**3GPP TSG RAN WG1 #118 R1-24nnnnn**

**Maastricht, NL, August 19th – 23rd, 2024**

**Agenda Item: 8.2.2**

**Source: Moderator (AT&T)**

**Title: Summary of UE features for other Rel-18 work items (Topics B)**

**Document for:** **Discussion/Decision**

# Introduction

This document presents the summary of email discussion [118-R18-UE\_features] during RAN1 #118. According to the Chair’s Notes:

|  |
| --- |
| [118-R18-UE\_features] Email discussion on Rel-18 UE features – Hiroki (DOCOMO), Ralf (AT&T)* To be used for sharing updates on online/offline schedule, details on what is to be discussed in online/offline sessions, tdoc number of the moderator summary for online session, etc
 |

The following was discussed and/or agreed during RAN1 #118 within the scope of [118-R18-UE\_features]. All proposals are based on the latest RAN1 UE features list for Rel-18 in [1] and [2].

# Summary of Contributions Submitted to RAN1 #118

The following is the moderator’s summary of contributions submitted to RAN1 #118 in this agenda item.

## NR\_MIMO\_evo\_DL\_UL

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-1 | Basic feature for multi-DCI based intra-cell Multi-TRP operation with two TA enhancement | Support of two TA enhancement for multi-DCI based intra-cell Multi-TRP operation | 16-2a | yes | n/a | Two TA enhancement for multi-DCI based intra-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a |  | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-2 | Basic feature for multi-DCI based inter-cell Multi-TRP operation with two TA enhancement | 1. Support of two TA enhancement for multi-DCI based inter-cell Multi-TRP operation2. Maximum number of n-TimingAdvanceOffset value per serving cell | 23-4, 40-1-7 | yes | n/a | Two TA enhancement for multi-DCI based inter-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1,2} | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-8 | Maximum number of TAGs across all CCs  | Maximum number of TAGs across all CCs in a band combination | 40-2-1 or 40-2-2 | yes | n/a | Maximum number of TAGs across all CCs is unknown when UE supports two TAGs per CC | Per BC | n/a | n/a | n/a | Component candidate values: {2,3,4}Note: UE only supports the configuration where all UL CCs of the same frequency band are configured with up to 2 Timing Advance Group IDNote: The same description of “supportedNumberTAG” in 38.306 applies to this FG as well | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] | Now FG 40-2-8 has a pre-requisite which is one of FG 40-2-1 or FG 40-2-2. But we think that even for FG 40-2-1 and FG 40-2-2, those FGs shall have FG 40-2-8 as a re-requisite, since FG 40-2-8 indicates a necessary information to gNB that the maximum number of TAGs across all CCs. Hence, it seems that one of FG 40-2-1 or FG 40-2-2 shall be reported together with FG 40-2-8. Hence, we would like to put a note in FG 40-2-1, FG 40-2-2, and FG 40-2-8 so that UE reports either both FG 40-2-8 and one of FG 40-2-1 or FG 40-2-2, or none of them.**Proposal 2:** *Add notes in FG 40-2-1, FG 40-2-2, and FG 40-2-8 as follow:*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-2-1 | Basic feature for multi-DCI based intra-cell Multi-TRP operation with two TA enhancement | Support of two TA enhancement for multi-DCI based intra-cell Multi-TRP operation | 16-2a | yes | n/a | Two TA enhancement for multi-DCI based intra-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a | Note: If a UE reports this FG, then the UE must report FG 40-2-8. | Optional with capability signalling |
| 40-2-2 | Basic feature for multi-DCI based inter-cell Multi-TRP operation with two TA enhancement | 1. Support of two TA enhancement for multi-DCI based inter-cell Multi-TRP operation2. Maximum number of n-TimingAdvanceOffset value per serving cell | 23-4, 40-1-7 | yes | n/a | Two TA enhancement for multi-DCI based inter-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1,2}Note: If a UE reports this FG, then the UE must report FG 40-2-8. | Optional with capability signalling |
| 40-2-8 | Maximum number of TAGs across all CCs  | Maximum number of TAGs across all CCs in a band combination | 40-2-1 or 40-2-2 | yes | n/a | Maximum number of TAGs across all CCs is unknown when UE supports two TAGs per CC | Per BC | n/a | n/a | n/a | Component candidate values: {2,3,4}Note: UE only supports the configuration where all UL CCs of the same frequency band are configured with up to 2 Timing Advance Group IDNote: The same description of “supportedNumberTAG” in 38.306 applies to this FG as wellNote: If a UE reports this FG, then the UE must report at least one of FG 40-2-1 or FG 40-2-2. | Optional with capability signaling |

 |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-4a | PDCCH order sent by one TRP triggers RACH procedure (specifically PRACH) towards a different TRP based on CFRA for intra-cell | Support of cross-TRP PDCCH order based on CFRA for intra-cell multi-DCI based mTRP |  | yes | N/A | Intra-cell cross-TRP PDCCH ordered PRACH transmission is not supported | Per band | No | No | N/A |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-6 | Rx timing difference larger than CP length | 1. Support of the Rx timing difference between the two DL reference timings is larger than CP length |  | yes | N/A | Rx timing difference larger than CP is not supported | Per FSPC | n/a | n/a | n/a |  | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] | We would like to include pre-requisites in the following FGs where FG 40-2-4a is related to multi-DCI based multi-TRP (i.e., FG 16-2a), and FG 40-2-6 is related to one of basic feature for two TA (i.e., FG 40-2-1 or FG 40-2-2).**Proposal 1:** *Add pre-requisites in FG 40-2-4a and FG 40-2-6 as follow:*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-2-4a | PDCCH order sent by one TRP triggers RACH procedure (specifically PRACH) towards a different TRP based on CFRA for intra-cell | Support of cross-TRP PDCCH order based on CFRA for intra-cell multi-DCI based mTRP | 16-2a | yes | N/A | Intra-cell cross-TRP PDCCH ordered PRACH transmission is not supported | Per band | No | No | N/A |  | Optional with capability signaling |
| 40-2-6 | Rx timing difference larger than CP length | 1. Support of the Rx timing difference between the two DL reference timings is larger than CP length | 40-2-1 or 40-2-2 | yes | N/A | Rx timing difference larger than CP is not supported | Per FSPC | n/a | n/a | n/a |  | Optional with capability signaling |

 |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-2 | Capability on the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | Maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | 2-10, 40-4-1g | Yes | n/a | Capability on the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell is not supported  | Per FS | No | No | n/a | Component candidate values: {2, 3, 4} | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] | In RAN1#116bis, FG 40-4-2 “Capability on the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell” was introduced, where the candidate value is {2,3,4}. Since FG 40-4-2 is optional, the default value when UE does not report this capability is not clear. There can be following understandings:* + - 1. Understanding 1: The default value is 2 if UE does not report FG 40-4-2
			2. Understanding 2: The default value is 4 if UE does not report FG 40-4-2
			3. Understanding 3: The default value equals to the number of all supported DMRS type reported by UE if FG 40-4-2 is not reported

