUSCH | 16-2a | Yes | N/A |  | ~~FFS~~ per band | No | No |  | Note: “Same closed loop index for power control across PUSCHs associated with different CORESETPoolIndex values is not supported by a UE indicating the support of this feature” | Optional with capability signalling |
| 16-2b-1 | Single-DCI based SDM scheme | 1. Support of single-DCI based SDM scheme
 |  | Yes | N/A |  | ~~[Per band or~~ per FS~~]~~ | N/A | N/A |  |  | Optional with capability signaling |
| 16-2b-2 | Single-DCI based FDMSchemeA | Support of single-DCI based FDMSchemeA |  | Yes | N/A |  | ~~[~~Per band ~~or per FSPC]~~ | No | No |  |  | Optional with capability signaling |
| 16-2b-3 | Single-DCI based FDMSchemeB | 1. Support of single-DCI based FDMSchemeB
 |  | Yes | N/A |  | ~~[~~per FSPC~~]~~ | No | No |  |  | Optional with capability signaling |
| 16-2b-3a | Single-DCI based FDMSchemeB CW soft combining | 1. For FDMSchemeB, Support CW soft combining that UE can support
 | 16-2b-3 | Yes | N/A |  | ~~[~~per band ~~FSPC]~~ | No | No |  |  | Optional with capability signaling |
| 16-2b-4 | Single-DCI based TDMSchemeA | 1. Support of single-DCI based TDMSchemeA
2. Supported maximum TBS size for TDMSchemeA
 |  | Yes | N/A |  | ~~[~~Per band ~~or per FSPC]~~ | No | No |  | Component 2 candidate values {3, 5, 10, 20, no restriction} KByte | Optional with capability signaling |
| 16-2b-5 | Single-DCI based inter-slot TDM | 1. Support of single-DCI based inter-slot TDM
2. Support of RepNumR16 in PDSCH-TimeDomainResourceAllocation and the maximum value of RepNumR16
3. Supported maximum TBS size
4. [Maximum number of TCI states]
 |  | Yes | N/A |  | ~~[~~Per band ~~or per FSPC]~~ | No | No |  | Component 2 candidate values: {{2,3,4,5,6,7,8,16}}Component 3 candidate values {{3, 5, 10, 20, no restriction} KByte } | Optional with capability signaling |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1g | Resources for beam management, ~~[~~pathloss measurement, BFD,~~and BFR]~~ RLM and new beam identification | 1. The maximum number of ~~[unique]~~ SSB/CSI-RS/CSI-IM resources configured to measure within a slot across all CCs [in a band] for any of L1-RSRP measurement, L1-SINR measurement, ~~[~~pathloss measurement, BFD, RLM~~]~~ and new beam identification
2. The maximum number of SSB/CSI-RS/CSI-IM resources configured across all CCs [in a band] for any of L1-RSRP measurement, L1-SINR measurement, ~~[~~pathloss measurement, BFD, RLM~~]~~ and new beam identification
 | 2-24, 2-31 | Yes | N/A |  | ~~[~~Per band~~]~~~~[Per BC]~~~~[Per UE]~~ | No | No |  | Component-1: candidate value set is {4, 8, 12, 16, 32, 64, 128~~, FFS~~}~~[~~Component-2: candidate value set is {4, 8, 12, 16, 32, 40, 48, 64, 72, 80, 96, 128, 256~~, FFS~~}~~]~~FFS: how to count the RS for component (1) and (2)FFS: The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the maximum FR1 value across all FR1 serving cells and no more than the maximum FR2 value across all FR2 serving cells | Optional with capability signaling |

**Agreement:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1a-1 | SSB/CSI-RS for L1-SINR measurement | Per slot limitations:1. The max number of ~~[unique]~~ SSB/CSI-RS ~~[~~(1Tx)~~]~~ for CMR
2. The max number of CSI-IM/NZP-IMR resources
3. The max number of CSI-RS (2Tx) resources for CMR

Memory limitations:1. The max number of SSB/CSI-RS resources as CMR
2. The max number of CSI-IM/NZP IMR resources

Other limitations:1. Supported density of CSI-RS (CMR)
2. The max number of aperiodic CSI-RS resources across all CCs configured to measure L1-SINR (including CMR and IMR) shall not exceed MD\_1
3. Supported SINR measurements~~: {SSB as CMR with dedicated IMR, CSI-RS as CMR with dedicated [CSI-IM/NZP IMR] configured, CSI-RS as CMR without dedicated IMR configured, [CSI-RS (2Tx) resources for CMR]}~~
 | 2-21, 2-22 or 2-23, 2-23a | Yes  | N/A |  | Per band | No | No |  | Component 1: Candidate values {8, 16, 32, 64}Component 2: Candidate values {~~[0,]~~ 8, 16, 32, 64}Component 3: Candidate values {~~[~~0, 4,~~]~~ 8, 16, 32, 64}Component 4: Candidate values {~~[~~8,~~]~~ 16, 32, 64 ~~[~~, 128~~]~~}Component 5: Candidate values {~~[0,]~~ 8, 16, 32, 64 ~~[~~, 128]}Component 6: Candidate values {‘1 only’, ‘3 only’, ‘1 and 3’}Component 7: Candidate values {[0, 1, 2, 4,] 8, 16, 32, 64}Component 8: Candidate values: bitmap with entries {SSB as CMR with dedicated CSI-IM, SSB as CMR with dedicated NZP IMR, CSI-RS as CMR with dedicated NZP IMR configured, CSI-RS as CMR without dedicated IMR configured} ~~FFS~~ ~~Note: For Component 8,~~ If a UE supports FG 16-1a-1 it must ~~at least report~~ support ~~of~~ CMR(CSI-RS) + dedicated CSI-IM ~~one [FFS: which one(s)]~~FFS: How CSI-RS is counted when it is configured as CMR without dedicated IMR | Optional with capability signalling |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-3a | Regular eType-II | Basic components:1. {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} to support regular eType-II for R=1
2. Support of parameter combinations  1-6
3. Support of rank 1,2
4. ~~[Number of beams L per CSI-RS ports]~~
 | 2-35 | Yes | N/A |  | Per band and per BC | N/A | N/A |  | Candidate values for component 1:* Maximum 16 triplets
* Max # of Tx ports in one resource: {~~[2,]~~ 4,8,12,16,24,32}
* Max # resources: {1 to 64}
* Max # total ports: {2 to 256}
 | Optional with capability signaling |
| 16-3b | Port selection eType-II | Basic components:1. {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} to support port selection eType-II for R=1
2. 6 parameter combinations (combos with L=6 don’t apply)
3. Support of rank 1,2
4. ~~[Number of beams L per CSI-RS ports]~~
 | 2-35 | Yes | N/A |  | Per band and per BC | N/A | N/A |  | Candidate values for component 1:* Maximum 16 triplets
* Max # of Tx ports in one resource: {~~[2,]~~ 4,8,12,16,24,32}
* Max # resources: {1 to 64}
* Max # total ports: {2 to 256}
 | Optional with capability signaling |