From our understanding, the legacy DMRS types include 2 types, i.e., type 1 and type 2. And if UE supports one of the Rel-18 DMRS types, UE should also support the corresponding Rel-15 DMRS type. Therefore, if UE does not report FG 40-4-2, the default value should be 2.**Proposal MIMO-1: For FG 40-4-2, the default value is 2 if UE does not report this capability.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-2 | Capability on the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | Maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | 2-10, 40-4-1g | Yes | n/a | ~~Capability on~~ the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell is ~~not supported~~ 2 | Per FS | No | No | n/a | Component candidate values: {2, 3, 4} | Optional with capability signaling |

 |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-5 | Rel-18 DL DMRS with single DCI based M-TRP | Support of Rel-18 DL DMRS with single DCI based M-TRP | 40-4-1 or 40-4-1a | Yes | n/a | Rel-18 DL DMRS with single DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-7 | Rel-18 DL DMRS with M-DCI based M-TRP | Support of Rel-18 DL DMRS with multi- DCI based M-TRP PDSCH operation | 40-4-1 or 40-4-1a | Yes | n/a | Rel-18 DL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-13 |  Support Rel-18 UL DMRS with single-DCI based M-TRP | 1. Support Rel-18 UL DMRS with Single-DCI based M-TRP |  | Yes | n/a | Rel-18 UL DMRS with single-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-14 | Support Rel-18 UL DMRS with M-DCI based M-TRP | 1. Support Rel-18 UL DMRS with M-DCI based M-TRP |  | Yes | n/a | Rel-18 UL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] | We would like to include pre-requisites in the following FGs * FG 40-4-5 is related to DL MTRP scheme by single-DCI based multi-TRP (i.e., at least one of FG 16-2b-1, FG 16-2b-2, FG 16-2b-3, FG 16-2b-4, or FG 16-2b-5)
* FG 40-4-13 is related to UL MTRP scheme by single-DCI based multi-TRP including Rel-17 PUSCH TDM repetition (i.e., at least one of FG 23-3-1, FG 23-3-1-2, FG 23-3-1-1, or FG 23-3-1-3), Rel-18 STXMP (i.e., at least one of FG 40-6-1, FG 40-6-1a, FG 40-6-2, or FG 40-6-2a), and Rel-18 DMRS (FG 40-4-6 or FG 40-4-6a)
* FG 40-4-7 and FG 40-4-14 are related to multi-DCI based multi-TRP (i.e., FG 16-2a).

**Proposal 3:** *Add pre-requisites in FG 40-4-5, FG 40-4-7, FG 40-4-13, and FG 40-4-14 as follow:*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-4-5 | Rel-18 DL DMRS with single DCI based M-TRP | Support of Rel-18 DL DMRS with single DCI based M-TRP | 40-4-1 or 40-4-1a, at least one of {16-2b-1, 16-2b-2, 16-2b-3, 16-2b-4, 16-2b-5} | Yes | n/a | Rel-18 DL DMRS with single DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40-4-7 | Rel-18 DL DMRS with M-DCI based M-TRP | Support of Rel-18 DL DMRS with multi- DCI based M-TRP PDSCH operation | 40-4-1 or 40-4-1a, 16-2a | Yes | n/a | Rel-18 DL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40-4-13 | Support Rel-18 UL DMRS with single-DCI based M-TRP | 1. Support Rel-18 UL DMRS with Single-DCI based M-TRP | 40-4-6 or 40-4-6a, at least one of {23-3-1, 23-3-1-2, 23-3-1-1, 23-3-1-3, 40-6-1, 40-6-1a, 40-6-2, or 40-6-2a} | Yes | n/a | Rel-18 UL DMRS with single-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40-4-14 | Support Rel-18 UL DMRS with M-DCI based M-TRP | 1. Support Rel-18 UL DMRS with M-DCI based M-TRP | 40-4-6 or 40-4-6a, 16-2a | Yes | n/a | Rel-18 UL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |

 |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-6-1-2 | New UL DMRS port entry for single-DCI based SDM scheme for Rel-15 DMRS port and/or Rel-18 DMRS port | Support of new UL DMRS port entry {0, 2, 3} | 40-6-1 or 40-6-1a | Yes | N/A | New UL DMRS port entry for single-DCI based SDM scheme is not supported | Per Band | n/a | FR2 only | n/a |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] | We would like to include pre-requisites in the following FG.* FG 40-6-12 is related to Rel-18 STXMP scheme (i.e., FG 40-6-1 or FG 40-6-1a) as well as Rel-18 DMRS (i.e., FG 40-4-13), but the later one is missing.

**Proposal 4:** *Add prerequisites for indicating Rel-18 UL DMRS for UL single-DCI based multi-TRP as follow:*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-6-1-2 | New UL DMRS port entry for single-DCI based SDM scheme for Rel-15 DMRS port and/or Rel-18 DMRS port | Support of new UL DMRS port entry {0, 2, 3} | 40-6-1 or 40-6-1a, 40-4-13 | Yes | N/A | New UL DMRS port entry for single-DCI based SDM scheme is not supported | Per Band | n/a | FR2 only | n/a |  | Optional with capability signalling |

 |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-6-5 | Support grouped-based beam reporting for STx2P | 1. Support group based L1-RSRP reporting for STxMP based transmission2. Max number N of beam groups (M=2 beams per beam group) in a single L1-RSRP reporting instance based on measurement on two CMR resource sets 3. Maximum number of SSB and CSI-RS resources for measurement in both CMR sets within a slot across all CCs in a band4. Maximum number of configured SSB and CSI-RS resources for measurement in both CMR sets across all CCs in a band | 23-5-1 | Yes | n/a | Grouped-based beam reporting for STx2P is not supported | Per Band | n/a | FR2 only | n/a | Component 1 candidate values: {JointULandDL, ULOnly, both}Component 2 candidate values: {1,2,3,4}Component 3 candidate values: {2,3,4,8,16,32,64}Component 4 candidate values: {8, 16, 32, 64, 128}Note: components 3 and 4 are also counted in FG 16-1g, 16-1g-1, and 23-5-1 | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] | In Rel-18, RAN1 agreed to support group-based beam reporting for STx2P and enhance the feature which can indicate that reported pair(s) of CRIs or SSBRIs can be referred to determine the UL Tx spatial filters for simultaneous UL transmission. This feature was designed considering that all possible STx2P schemes which include sDCI based PUSCH SDM/SFN, sDCI based PUCCH SFN and mDCI based PUSCH+PUSCH can be supported based on reported pair(s). Therefore, this feature group 40-6-5 is meaningful when at least one of STx2P schemes is supported. Considering this, we propose to add prerequisites for indicating at least one of STx2P schemes for Rel-18 enhanced group-based beam reporting as follow:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-6-5 | Support grouped-based beam reporting for STx2P | 1. Support group based L1-RSRP reporting for STxMP based transmission2. Max number N of beam groups (M=2 beams per beam group) in a single L1-RSRP reporting instance based on measurement on two CMR resource sets 3. Maximum number of SSB and CSI-RS resources for measurement in both CMR sets within a slot across all CCs in a band4. Maximum number of configured SSB and CSI-RS resources for measurement in both CMR sets across all CCs in a band | 23-5-1, at least one of {40-6-1, 40-6-1a, 40-6-2, 40-6-2a, 40-6-3a, 40-6-3b, 40-6-4} | Grouped-based beam reporting for STx2P is not supported | Per Band | FR2 only | Component 1 candidate values: {JointULandDL, ULOnly, both}Component 2 candidate values: {1,2,3,4}Component 3 candidate values: {2,3,4,8,16,32,64}Component 4 candidate values: {8, 16, 32, 64, 128}Note: components 3 and 4 are also counted in FG 16-1g, 16-1g-1, and 23-5-1} | Optional with capability signaling |

 |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g | UL full power transmission mode 2 with 1/2/4 resources | 1. Support of UL full power transmission mode of fullpowerMode2 when UE is capable of 8 Tx codebook based PUSCH operation2. Maximum number of SRS resources in one SRS resource set with usage set to 'codebook' for 8Tx codebook based PUSCH for Mode 2 | 40-7-1 | yes | n/a | UL full power transmission mode 2 is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1, 2, 4}Note: A UE that supports FG 40-7-1g supports at least full power operation with single port | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g-1 | SRS resources for UL full power transmission mode 2 | 1. SRS configurations with different number of antenna ports per SRS resource for mode 2 | 40-7-1g | yes | n/a | SRS resources for UL full power transmission mode 2 cannot be signaled  | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: 3 bit bitmap {b0, b1, b2}b0 indicates whether SRS resource can be configured with 1 portb1 indicates whether SRS resource can be configured with 2 portb2 indicates whether SRS resource can be configured with 4 port | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g-2 | TPMI group(s) which delivers full power for codebook2 | 1. TPMI group(s) which delivers full power when UE is capable of and configured with 8 Tx codebook based PUSCH operation with codebook2 | 40-7-1g | yes | n/a | TPMI group(s) which delivers full power is unknown | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: {first coherent antenna port group, second coherent antenna port group} | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] | **Regarding the TPMI group definitions in full power mode 2 in 40-7-1g-1**, The component values for UL FPTx Mode 2 SRS resources are currently defined with a bitmap as follows (highlighting added here is not in the feature list). In RAN1#117, it was discussed (e.g. in [3]) if the bit b0 in component 1 of 40-7-1g-1 is incorrect, and that 40-7-1g-1 should identify that 8 SRS ports must be in the SRS resource set. The discussion was inconclusive and the bitmap was not removed with the understanding that it can be further discussed whether some of the bits are set to fixed values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 40-7-1g-1 | SRS resources for UL full power transmission mode 2 | 1. SRS configurations with different number of antenna ports per SRS resource for mode 2 | 40-7-1g | Component 1 candidate values: 3 bit bitmap {b0, b1, b2}b0 indicates whether SRS resource can be configured with 1 portb1 indicates whether SRS resource can be configured with 2 portb2 indicates whether SRS resource can be configured with 4 port |

1. An outcome of RAN1#117 was that whether some of the bits of the bitmap in FG 40-7-1g-1 are set to fixed values can be further discussed.