**Agreement:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-3a | Regular eType-II | Basic components:1. {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} to support regular eType-II for R=1
2. Support of parameter combinations  1-6
3. Support of rank 1,2
 | 2-35 | Yes | N/A |  | Per band and per BC | N/A | N/A |  | Candidate values for component 1:* Maximum 16 triplets
* Max # of Tx ports in one resource: {4,8,12,16,24,32}
* Max # resources: {1 to 64}
* Max # total ports: {~~2~~4 to 256}
 | Optional with capability signaling |
| 16-3b | Port selection eType-II | Basic components:1. {Max # of Tx ports in one resource, Max # of resources and total # of Tx ports} to support port selection eType-II for R=1
2. 6 parameter combinations (combos with L=6 don’t apply)
3. Support of rank 1,2
 | 2-35 | Yes | N/A |  | Per band and per BC | N/A | N/A |  | Candidate values for component 1:* Maximum 16 triplets
* Max # of Tx ports in one resource: {4,8,12,16,24,32}
* Max # resources: {1 to 64}
* Max # total ports: {~~2~~4 to 256}
 | Optional with capability signaling |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1g | Resources for beam management, pathloss measurement, BFD, RLM and new beam identification | 1. The maximum total number of SSB/CSI-RS/CSI-IM resources configured to measure within a slot across all CCs in one frequency range ~~[in a band]~~ for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
2. The maximum total number of SSB/CSI-RS/CSI-IM resources configured across all CCs in one frequency range ~~[in a band]~~ for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
 | 2-24, 2-31 | Yes | N/A |  | Per ~~band~~ UE | No | ~~No~~ Yes |  | Component-1: candidate value set is {4, 8, 12, 16, 32, 64, 128}Component-2: candidate value set is {4, 8, 12, 16, 32, 40, 48, 64, 72, 80, 96, 128, 256}FFS: how to count the RS for component (1) and (2)Note: For FR1 the reference SCS is 15 kHz, for FR2 the reference SCS is 60 kHz~~FFS: The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the maximum FR1 value across all FR1 serving cells and no more than the maximum FR2 value across all FR2 serving cells~~ | Optional with capability signaling |
| 16-1g-1 | Resources for beam management, pathloss measurement, BFD, RLM and new beam identification across frequency ranges | 1. The maximum total number of SSB/CSI-RS/CSI-IM resources configured to measure within a slot across all CCs for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
2. The maximum total number of SSB/CSI-RS/CSI-IM resources configured across all CCs for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
 | 2-24, 2-31, 16-1g | Yes  | N/A |   | Per UE | No | No |   | Component-1: candidate value set is {4, 8, 12, 16, 32, 64, 128}Component-2: candidate value set is {4, 8, 12, 16, 32, 40, 48, 64, 72, 80, 96, 128, 256}Note: This FG indicates the maximum number of resources including both FR1 and FR2FFS: Note: The signalled values apply to the shortest slot duration supported by the UE  | Optional with capability signaling |

**Conclusion:** Remove FG 16-2a-9

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| ~~16-2a-9~~ | ~~[Simultaneous reception across CCs with Multi-DCI]~~ | ~~[The maximum number of CCs supporting multi-DCI based multi-TRP simultaneously]~~ |  | ~~Yes~~ | ~~N/A~~ |  | ~~FSS~~ | ~~FSS~~ | ~~FSS~~ |  | ~~Note: If the type of 16-2a is agreed to be FSPC or Fs this FG will be removed~~  | ~~Optional with capability signalling~~ |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-2a | Multi-DCI based multi-TRP | 1. The maximum number of CORESETs configured per ~~“PDCCH-Config”~~ BWP per cell in addition to CORESET 0
2. The maximum number of CORESETs configured per CORESETPoolIndex ( if CORESETPoolIndex is not configured, it is assumed CORESETPoolIndex = 0) per ~~“PDCCH-Config”~~ BWP per cell in addition to CORESET 0
3. Support fully/partially overlapping PDSCHs in time and non-overlapping in frequency
4. Maximum number of unicast PDSCHs per CORESETPoolIndex per slot
5. ~~[PDSCH processing capability for CC]~~
 | ~~FFS~~ | Yes | N/A |  | per FSPC | No | No |  | Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CP~~FFS: component (5) only applies to UE processing capability #1~~Note: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of CORESETPoolIndexComponent 1: Candidate values {~~[~~2,~~]~~ 3,4,5}Component 2: Candidate values {1,2,3}Component 4: Candidate values {1,2,3,4,7}Note: per SCS, similar with Rel-15 | Optional with capability signaling |

Note**:** RAN1 will continue discussing how the network will interpret the signaled maximum number of CORESETs in components (1) and (2) (i.e., candidate value 5 for component (1) and candidate value 3 for component (2)) of FG 16-2a, e.g., when CORESET #0 is not configured

**Agreement:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-2b-5 | Single-DCI based inter-slot TDM | 1. Support of single-DCI based inter-slot TDM
2. Support of RepNumR16 in PDSCH-TimeDomainResourceAllocation and the maximum value of RepNumR16
3. Supported maximum TBS size
4. ~~[~~Maximum number of TCI states~~]~~
 |  | Yes | N/A |  | Per band | No | No |  | Component 2 candidate values: {{2,3,4,5,6,7,8,16}}Component 3 candidate values {{3, 5, 10, 20, no restriction} KByte }Component 4 candidate values: {1,2} | Optional with capability signalling |

**Agreement:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-5c-3 | UL full power transmission fullpowerMode2 – full power TPMI groups  | 1. TPMI group(s) which delivers full power~~: {2-port {2-bit bitmap}, 4-port non-coherent {G0~G3}, 4-port partial-coherent {G0~G6}, [FFS: 4-port full-coherent {G0~G6}]}~~
 | 16-5c | Yes | N/A |  | Per FS | No | No |  | Candidate component values: any of {2-port {2-bit bitmap}, one of 4-port non-coherent {G0~G3}, one of 4-port partial-coherent {G0~G6}}Note: When a full coherent UE operates in mode 2, the way it reports TPMIs should be the same as a partial-coherent UEFFS: Note: For 4 port partial-coherent or full-coherent UE, UE can report: 2-port {2-bit bitmap} and 4-port non-coherent {G0~G3} and 4-port partial-coherent {G0~G6}For 4 port non-coherent UE, UE can report: 2-port {2-bit bitmap} and 4-port non-coherent {G0~G3} For 2 port UE, UE can report: 2-port {2-bit bitmap} | Optional with capability signaling |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1a-1 | SSB/CSI-RS for L1-SINR measurement | Per slot limitations:1. The max number of SSB/CSI-RS (1Tx) for CMR
2. The max number of CSI-IM/NZP-IMR resources
3. The max number of CSI-RS (2Tx) resources for CMR

Memory limitations:1. The max number of SSB/CSI-RS resources as CMR
2. The max number of CSI-IM/NZP IMR resources

Other limitations:1. Supported density of CSI-RS (CMR)
2. The max number of aperiodic CSI-RS resources across all CCs configured to measure L1-SINR (including CMR and IMR) shall not exceed MD\_1
3. Supported SINR measurements
 | 2-21, 2-22 or 2-23, 2-23a | Yes  | N/A |  | Per band | No | No |  | Component 1: Candidate values {8, 16, 32, 64}Component 2: Candidate values {8, 16, 32, 64}Component 3: Candidate values {0, 4, 8, 16, 32, 64}Component 4: Candidate values {8, 16, 32, 64, 128}Component 5: Candidate values {8, 16, 32, 64, 128}Component 6: Candidate values {‘1 only’, ‘3 only’, ‘1 and 3’}Component 7: Candidate values {~~[0, 1,~~ 2, 4,~~]~~ 8, 16, 32, 64}Component 8: Candidate values: bitmap with entries {SSB as CMR with dedicated CSI-IM, SSB as CMR with dedicated NZP IMR, CSI-RS as CMR with dedicated NZP IMR configured, CSI-RS as CMR without dedicated IMR configured} If a UE supports FG 16-1a-1 it mustsupport CMR(CSI-RS) + dedicated CSI-IMFFS: How CSI-RS is counted when it is configured as CMR without dedicated IMR | Optional with capability signalling |

**Conclusion:**

* No new ASN.1 impact for FG 16-2a-3
* Continue discussion in maintenance session on how/whether to revise the note and/or address in specifications