For 8 Tx, UL FPTx Mode 2 with different numbers of SRS ports in an SRS resource set behaves as described in the agreement and in the 38.214 section 6.1.1.1 excerpt below. It can be seen that an 8 port SRS resource is always configured and that 1, 2, or 4 ports may be configured in the set.

|  |
| --- |
| Agreement (RAN1#114)For an 8TX UE, configured for full power transmission with ‘fullpowerMode2’,* Subject to UE capability, a maximum of 2 or 4 SRS resources are supported in an SRS resource set with usage set to 'codebook',
* An SRS resource set can be configured with one or more of 1-, 2-, 4-, or 8-port SRS resources.
 |

|  |
| --- |
| When higher layer parameter *ul-FullPowerTransmission* is set to 'fullpowerMode2*'* and the higher layer parameter *CodebookTypeUL* is set to *'*Codebook2' or *'*Codebook3', and the *SRS-resourceSet* with *usage* set to 'codebook' includes one SRS resource with 8 ports, and at least one SRS resource with 2 ports or 4 ports, subject to UE capability,- when *CodebookTypeUL* is set to *'*Codebook2', the *codebookSubset* associated with the 2-port SRS resource is 'nonCoherent'.- when *CodebookTypeUL* is set to *'*Codebook2', the *codebookSubset* associated with the 4-port SRS resource can be configured as 'partialAndNonCoherent' or 'nonCoherent', subject to UE capability.- when *CodebookTypeUL* is set to *'*Codebook3', the *codebookSubset* associated with 4 ports SRS resources is 'nonCoherent'. |

Given the above, and from discussions in RAN1#117 there seemed to be a common understanding that 8 port SRS is always included in combinations with other size SRS resources in FG 40-7-1g-1, we think a note should be added to ensure that the lack of a bit for the 8 port resource in FG 40-7-1g-1 means that an 8 port resource is always used in the SRS resource combinations for UL FPTx Mode 2 with multiple SRS resources in an SRS resource set.1. That an 8 port SRS resource must always be present when multiple SRS resources are in an SRS resource set for UL FTPTx Mode 2 is not presently captured in FG 40-7-1g-1, but should be.
2. Add “Note: An SRS resource set supported by the UE for uplink full power Mode 2 must contains at least an 8 port SRS resource” to FG 40-7-1g-1.

In RAN1#116bis, FG 40-7-1g was updated as shown below to capture that full power operation for single port is always supported by UEs that support UL FTPTx Mode 2 with 1/2/4 SRS resources.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40-7-1g | UL full power transmission mode 2 with 1/2/4 resources | 1. Support of UL full power transmission mode of fullpowerMode2 when UE is capable of 8 Tx codebook based PUSCH operation2. Maximum number of SRS resources in one SRS resource set with usage set to 'codebook' for 8Tx codebook based PUSCH for Mode 2 | 40-7-1 | yes | n/a | UL full power transmission mode 2 is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1, 2, 4}Note: A UE that supports FG 40-7-1g supports at least full power operation with single port |

An argument was made in RAN1#117 that the Note could be interpreted to say that a UE need not be able to support combinations of one port SRS with SRS resources having other numbers of SRS ports in an SRS resource set for UL FPTx Mode 2. This does not make sense to us, since the UE must support full power operation with 1 port since Rel-15, and full power modes were defined to improve cases where only one port is not configured. Furthermore, the added note is identical to what was used for Rel-16 FG 16-5c, copied below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 16-5c | UL full power transmission *fullpowerMode2* | 1. The maximum number of SRS resources in one SRS resource set with usage set to 'codebook' for Mode 2: {1, 2, 4} | 2-13, 2-14 | … | A UE that supports FG 16-5c supports at least full power operation with single port |

We also observe that Rel-16 UL FPTx Mode 2 UEs always support 1 port SRS resources for Mode 2, as can be seen in FG 16-5c-2 copied further below. It was agreed in RAN1#112bis that 8 Tx UEs will reuse Rel-16 Mode 2, and so it seems very difficult to say that an identically worded agreement to Rel-16 can mean something different in Rel-18.

|  |
| --- |
| **Agreement** (**RAN1#112bis)**For full power PUSCH transmission by an 8TX UE, confirm the Working Assumption for Mode2 with updates:* To support full power transmission with Mode2, Rel-16 Mode2 (fullPowerMode2) is re-used.
	+ ~~FFS~~ definition of precoder groups (G0, G1, …)
	+ ~~FFS~~ enhancements for SRS configuration
 |

Finally, UEs must provide full power when transmitting with DCI 0\_0, and so Rel-18 UEs must support full power transmission with one antenna port. Therefore, we think it is crystal clear that the intention of the Note is that 1 port SRS is supported, and in all combinations of SRS resource sizes for this feature.1. It is crystal clear that “Note: A UE that supports FG 40-7-1g supports at least full power operation with single port” requires UEs to support 1 port SRS resources in any multi-SRS-resource UL FPTx Mode 2 configuration: This follows Rel-16 behavior and uses the wording of Rel-16, is consistent with the need to support 1 port with DCI 0\_0, and follows Rel-18 agreements to reuse UL FPTx modes from Rel-16.

The SRS resource size combinations in Rel-16 UL FPTx Mode 2 FG 16-5c-2 are straightforwardly identified as combinations of Rel-16 SRS resource sizes, listed as {1\_2, 1\_4, and 1\_2\_4} and as shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 | Component (1) candidate values: {1\_2, 1\_4, 1\_2\_4}1st state (1\_2): each SRS resource can be configured with 1 port or 2 ports2nd state (1\_4): each SRS resource can be configured with 1 port or 4 ports3rd state (1\_2\_4): each SRS resource can be configured with 1 port or 2 ports or 4 portsNote: The first, second, or third state can be used if 16-5c is reported as 2 or 4. |

For 8 Tx Mode 2 FG 40-7-1g-1, supporting either or both of 2 or 4 port SRS resources as is done with the current bitmap, but requiring support for 1 port and 8 port SRS resources, leads to the combinations {1\_8, 1\_2\_8, 1\_4\_8, 1\_2\_4\_8}. These can be captured by fixing b0 of the bitmap to ‘1’. Since the capability for the maximum number of SRS resources for UL FP Tx Mode 2 is also 2 or 4 for 8 Tx, we extend the Rel-16 note to be ‘Note: Any of the above values can be used if 40-7-1g is reported as 2 or 4.’ Therefore, we suggest that FG 40-7-1g-1 be updated as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 40-7-1g-1 | SRS resources for UL full power transmission mode 2 | 1. SRS configurations with different number of antenna ports per SRS resource for mode 2 | 40-7-1g | Component 1 candidate values: 3 bit bitmap {b0, b1, b2}b0 indicates whether SRS resource can be configured with 1 portb1 indicates whether SRS resource can be configured with 2 portb2 indicates whether SRS resource can be configured with 4 portNote: b0 is set to 1 in this release of the specification.Note: An SRS resource set supported by the UE for uplink full power Mode 2 must contain at least an 8 port SRS resource.Note: Any of the above values can be used if 40-7-1g is reported as 2 or 4. |

1. For 8 Tx UL full power Mode 2 with different numbers of SRS resources per set, an 8 port SRS resource must be configured in the set, while 1, 2, or 4 port resources may be configured. Since 1 port SRS resource combinations must be supported, this implies that the bit b0 in component 1 of 40-7-1g-1 should be fixed to 1, and that 40-7-1g-1 should identify that 8 SRS ports must be in the SRS resource set.
2. Update FG 40-7-1g-1 according to Annex A, defining SRS port combinations in Component 1 with “Note: b0 is set to 1 in this release of the specification.”, “Note: An SRS resource set supported by the UE for uplink full power Mode 2 must contain at least an 8 port SRS resource.”, and “Note: Any of the above values can be used if 40-7-1g is reported as 2 or 4.”

**Regarding the TPMI group definitions in full power mode 2 in 40-7-1g-2**,

|  |
| --- |
| Agreement (RAN1#114)For an 8TX UE, configured for full power transmission with ‘fullpowerMode2’ for Ng=2* UE power capability is indicated per antenna group, where for an indicated group, full power is supported for all ranks
	+ For when Ng=2, a single bit is used to indicate which of the antenna group has full power capability.
 |

In RAN1#116, the agreement above from RAN1#114 was captured as follows in FG 40-7-1g-2. How the first and second coherent antenna port group components are defined was left to further discussion. In RAN1#117, the proposal below was briefly introduced, but there was no time for detailed discussion. Consequently, how Component 1 is defined still needs to be resolved.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 40-7-1g-2 | TPMI group(s) which delivers full power for codebook2 | 1. TPMI group(s) which delivers full power when UE is capable of and configured with 8 Tx codebook based PUSCH operation with codebook2 | 40-7-1g | Component 1 candidate values: {first coherent antenna port group, second coherent antenna port group} |

Full power TPMI groups were defined in 38.306 for Rel-16 as follows:

|  |  |
| --- | --- |
| ID | TPMI groups |
| G0 | $\frac{1}{2}\left[\begin{array}{c}1\\0\\0\\0\end{array}\right]$, |
| G1 | $\frac{1}{2}\left[\begin{array}{c}1\\0\\0\\0\end{array}\right]$, $\frac{1}{2}\left[\begin{array}{c}0\\0\\1\\0\end{array}\right]$, $\frac{1}{2}\left[\begin{array}{c}\begin{matrix}1&0\end{matrix}\\\begin{matrix}0&0\end{matrix}\\\begin{matrix}0&1\end{matrix}\\\begin{matrix}0&0\end{matrix}\end{array}\right]$, |
| … |  |

Similar methods are possible for 8 Tx in Rel-18, as sketched below. A UE will indicate support for either TPMI group 0 or 1, and support the precoders in the group for a number of layers up to the maximum number of layers that the UE supports in 40-7-1. Note that the UE transmits on 4 ports for each $\overbar{W}\_{j, i}$, and so transmits at least half its maximum power without full power operation. This implies that only the intermediate precoding matrices with a single (non-zero) $\overbar{W}\_{j, i} $are the ones that should be used to identify full power operation. Transmitting on 4 ports per $\overbar{W}\_{j, i} $also implies that ranks > 4 are always at full power.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 Layer | 2 Layers | 3 Layers | 4 Layers |
| TPMI group | TPMIs | Intermediate precoder matrix $W'$ | TPMIs | Intermediate precoder matrix $W'$ | TPMIs | Intermediate precoder matrix $W'$ | TPMIs | Intermediate precoder matrix $W'$ |
| 0 | 0-15 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{1, i}\\0\_{4×1}\end{matrix}\right]$$ | 0-7 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{2, i}\\0\_{4×2}\end{matrix}\right]$$ | 0-3 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{3, i}\\0\_{4×3}\end{matrix}\right]$$ | 0-1 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{4, i}\\0\_{4×4}\end{matrix}\right]$$ |
| 1 | 16-31 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×1}\\\overbar{W}\_{1, (i−16)}\end{matrix}\right]$$ | 8-15 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×2}\\\overbar{W}\_{2, \left(i−8\right)}\end{matrix}\right]$$ | 4-7 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×3}\\\overbar{W}\_{3, \left(i−4\right)}\end{matrix}\right]$$ | 2-3 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×4}\\\overbar{W}\_{4, \left(i− 2\right)}\end{matrix}\right]$$ |

1. Define two groups of 8 Tx full power Mode 2 precoders/TPMIs for FG 40-7-1g-2 according to the maximum rank supported by the UE for 8 Tx, where the full power precoders constitute a single non-zero submatrix $\overbar{W}\_{j, i}$ in the intermediate precoder matrix $W'$ from 38.211. The UE indicates support for only one of the groups.

Note that the proposal above for 40-7-1g-2 should be captured directly in 38.306, as was done for Rel-16 UL FPTx Mode 2, since it is not straightforwardly included in the feature lists.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g-1 | SRS resources for UL full power transmission mode 2 | 1. SRS configurations with different number of antenna ports per SRS resource for mode 2 | 40-7-1g | yes | n/a | SRS resources for UL full power transmission mode 2 cannot be signaled  | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: 3 bit bitmap {b0, b1, b2}b0 indicates whether SRS resource can be configured with 1 portb1 indicates whether SRS resource can be configured with 2 portb2 indicates whether SRS resource can be configured with 4 portNote: b0 is set to 1 in this release of the specification.Note: An SRS resource set supported by the UE for uplink full power Mode 2 must contain at least an 8 port SRS resource.Note: Any of the above values can be used if 40-7-1g is reported as 2 or 4. | Optional with capability signalling |

 |

**Other**

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] | In the whole process of Rel-18 MIMO standardization, 8 Tx PUSCH and SRS enhancement were discussed independently in two different sub-agendas. Therefore, an aspect on UE capability signaling which requires taking both 8 Tx PUSCH and SRS into consideration was missed. Fortunately, RAN4 sent an LS R4-2321728 “Reply LS on coherence between PUSCH and 8-ports SRS with partial dropping”, which reminds RAN1 to double check UE capability and address this open issue. In LS R4-2321728, the following is provided to answer the question raised by RAN1. **RAN1 Question 1:** For a coherent 8Tx PUSCH transmission, can a UE meet the relative phase and power error requirements (defined in RAN 4 specifications) among the 8 SRS ports between the last SRS transmission and the PUSCH transmission over the defined time window, when the SRS is configured with or without TDM and no SRS symbol is dropped? **RAN4 Answer**: Yes, depending on UE capability. Some UEs may be capable to achieve coherence across TDM’d SRS and some UE may not. The current RAN4 requirements for coherent UL-MIMO are specified for a pair of connectors (two ports/Tx connectors). It is the understanding of RAN4 that a UE supporting full coherent 8Tx should at least meet the specified phase and power error requirements for any pair of two Tx antenna connectors in the current RAN4 specifications.Based on RAN4 answer “Yes, depending on UE capability. Some UEs may be capable to achieve coherence across TDM’d SRS and some UE may not” in the above answer, it is recognized that achieving coherency across TDMed SRS is a new, and potentially more challenging, requirement for a UE to achieve, rather than the legacy coherency across nonTDMed SRS. Therefore, an 8 Tx UE might be able to achieve coherency with nonTDMed 8-port SRS, while not able to achieve coherency with TDMed 8-port SRS. However, current UE capability framework is not able to distinguish between these two cases. Current Rel-18 8-Tx UE capability signaling has the following independent signaling of UE feature group:* SRS 8 Tx ports - codebook: This is the UE capability signaling of 8 Tx SRS for codebook based PUSCH. The component values for this capability signaling are {noTDMed SRS, noTDMed and TDMed SRS}
* Support of codebook-based 8Tx PUSCH - codebook1: This is the UE capability signaling to indicate supporting full coherent 8 Tx PUSCH
* Support of codebook-based 8Tx PUSCH – codebook2: This is the UE capability signaling to indicate supporting partial coherent 8 Tx PUSCH with two antenna groups (4+4 structure)
* Support of codebook-based 8Tx PUSCH – codebook3: This is the UE capability signaling to indicate supporting partial coherent 8 Tx PUSCH with 4 antenna groups (2+2+2+2 structure)
* Support of codebook-based 8Tx PUSCH – codebook4: This is the UE capability signaling to indicate supporting non coherent 8 Tx PUSCH

With current independent signaling UE features, for each codebook, a UE can indicate support that codebook with what kind of SRS. For example, with coherent codebook 1, a UE can signal the one of the following 2 combinations. * Combination 1: the UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS
* Combination 2: the UE support coherent 8Tx PUSCH (codebook 1) with noTDMed and TDMed SRS

As another example, with noncoherent codebook 4, a UE can signal the one of the following 2 combinations* Combination 3: the UE support noncoherent 8 Tx PUSCH (codebook 4) with noTDMed SRS
* Combination 4: the UE support noncoherent 8Tx PUSCH (codebook 4) with noTDMed and TDMed SRS

However, what missing is a “joint” capability signaling of coherence type and SRS type. For example, a UE might want to signaling the following: * The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS.