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-5c-3 | UL full power transmission fullpowerMode2 – full power TPMI groups  | 1. TPMI group(s) which delivers full power
 | 16-5c | Yes | N/A |  | Per FS | No | No |  | Candidate component values: any of {2-port {2-bit bitmap}, one of 4-port non-coherent {G0~G3}, one of 4-port partial-coherent {G0~G6}}Note: When a full coherent UE operates in mode 2, the way it reports TPMIs should be the same as a partial-coherent UE~~FFS:~~ Note: For 4 port partial-coherent or full-coherent UE, UE can report: 2-port {2-bit bitmap} and one of 4-port non-coherent {G0~G3} and one of 4-port partial-coherent {G0~G6}For 4 port non-coherent UE, UE can report: 2-port {2-bit bitmap} and one of 4-port non-coherent {G0~G3} For 2 port UE, UE can report: 2-port {2-bit bitmap}Note: A UE that supports FG 16-5c-3 must report at least one  | Optional with capability signaling |

**Agreement:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-5b | UL full power transmission *fullpowerMode1* | 1. Supported UL full power transmission *fullpowerMode1*
2. ~~[Number of Tx to support mode 1: {2Tx, 4Tx, 2Tx\_4Tx}]~~
 | 2-13, 2-14 | Yes | N/A |  | Per FS  | No | No |  |  | Optional with capability signaling |

**Agreement:**

* Adopt the following changes highlighted in red

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-5c-2 | UL full power transmission fullpowerMode2 – SRS resources | 1. ~~[Number of Tx to support mode 2: {2Tx, 4Tx, 2Tx\_4Tx}]~~
2. The SRS configuration with different number of antenna ports per SRS resource for Mode 2~~: {[NULL,] 1\_2, 1\_4, [2\_4], 1\_2\_4}~~
 | 16-5c | Yes | N/A |  | Per FS | No | No |  | Component (2) candidate values: {1\_2, 1\_4, 2\_4, 1\_2\_4}Note: RAN1 will continue discussing the meaning of {1\_2, 1\_4, 2\_4, 1\_2\_4} without additional ASN.1 impactNote: At most one of the values (i.e., 2\_4) may end up being defined as spare  | Optional with capability signaling |

* Add a note to FG 16-5c: A UE that supports FG 16-5c supports at least full power operation with single port

**Conclusion:**

* Define two new FGs for semi-persistent L1-SINR reporting on PUCCH/PUSCH
	+ Details to be finalized during RAN1 #102-e
* Indicate in the LS that this may have impact on network in regard to early implementations and/or may be NBC
	+ Discuss final wording for LS during RAN1 #102-e

**Agreement:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-2c | Simultaneous reception with different Type-D | Supports simultaneous reception with different QCL Type-D RSs ~~[based on multiple spatial domain receiver filters~~]. ~~This applies to [PDCCHs]/PDSCHs~~ |  | Yes | N/A |  | Per band | N/A | FR2 only |  |  | Optional with capability signalling |

**Agreement:** The following two new FGs for semi-persistent L1-SINR reporting on PUCCH/PUSCH are defined

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1a-3 | Semi-persistent L1-SINR report on PUCCH | 1) Support report on PUCCH formats over 1 – 2 OFDM symbols once per slot (or piggybacked on a PUSCH)2) Support report on PUCCH formats over 4 – 14 OFDM symbols once per slot (or piggybacked on a PUSCH)  | 16-1a-1 | Yes | N/A |   | Per band | No | No |   |  | Optional with capability signalling |
| 16-1a-4 | Semi-persistent L1-SINR report on PUSCH | 1) Support semi-persistent report on PUSCH  | 16-1a-1 | Yes | N/A |   | Per band | No | No |  |  | Optional with capability signalling |

**Working assumption:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-5c-2 | UL full power transmission fullpowerMode2 – SRS resources | 1. The SRS configuration with different number of antenna ports per SRS resource for Mode 2
 | 16-5c | Yes | N/A |  | Per FS | No | No |  | Component (1) candidate values: {1\_2, 1\_4, ~~2\_4,~~ 1\_2\_4}~~Note: RAN1 will continue discussing the meaning of {1\_2, 1\_4, 2\_4, 1\_2\_4} without additional ASN.1 impact~~~~Note: At most one of the values (i.e., 2\_4) may end up being defined as spare~~1st state (1\_2): each SRS resource can be configured with 1 port or 2 ports 2nd state (1\_4): each SRS resource can be configured with 1 port or 4 ports 3rd state (1\_2\_4): each SRS resource can be configured with 1 port or 2 ports or 4 portsFFS: Note: The max number of SRS resources with different ports is the same as the number of SRS resources | Optional with capability signaling |