As mentioned above, the rationale for this signaling is because coherency with TDMed SRS is a newer, and likely more challenging, requirement than coherentcy with nonTDMed (legacy) SRS. A UE can support coherency with legacy nonTDMed SRS may not be able to support coherency with the new TDMed SRS. In LS R4-2403632, RAN 4 also send the following message to RAN 1. Additionally, RAN4 further discussed coherence between PUSCH and 8-ports SRS with partial dropping. The approved reply LS of R4-2321728 says that “Some UEs may be capable to achieve coherence across TDM’d SRS and some UE may not” in the answer for Question 1. It is RAN4’s understanding that the current capability wouldn’t allow a UE to indicate that the UE supports codebook 1 with not TDMed SRS, while the same UE can also support codebook 2, 3, or 4 with TDM’d SRS. If the RAN4 understanding is correct, RAN4’d like to request RAN1 to consider allowing UE to indicate the above mentioned cases, details are up to RAN1.With the above reasoning, it is proposed to add a UE capability signaling to differentiate the coherency with and without TDMed SRS. Taking all 4 codebooks into consideration, we want a “joint” capability signaling of coherence type and SRS type which allows the UE to signaling one of the following. * Joint signaling value 1: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 2) with TDMed SRS
* Joint signaling value 2: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS
* Joint signaling value 3: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS
* Joint signaling value 4: The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS
* Joint signaling value 5: The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS
* Joint signaling value 6: The UE support partial coherent 8 Tx PUSCH (codebook 3) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS

One should notice that the existing UE capability can already support signaling values such as “The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, and the UE support coherent 8 Tx PUSCH (codebook 1) with TDMed SRS as well”. Therefore, there is no need to add those values in the new UE capability. Based on the above analysis, the following proposal is proposed. **Proposal 2.1: for codebook based 8-Tx PUSCH, add a UE feature group as 40-7-1h under 40-7-1 family. The new UE feature group signals the supported codebook type and SRS type jointly with the following candidate values.** * **Candidate value 1: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 2) with TDMed SRS**
* **Candidate value 2: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS**
* **Candidate value 3: The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS**
* **Candidate value 4: The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS**
* **Candidate value 5: The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS**
* **Candidate value 6: The UE support partial coherent 8 Tx PUSCH (codebook 3) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS**
 |
| Ericsson [11] |  |

## NR\_pos\_enh2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. NR\_pos\_enh2 | 41-1-7a | SL PRS measurement for SL-RSTD | 1. Support SL RSTD measurement based on SL-PRS2. Support SL RSTD measurement reporting3. Maximum number of SL RSTD measurement reporting for different SL-PRS reception for the same pair of UEs | 41-1-1 | No | No | UE does not support SL PRS measurement for SL-RSTD | Per band | n/a | n/a | n/a | Need for location server/ UE to know if the feature is supportedComponent 3 candidate values: {1,2,3,4} | Optional with capability signaling |
| 41. NR\_pos\_enh2 | 41-1-7b | SL PRS measurement for SL RTOA | 1. Support SL RTOA measurement based on SL-PRS2. Support SL RTOA measurement reporting3. Maximum number of SL RTOA measurementreporting for different SL-PRS reception for the same pair of UEs | 41-1-1 | No | No | UE does not support SL PRS measurement for SL RTOA | Per band | n/a | n/a | n/a | Need for location server/ UE to know if the feature is supportedComponent 3 candidate values: {1,2,3,4} | Optional with capability signaling |
| 41. NR\_pos\_enh2 | 41-1-19a | Report of Rx ARP-ID with SL positioning measurements | Support providing Rx ARP-ID with SL positioning measurements |  | No | No | UE cannot report Rx ARP-ID with SL positioning measurements | Per band | n/a | n/a | n/a | Need for location server/UE to know if the feature is supported | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |

|  |
| --- |
| SL-TDOA-CapabilityPerBand ::= SEQUENCE { --R1 41-1-7a SL PRS measurement for SL-RSTD **sl-PRS-RSTD-Meas ENUMERATED {n1,n2,n3,n4} OPTIONAL,** measurementsForMultipleARP-IDs-Rx ENUMERATED { supported } OPTIONAL, ...}***sl-PRS-RSTD-Meas***Indicates whether UE supports SL PRS measurement for SL-RSTD, and is comprised of the following functional components:- Support SL RSTD measurement based on SL-PRS;- Support SL RSTD measurement reporting;The value indicates the supported maximum number of SL RSTD measurement reporting for different SL-PRS reception for the same pair of UEs.UE supporting this feature shall also support *sl-PRS-CommonProcCapabilityPerBand*.SL-TOA-CapabilityPerBand ::= SEQUENCE { --R1 41-1-7b SL PRS measurement for SL RTOA **sl-RTOA-Meas ENUMERATED {n1,n2,n3,n4} OPTIONAL,** measurementsForMultipleARP-IDs-Rx ENUMERATED { supported } OPTIONAL, ...}***sl-RTOA-Meas***Indicates whether UE supports SL PRS measurement for SL-RTOA, and is comprised of the following functional components:- Support SL RTOA measurement based on SL-PRS;- Support SL RTOA measurement reporting.The value indicates the supported maximum number of SL RTOA measurement reporting for different SL-PRS reception for the same pair of UEs.UE supporting this feature shall also support *sl-PRS-CommonProcCapabilityPerBand*. |

However, in SLPP report, there is no option for the UE to report multiple RSTDs or RTOA for different SL-PRS reception for the same pair of UEs as it is shown below. The “SL-TOA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-TOA-MeasElement“ is for providing RTOA for different ARPs.

|  |
| --- |
| SL-TOA-ProvideLocationInformation ::= SEQUENCE { sl-TOA-SignalMeasurementInformation SL-TOA-MeasElementPerARP-ID-Rx OPTIONAL, sl-TOA-Error SL-TOA-LocationInformationError OPTIONAL, ...}SL-TOA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-TOA-MeasElementSL-TOA-MeasElement ::= SEQUENCE { los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator sl-RTOA-Result CHOICE { k0 INTEGER (0..1970049), k1 INTEGER (0..985025), k2 INTEGER (0..492513), k3 INTEGER (0..246257), k4 INTEGER (0..123129), k5 INTEGER (0..61565) } OPTIONAL, -- sl-PRS-RTOA sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-Rx sl-PRS-ResourceId INTEGER (0..16) OPTIONAL, -- sl-PRS-ResourceId sl-PRS-RSRP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRP sl-PRS-RSRPP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRPP sl-TOA-AdditionalPathList SL-TOA-AdditionalPathList OPTIONAL, sl-TimeStamp SL-TimeStamp OPTIONAL, -- sl-Timestamp sl-TimingQuality SL-TimingQuality OPTIONAL, -- sl-TimingQuality ...} |

Furthermore, we observe that there is no reported UE capability for the number of Rx ARP IDs that a UE could have. The capability is whether the device supports or not the ARP reporting feature, but not how many Rx ARPs it has.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. NR\_pos\_enh2 | 41-1-19 | ARP location provision for sidelink as assistance data | Support of ARP location provision for sidelink as assistance data |  | No | No | UE cannot provide ARP location for sidelink as assistance data | Per band | n/a | n/a | n/a | Need for location server/UE to know if the feature is supported | Optional with capability signaling |
| 41. NR\_pos\_enh2 | 41-1-19a | Report of Rx ARP-ID with SL positioning measurements | Support providing Rx ARP-ID with SL positioning measurements |  | No | No | UE cannot report Rx ARP-ID with SL positioning measurements | Per band | n/a | n/a | n/a | Need for location server/UE to know if the feature is supported | Optional with capability signaling |
| 41. NR\_pos\_enh2 | 41-1-19b | Report of Tx ARP-ID to LMF or another UE for the transmitted SL PRS | Support providing Tx ARP-ID for the transmitted SL PRS |  | No | No | Report of Tx ARP-ID to LMF or another UE for the transmitted SL PRS is not supported | Per band | N.A. | N.A. | N.A. | Need for location server/UE to know if the feature is supported | Optional with capability signaling |