Note: Huawei/HiSi has concerns whether the FG 16-5c-2 can work due to the missing information of the max number of SRS resources with different ports for the UE

**Proposal:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1g | Resources for beam management, pathloss measurement, BFD, RLM and new beam identification | 1. The maximum total number of SSB/CSI-RS/CSI-IM resources configured to measure within a slot across all CCs in one frequency range for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
2. The maximum total number of SSB/CSI-RS/CSI-IM resources configured across all CCs in one frequency range for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
 | 2-24, 2-31 | Yes | N/A |  | Per UE | No | Yes |  | Component-1: candidate value set is {4, 8, 12, 16, 32, 64, 128}Component-2: candidate value set is {4, 8, 12, 16, 32, 40, 48, 64, 72, 80, 96, 128, 256}FFS: how to count the RS for component (1) and (2)Note: ~~For FR1~~ the reference ~~SCS is 15 kHz, for FR2 the reference SCS is 60 kHz~~ slot duration is the shortest slot duration defined for the reported FR | Optional with capability signaling |
| 16-1g-1 | Resources for beam management, pathloss measurement, BFD, RLM and new beam identification across frequency ranges | 1. The maximum total number of SSB/CSI-RS/CSI-IM resources configured to measure within a slot across all CCs for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
2. The maximum total number of SSB/CSI-RS/CSI-IM resources configured across all CCs for any of L1-RSRP measurement, L1-SINR measurement, pathloss measurement, BFD, RLM and new beam identification
 | 2-24, 2-31, 16-1g | Yes  | N/A |   | Per UE | No | No |   | Component-1: candidate value set is {4, 8, 12, 16, 32, 64, 128}Component-2: candidate value set is {4, 8, 12, 16, 32, 40, 48, 64, 72, 80, 96, 128, 256}Note: This FG indicates the maximum number of resources including both FR1 and FR2~~FFS:~~ Note: The signalled values apply to the shortest slot duration defined in any FR(s) that are supported by the UE  | Optional with capability signaling |

**Proposal:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16-1a-1 | SSB/CSI-RS for L1-SINR measurement | Per slot limitations:1. The max number of SSB/CSI-RS (1Tx) for CMR
2. The max number of CSI-IM/NZP-IMR resources
3. The max number of CSI-RS (2Tx) resources for CMR

Memory limitations:1. The max number of SSB/CSI-RS resources as CMR
2. The max number of CSI-IM/NZP IMR resources

Other limitations:1. Supported density of CSI-RS (CMR)
2. The max number of aperiodic CSI-RS resources across all CCs configured to measure L1-SINR (including CMR and IMR) shall not exceed MD\_1
3. Supported SINR measurements
 | 2-21, 2-22 or 2-23, 2-23a | Yes  | N/A |  | Per band | No | No |  | Component 1: Candidate values {8, 16, 32, 64}Component 2: Candidate values {8, 16, 32, 64}Component 3: Candidate values {0, 4, 8, 16, 32, 64}Component 4: Candidate values {8, 16, 32, 64, 128}Component 5: Candidate values {8, 16, 32, 64, 128}Component 6: Candidate values {‘1 only’, ‘3 only’, ‘1 and 3’}Component 7: Candidate values {2, 4, 8, 16, 32, 64}Component 8: Candidate values: bitmap with entries {SSB as CMR with dedicated CSI-IM, SSB as CMR with dedicated NZP IMR, CSI-RS as CMR with dedicated NZP IMR configured, CSI-RS as CMR without dedicated IMR configured} If a UE supports FG 16-1a-1 it mustsupport CMR(CSI-RS) + dedicated CSI-IMFFS: How CSI-RS is counted when it is configured as CMR without dedicated IMR | Optional with capability signalling |

**PowerSaving (1)**

[102-e-NR-UEFeatures-PowSav-01] Email discussion/approval for remaining issues on UE features for UE Power Savings, till 8/20 – Ralf (AT&T)

* clarify the interpretation of the FR1/FR2 differentiation bit for FG 19-1
* add, if any, a new component "Support of extended value range for aperiodic CSI-RS triggering offset" to FG 19-2

**Positioning (1)**

[102-e-NR-UEFeatures-Positioning-01] Email discussion/approval on UE features for NR positioning (17th – 20th August) – Hiroki (DCM)

* Whether to add a component of additional path report to FG13-6 and 13-11 or not
* Whether to replace FG13-12/12a with four FGs as proposed in [R1-2005814](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005814.zip) or not
* Whether/how to modify or merge FG13-15 and FG13-15a
* Whether/how to define new FG for simultaneous positioning SRS and MIMO SRS transmission for intra-band CA and inter-band CA
* Whether to add a note “Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination” in FG13-1/2a/2b/3a/3b/4a/4b or not
* Whether to add a note “Note: if the UE does not indicate this capability for a band, the UE does not support any pathloss estimates in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions in that band” in FG13-9e or not
* Whether FG13-11a is changed to per BC or not
* Whether to move component 1 of FG13-2/3/4 inside FG13-2a/3a/4a respectively or not
* Whether to add a note “Note: if the UE does not indicate this capability for a band in a band combination, the UE does not support SRS for Positioning in this band in the band combination” in FG13-8 or not

**Mobility Enhancements (2)**

[102-e-NR-UEFeatures-MobEnh-01] Email discussion/approval for remaining issues on UE features for NR mobility enhancements, till 8/20 – Ralf (AT&T)

* whether to update the consequence if FG 21-1a and/or 21-1b is not supported by the UE

[102-e-NR-UEFeatures-MobEnh-02] Email discussion/approval for basic UE feature groups for NR mobility enhancements, till 8/26 – Ralf (AT&T)

* FG 21-1a is a basic FG for NR mobility enhancements
* FG 21-1b is optional with capability signaling

**MR-DC/CA (1)**

[102-e-NR-UEFeatures-MRDCCA-01] Email discussion/approval on UE features for MR-DC/CA (17th – 20th August) – Hiroki (DCM)

* Whether and how to define FG 18-4b.
* Whether and how to define FG 18-5c/5d, including values of X, reporting type, applicable PDCCH monitoring capability and corresponding potential further separate capability
* Whether to add “different only” as candidate value for FG18-5a/6a
* Whether/how to add candidate values for FG18-7
* Whether to modify “DL DCI” to “unicast DL DCI” in FG18-9 FG name
* Whether the note “This FG is for synchronous EN-DC” is kept or removed for FG18-2a/2b/3/3a/3b
* Whether/how to modify the prerequisite FG of FG18-3a/3b

**CLI/RIM (1)**

[102-e-NR-UEFeatures-CLI/RIM-01] Email discussion/approval on UE features for CLI/RIM (17th – 19th August), Hiroki (DCM)

* Whether the slot in FG17-2 component 3 is a slot using the SCS of UE’s active DL BWP or a slot in SCS = 15kHz.