Based on the above we make the following observations:**Observation 4.1: In FGs 41-1-7a and 41-1-7b, component 3 (Maximum number of SL RSTD (or RTOA) measurement reporting for different SL-PRS reception for the same pair of UEs) does not have a corresponding feature specified; i.e. the UE cannot report multiple RSTD or RTOA for different SL-PRS reception for the same pair of UEs, rather it can report multiple RSTD or RTOA for different Rx TEGs.** **Proposal 4.1: With regards to FG 41-1-7a and FG 41-1-7b, consider the following options:*** **Option 1: Remove component 3 from both FGs, since there is no corresponding feature specified in SLPP**
* **Option 2: Send an LS to RAN2 to inform them that this UE capability component has been specified, but there is no corresponding report specified in the ProvideLocationInformation message of TDOA and TOA methods.**

**Observation 4.2: In FGs 41-1-19a, there is no component for the UE to report the number of ARPs it supports, even though the LMF can request a specific number from the UE.** **Proposal 4.2: To address the absence of a number of ARP-IDs the device supports, introduce a new component in FG 41-1-19a:*** **Add a new component in FG 41-1-19a, “Maximum number of Rx ARP-IDs it supports”, with values {1,2,3,4}.**
 |
| Ericsson [11] |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. NR\_pos\_enh2 | 41-5-2a | Support of positioning SRS with Tx frequency hopping in RRC\_INACTIVE for RedCap UEs | 1. Maximum SRS bandwidth across all hops2. Maximum number of hops3. RF Tx retuning time between consecutive hops4. Switching time between active BWP and frequency hop5. Overlapping PRB(s) between adjacent hops6. Support of {0,1,2,4} overlapping PRB(s) between adjacent hops7. Maximum number of positioning SRS resources with Tx frequency hopping | 27-15b, one of {28-1,48-1} | Yes | n/a | Positioning SRS with Tx hopping in RRC\_INACTIVE is not supported | Per band | n/a | n/a | n/a | Component 1 candidate values:FR1: {40, 50, 80, 100}FR2: {100, 200, 400}Component 2 candidate values: {2,3,4,5,6}Component 3 candidate values:FR1: {70us, 140us, 210us}FR2: {35us, 70us, 140us}Component 4 candidate values:{100us, 140us, 200us, 300us, 500us}Component 7 candidate values:Periodic: {1,2,4,8,16,32,64}Semi-persistent: {0,1,2,4,8,16,32,64}Note: No additional UE requirements shall be specified for the case of Tx hopping with non-overlapping hops compared to the case of Tx hopping with overlapping hops, e.g., a UE is not responsible for keeping phase continuity across the hops in either case of overlapping or non-overlapping hopsNeed for location server to know if the feature is supported | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] |  |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] | With the increase of demands on high accuracy positioning, bandwidth/carrier aggregation and frequency hopping are introduced in Rel-18 for equivalent large bandwidth. The maximum aggregated bandwidth for positioning which is supported by UE is up to 300MHz in FR1. However, for UEs not supporting bandwidth aggregation feature, the frequency resources can not be used for positioning accuracy improvement. In order to make use of the intra-band contiguous CCs and the up-to-300MHz frequency resources in FR1, the maximum SRS bandwidth across all hops should be extended at least for RRC\_INACTIVE state. In such case, the frequency resources can be effectively utilized for a UE only supporting SRS Tx hopping but not supporting SRS bandwidth aggregation.***Proposal 1-1****: For FG 41-5-2a on supporting positioning SRS Tx hopping in RRC\_INACTIVE:** *Prerequisite feature groups: delete “*one of {28-1, 48-1}*”*
* *Component 1 candidate values: extend maximum SRS bandwidth across all hops to up to 300MHz*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41-5-2a | Support of positioning SRS with Tx frequency hopping in RRC\_INACTIVE for RedCap UEs | 1. Maximum SRS bandwidth across all hops2. Maximum number of hops3. RF Tx retuning time between consecutive hops4. Switching time between active BWP and frequency hop5. Overlapping PRB(s) between adjacent hops6. Support of {0,1,2,4} overlapping PRB(s) between adjacent hops7. Maximum number of positioning SRS resources with Tx frequency hopping | 27-15b, ~~one of {28-1, 48-1}~~  | Yes | n/a | Positioning SRS with Tx hopping in RRC\_INACTIVE is not supported | Per band | n/a | n/a | n/a | Component 1 candidate values:FR1: {40, 50, 80, 100, 200, 300}FR2: {100, 200, 400}Component 2 candidate values: {2,3,4,5,6}Component 3 candidate values:FR1: {70us, 140us, 210us}FR2: {35us, 70us, 140us}Component 4 candidate values:{100us, 140us, 200us, 300us, 500us}Component 7 candidate values:Periodic: {1,2,4,8,16,32,64}Semi-persistent: {0,1,2,4,8,16,32,64}Note: No additional UE requirements shall be specified for the case of Tx hopping with non-overlapping hops compared to the case of Tx hopping with overlapping hops, e.g., a UE is not responsible for keeping phase continuity across the hops in either case of overlapping or non-overlapping hopsNeed for location server to know if the feature is supported |

 |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

## Netw\_Energy\_NR

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-8 | simultaneousCSI-SubReportsPerCC-r18 | Indicates the number of CSI report(s) for which the UE can measure and process reference signals simultaneously in a CC of the band for which this capability is provided. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsPerCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports | FFS | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per Band | No | No | N/A | Component 1 candidate values: {1, 2, 3, 4, 5, 6, 7, 8}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsPerCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-9 | simultaneousCSI-SubReportsAllCC-r18 | Indicates whether the UE supports CSI report framework and the number of CSI report(s) which the UE can simultaneously process across all CCs, and across MCG and SCG in case of NR-DC. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsAllCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports. This parameter may further limit *simultaneousCSI-SubReportsPerCC-r18* in MIMO-ParametersPerBand and Phy-ParametersFRX-Diff for each band in a given band combination | FFS | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per BC | No | No | N/A | Component 1 candidate values: {5, 6, 7, ..., 32}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsAllCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] | * **FG 42-1/42-1a/42-1c/42-1b/42-2/42-2a/42-2c/42-2b/42-8/42-9**

**Comments:**1. Regarding the prerequisite feature groups,
	* For FG 42-1/42-1b/42-2/42-2b, since periodic CSI reporting and aperiodic CSI reporting are mandatory capability for NR UEs, and we specifically design the NES feature with willingness of supporting different values from a legacy CSI report capability, there does not expect strong dependences among these FGs, it is not necessary to take FG 2-32 (Basic CSI feedback) and FG 2-35(CSI report framework) as prerequisite feature groups.
	* For FG 42-1a/42-1c/42-2a/42-2c, for a similar reason, even though semi-persistent CSI reporting is optional capability for NR UEs, support of FG 2-32b (Semi-persistent CSI report on PUSCH) does not necessarily restrict the support of feature groups for FG 42-1a/42-1c/42-2a/42-2c.
	* For FG 42-8/42-9, one of FG 42-1/1a/1b/1c/2/2a/2b/2c can be added as prerequisite feature groups as the note.