**TEIs (2)**

[102-e-NR-UEFeatures-TEI-01] Email discussion/approval on UE features for NR TEI (17th – 20th August) – Hiroki (DCM)

* Whether to change type of FG14-2 to “per UE” and to apply the DSS bands the UE support or not

[102-e-NR-UEFeatures-TEI-02] Email discussion/approval on mandatory/optional for NR TEI (after the completion of TEI-01) by 8/26 – Hiroki (DCM)

* Whether the FG14-8 is mandatory with capability signaling or optional with capability signaling, including possibility of mandatory for UEs supporting with 4 or more carriers

**Others (1)**

[102-e-NR-UEFeatures-Others-01] Email discussion/approval on new FGs that are not dedicated to a specific Rel-16 work item/TEI (17th – 20th August), Hiroki (DCM)

* Whether/how to define new FGs related to PUCCH group based on proposals in [R1-2006482](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006482.zip) and potentially following points
	+ A UE should not be mandated to support the case where cells from different NR PUCCH groups are in the same TAG, but there is no such capability signalling in Rel.15.
	+ A UE should not be mandated to support the case where cells from two NR PUCCH groups are in the same band, but there is no such capability signalling in Rel.15
* Whether/how to define new FG for supporting offset between the end of PDCCH triggering A-SRS and the SRS transmission for CB PUSCH and antenna switching for UEs supporting PDCCH capabilities besides FG 3-1
* Whether/how to define new FG for supporting partial cancellation of configured PUCCH/PUSCH/PRACH due to dynamic SFI, dynamically granted PDSCH and CSI-RS, and UE behavior for UE not supporting the FG

[R1-2005294](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005294.zip) Remaining details of features for Rel-16 V2X FUTUREWEI

[R1-2005361](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005361.zip) Remaining issues on Rel-16 UE features vivo

[R1-2005423](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005423.zip) Discussion on NR Rel-16 UE Features ZTE

[R1-2005666](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005666.zip) Remaining issues on Rel-16 UE features CATT

[R1-2005781](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005781.zip) Views on Rel-16 UE features MediaTek Inc.

[R1-2005814](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005814.zip) Remaining details of Rel-16 NR UE features Huawei, HiSilicon

[R1-2005857](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005857.zip) Rel-16 UE feature Intel Corporation

[R1-2005945](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005945.zip) Remaining details of UE features for IAB AT&T

[R1-2005980](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005980.zip) Discussion on Rel-16 UE features OPPO

[R1-2006003](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006003.zip) Discussion on remaining issues of NR feature list for 5G\_V2X\_NRSL OPPO

[R1-2006124](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006124.zip) Remaining issues on NR Rel-16 UE features Samsung

[R1-2006195](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006195.zip) LS on UE behavior for P/SP-CSI-RS reception in NR-U MediaTek Inc.

[R1-2006462](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006462.zip) Updated RAN1 UE features list for Rel-16 NR Moderators (AT&T, NTT DOCOMO, INC.)

[R1-2006482](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006482.zip) Discussions on NR Rel-16 UE features Apple

[R1-2006646](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006646.zip) Discussion on NR Rel-16 UE features LG Electronics

[R1-2006677](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006677.zip) Remaining aspects of Rel-16 UE features Nokia, Nokia Shanghai Bell

[R1-2006703](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006703.zip) Discussion on NR Rel-16 UE features NTT DOCOMO, INC.

[R1-2006704](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006704.zip) Summary on [101-e-Post-NR-UE-Features-11] Moderator (NTT DOCOMO, INC.)

[R1-2006705](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006705.zip) Summary on [101-e-Post-NR-UE-Features-12] Moderator (NTT DOCOMO, INC.)

[R1-2006706](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006706.zip) Summary on [101-e-Post-NR-UE-Features-13] Moderator (NTT DOCOMO, INC.)

[R1-2006707](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006707.zip) Summary on [101-e-Post-NR-UE-Features-14] Moderator (NTT DOCOMO, INC.)

[R1-2006788](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006788.zip) Discussion on NR Rel-16 UE features Qualcomm Incorporated

[R1-2006874](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006874.zip) Remaining details of Rel-16 NR UE features Ericsson

[R1-2006954](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006954.zip) Summary on [101-e-Post-NR-UE-Features-08] Moderator (AT&T)

[R1-2006955](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006955.zip) Summary on [101-e-Post-NR-UE-Features-09] Moderator (AT&T)

[R1-2006956](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006956.zip) Summary on [101-e-Post-NR-UE-Features-10] Moderator (AT&T)