**Proposal Nes-1: For** **the prerequisite feature groups,*** **For FG 42-1/42-1a/42-1b/42-1c/42-2/42-2a/42-2b/42-2c, no prerequisite feature groups are needed.**
* **For FG 42-8/42-9, add “one of FG 42-1/1a/1b/1c/2/2a/2b/2c” as the prerequisite feature groups.**

1. Regarding the component 9) for FG 42-1/42-1a/42-1c/42-1b/42-2/42-2b and the component 8) for FG 42-2a/42-2c,
	* The same value should be applied for the same type of CSI report regarding the number of CSI report setting, which means the same value for 42-1/42-2 (periodic CSI report), 42-1b/42-2b (aperiodic CSI report) and 42-1a/42-1c/42-2a/42-2c (semi-persistent CSI report) individually. If UE reports more than one FG from FGs related to the same type of CSI report, and if the UE is configured with CSI report settings with sub-configurations from the subset of these reported FGs, the minimum of the reported values from the subset should be used.

**Proposal Nes-2: For FG 42-1 and FG 42-2, add the following note:*** **Note: If a UE reports both FG 42-1 and FG 42-2, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FG 42-1 and 42-2, then the supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1 and 42-2.**

**Proposal Nes-3: For FG 42-1b and FG 42-2b, add the following note:*** **Note: If a UE reports both FGs 42-1b and FG 42-2b, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1b and 42-2b, then the supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1b and 42-2b.**

**Proposal Nes-4: For FG 42-1a and 42-1c, update the following note:*** **Note: If a UE reports ~~both~~ more than one FG from FGs 42-1a/1c and 42-~~1~~2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-1a/1c and 42-~~1~~2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-1a and 42-1c~~.**

**Proposal Nes-5: For FG 42-2a and 42-2c, update the following note:*** **Note: If a UE reports ~~both~~ more than one FG from FGs 42-~~2~~1a/1c and 42-2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-1~~2~~a/1c and 42-2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-2a and 42-2c~~.**
1. For FGs 42-1a/1c and 2a /2c, Lmax and N are reported for SP-CSI reporting on PUCCH and PUSCH individually. However, If
2. Lmax reported for PUSCH is less than the value of Lmax reported for PUCCH; and
3. the SP-CSI report originally triggered on PUCCH is to be piggybacked on the PUSCH according to the rules in 38.213, when PUCCH carrying SP-CSI report collides with a PUSCH.

it is unclear which restriction/capability (of PUCCH and PUSCH) shall apply for determining the Lmax and N. Hence, to avoid complexity without sacrificing advantages, we propose that Lmax reported for PUSCH should be equal or larger than the value of Lmax reported for PUCCH. And the same restriction should be applied for N.**Proposal Nes-6: For FG 42-1c, add the following note:** * **Notes: The value reported for Components 2 and 3 is no larger than the value reported for Components 2 and 3 in FG 42-1a (if supported), respectively.**

**Proposal Nes-7: For FG 42-2c, add the following note:*** **Notes: The value reported for Components 2 and 3 is no larger than the value reported for Components 2 and 3 in FG 42-2a (if supported), respectively.**
1. For the following two notes of 42-1/42-1a/42-1c/42-1b, it is more accurate to update “configuration” to “all sub-configurations”
	* Note: SD-type1 refers to configuration contains one port subset
	* Note: SD-type2 refers to configuration contains list of CSI-RS resource IDs

**Proposal Nes-8: For FG 42-1/42-1a/42-1c/42-1b, update the following note:*** **Note: SD-type1 refers to all sub-configurations that contain~~s~~ one port subset.**
* **Note: SD-type2 refers to all sub-configurations that contain~~s~~ list of CSI-RS resource IDs.**
 |
| CATT [4] |  |
| Samsung [5] | - Regarding note for reporting more than one FG from FGs 42-1/1a/1b/1c and 42-2/2a/2b/2cIn RAN1#117, the following note was agreed to define the supported total number of NZP-CSI-RS resources and CSI-RS ports is determined as the minimum of all configured FGs when the UE reports multiple FGs.

|  |
| --- |
| Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |

However, the above wording is less ideal since it can be interpreted as the determined minimum value is still applied per FG while making the total number as the sum of all. Hence, we propose modification of the note similar to the below note used for semi-persistence reporting:

|  |
| --- |
| Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. |

**Proposal 5: Modify the agreed note in RAN1#117 as below.**

|  |
| --- |
| Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |

- Regarding reporting values for SD-type1 and SD-type2 in FGs 42-1/1bAnother related issue is that components 4~7 in FGs 42-1 and 42-1b still have different reported values for SD-type 1 and SD-type 2. This is not ideal considering the purpose of the above note. Hence, we propose a note below:**Proposal 6: Add the following note for FG 42-1 and 42-1b.**

|  |
| --- |
| Note: If a UE does not report only type 1 or only type 2 for components 4~7 in both FGs 42-1 and 42-1b and if the UE is configured with CSI report settings with sub-configurations corresponding to both SD-type 1 and SD-type 2, then the supported total number of NZP-CSI-RS resources/ports is determined by the minimum of the reported values for both SD-type 1 and SD-type 2. |

Note that an alternative wording for the above would say ‘If a UE reports both type 1 and type 2 for components 4~7 in FGs 42-1 or 42-1b’, but this condition would not cover a case when a UE reports only SD-type 1 for FG 42-1 and only SD-type 2 for FG 42-1b while the minimum of those two reported values should still be used as the total value. |
| Nokia [6] | **Proposal: Adopt the changes proposed in the following table for UE features supporting Rel-18 Network Energy Saving.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP |  | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-8 | simultaneousCSI-SubReportsPerCC-r18 | Indicates the number of CSI report(s) for which the UE can measure and process reference signals simultaneously in a CC of the band for which this capability is provided. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsPerCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports |  | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per Band | No | No | N/A | Component 1 candidate values: {1, 2, 3, 4, 5, 6, 7, 8}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsPerCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-9 | simultaneousCSI-SubReportsAllCC-r18 | Indicates whether the UE supports CSI report framework and the number of CSI report(s) which the UE can simultaneously process across all CCs, and across MCG and SCG in case of NR-DC. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsAllCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports. This parameter may further limit *simultaneousCSI-SubReportsPerCC-r18* in MIMO-ParametersPerBand and Phy-ParametersFRX-Diff for each band in a given band combination |  | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per BC | No | No | N/A | Component 1 candidate values: {5, 6, 7, ..., 32}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsAllCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |

 |
| Apple [7] | We would like to address the following two issues.* 1/ When UE reports both spatial domain (SD) and power domain (PD) adaptations, it can be misunderstood that summation of supported number of P/SP/A-CSI reporting settings from SD and PD adaptations is applied (i.e. the number should not be SD+PD capabilities).
	+ **Proposal**: If UE reports FGs for both SD and PD per each CSI reporting type, the minimum value of the CSI reporting type between SD and PD is applied (i.e. not summed up) to align with legacy capabilities.
		- To be applied for FGs {42-1, 42-2}, {42-1a, 42-1c, 42-2a, 42-2c}, {42-1b, 42-2b}
* 2/ Notes to consider supported maximum of NZP-CSI-RS resources/ports as minimum of the reported values should be applied regardless of CSI report types to align with legacy capabilities. The current description can be misunderstood as the note is applied for individual CSI report type.
	+ *Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.*
	+ **Proposal**: *Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.*

**<Proposed updates>**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1 and 42-2 and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1 and 42-2, then the supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1 and 42-2. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports more than one FG from FGs 42-1a, 42-1c, 42-2a, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1a, 42-1c, 42-2a, 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from FGs 42-1a, 42-1c, 42-2a, 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports more than one FGs from FGs 42-1a, 42-1c, 42-2a, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of reported FGs 42-1a, 42-1c, 42-2a, 42-2c then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from FGs 42-1a, 42-1c, 42-2a, 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1b and 42-2b and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1b and 42-2b, then the supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1b and 42-2b. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1 and 42-2 and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1 and 42-2, then the supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1 and 42-2. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports more than one FG from FGs 42-1a, 42-1c, 42-2a, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1a, 42-1c, 42-2a, 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a, 42-1c, 42-2a, 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports more than one FG from FGs 42-1a, 42-1c, 42-2a, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1a, 42-1c, 42-2a, 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from FGs 42-1a, 42-1c, 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1b and 42-2b and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1b and 42-2b, then the supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1b and 42-2b. | Optional with capability signaling |

 |
| NTT DOCOMO, INC. [8] | In Rel-15, basic CSI feedback capability FG2-32 covers periodic/aperiodic CSI reporting, while FG2-32a/b for semi-persistent CSI reporting are optional capabilities. Therefore, for FG42-1 family, we prefer to have FG42-1 or FG42-1b as prerequisite FG for FG42-1a/1c, while FG42-1 and FG42-1b would not require any prerequisite FG as basic CSI reporting capability FG2-32 is anyway mandatory. Same proposal is applied to FG42-2 family.Regarding FG42-8/9, these FGs intend to report larger value on maximum number of CSI reports for which the UE can measure and process simultaneously in a CC or across all CCs than those reported in 2-35. Based on the intention, prerequisite FG of FG42-8/9 should be 2-35, and the value reported in FG42-8/9 is applicable if the UE is configured with CSI report setting with sub-configuration.**Proposal 1: FFSs on prerequisite FG column for FG42-1 family and FG42-2 family are updated as below.*** **FG42-1: None (i.e., no prerequisite FG)**
* **FG42-1a: One of {42-1, 42-1b}**
* **FG42-1c: One of {42-1, 42-1b}**
* **FG42-1b: None (i.e., no prerequisite FG)**
* **FG42-2: None (i.e., no prerequisite FG)**
* **FG42-2a: One of {42-2, 42-2b}**
* **FG42-2c: One of {42-2, 42-2b}**
* **FG42-2b: None (i.e., no prerequisite FG)**

**Proposal 2: FG42-8 and 42-9 are updated as below.*** **Prerequisite FG of FG42-8/9 is 2-35.**
 |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] | This section provides our views on the remaining aspects of the agreed UE feature groups in supporting spatial and/or power domain adaptation. On prerequisite for the feature groups. From our perspectives, the following prerequisites should be adopted:* FG 2-35 is prerequisite for FGs 42-1/1a/1b/1c/2/2a/2b/2c. The report in FG 2-35 is needed for determining the supported total number of sub-configurations across CSI report settings with sub-configurations per BW. For example, FG 42-1 has a component that “Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across CSI report settings with sub-configurations per BWP”. Based on the reported component 1 in FG 2-35, the supported total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP can be determined.
* Additionally, FG 2-32a is prerequisite for FG 42-1c/2c, and FG 2-32b is prerequisite for FG 42-1a/2a.
* FG 2-35 is prerequisite for FGs 42-8/9 since the reported numbers X and Y in components 4 and 5 of FG 2-35 are needed for determining the number of CSI sub-reports.

Currently the capabilities related to CSI-RS resource counting (e.g., components 4-7 in FG 42-1) are reported per FG. It was agreed in the below agreement that for components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Hence, some corresponding information in FG 2-33 should be reported for determining CSI-RS resource and CSI-RS ports are counted for reporting settings with sub-configurations. **Agreement: The following notes are agreed for Rel. 18 Netw\_Energy\_NR UE features to be captured in the second to last column of the corresponding FG**

|  |  |
| --- | --- |
| 42-1 | Note: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.  |
| 42-1a | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-1c | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-1b | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-2 | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-2a | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-2c | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |
| 42-2b | Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. |

Hence, we make the following proposal:**Proposal 1.1: Adopt the following prerequisites as follows:*** **FG 2-35 is prerequisite for FGs 42-1/1a/1b/1c/2/2a/2b/2c/8/9.**
* **FG 2-33 is prerequisite for FGs 42-1/1a/1b/1c/2/2a/2b/2c.**
* **Additionally, FG 2-32a is prerequisite for FG 42-1c/2c, and FG 2-32b is prerequisite for FG 42-1a/2a.**
 |
| Ericsson [11] | Most UE features details for NES were finalized in last RAN1 meeting. One remaining issue was regarding the pre-requisites which is discussed below. * Adding FG 2-35 as prerequisite for all spatial/power domain FGs is strictly not necessary since anyways 2-35 is mandatory with capability signaling.
* FG 42-1c (spatial domain + semi-persistent CSI reporting on PUCCH)
	+ OK to add 2-32a (Semi-persistent CSI report on PUCCH)
	+ Additional prerequisite (if any) should be only 42-1
* FG 42-2c (power domain + semi-persistent CSI reporting on PUCCH)
	+ OK to add 2-32a (Semi-persistent CSI report on PUCCH)
	+ Additional prerequisite (if any) should be only 42-2
* FG 42-1a (spatial domain + semi-persistent CSI reporting on PUSCH)
	+ OK to add 2-32b (Semi-persistent CSI report on PUSCH)
	+ Additional prerequisite (if any) should be only 42-1b as semi-persistent CSI reporting on PUSCH is also based on trigger states like aperiodic reporting.
* FG 42-2a (power domain + semi-persistent CSI reporting on PUSCH)
	+ OK to add 2-32b (Semi-persistent CSI report on PUSCH)
	+ Additional prerequisite (if any) should be only 42-2b as semi-persistent CSI reporting on PUSCH is also based on trigger states like aperiodic reporting.
1. For NES FGs, we propose the following for finalizing pre-requisites.
	1. FG 42-1c (spatial domain + semi-persistent CSI reporting on PUCCH)
		1. OK to add 2-32a (Semi-persistent CSI report on PUCCH)
		2. Additional prerequisite (if any) should be only 42-1
	2. FG 42-2c (power domain + semi-persistent CSI reporting on PUCCH)
		1. OK to add 2-32a (Semi-persistent CSI report on PUCCH)
		2. Additional prerequisite (if any) should be only 42-2
	3. FG 42-1a (spatial domain + semi-persistent CSI reporting on PUSCH)
		1. OK to add 2-32b (Semi-persistent CSI report on PUSCH)
		2. Additional prerequisite (if any) should be only 42-1b as semi-persistent CSI reporting on PUSCH is also based on trigger states like aperiodic reporting.
	4. FG 42-2a (power domain + semi-persistent CSI reporting on PUSCH)
		1. OK to add 2-32b (Semi-persistent CSI report on PUSCH)
		2. Additional prerequisite (if any) should be only 42-2b as semi-persistent CSI reporting on PUSCH is also based on trigger states like aperiodic reporting.
 |

## NR\_Mob\_enh2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. NR\_Mob\_enh2 | 45-3 | Beam indication with joint DL/UL LTM TCI states | 1. Support of unified TCI with joint DL/UL LTM TCI-state indication for LTM procedure.2. Maximum number of configured joint LTM TCI state(s) per candidate cell3. Support of indicating and activating a single joint LTM TCI state in a cell switch command.4. Supported QCL source RS in the LTM TCI-stateconfiguration5. Maximum number of configured joint LTM TCI state(s) across candidate cells6. Maximum number of configured cells for joint LTM TCI states | 23-1-1, RAN2 FG for LTM | Yes | No | UE does not support Beam indication with joint DL/UL LTM TCI states | Per band | No | No | n/a | Component 2 candidate values: {8, 12, 16, 24, 32, 48, 64, 128}Component 4 candidate values: {SSB, TRS, both}Component 5 candidate values: {8, 16, 24, 32, …, 1024}Component 6 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |
| 45. NR\_Mob\_enh2 | 45-4 | Beam indication with separate DL/UL LTM TCI states | 1. Support of unified TCI with separate DL/UL TCI-state indication for LTM procedure.2. Maximum number of configured DL TCI state(s) per candidate cell3. Maximum number of configured UL TCI state(s) per candidate cell4. Support of indicating and activating a pair of UL/DL TCI-state in a cell switch command.5. Supported QCL source RS in the LTM TCI-state configuration7. Maximum number of configured separate DL LTM TCI state(s) across candidate cells8. Maximum number of configured separate UL LTM TCI state(s) across candidate cells9. Maximum number of configured cells for separate DL/UL LTM TCI states | 23-10-1, RAN2 FG for LTM | Yes | No | UE does not support Rel-18 LTM operation with separate DL/UL TCI states | Per band | No | No | n/a | Component 2 candidate values: {4, 8, 12, 16, 24, 32, 48, 64, 128}Component 3 candidate values: {4, 8, 12, 16, 24, 32, 48, 64}Component 5 candidate values: {SSB, TRS, both}Component 7 candidate values: {8, 16, 24, 32, …, 1024}Component 8 candidate values: {4, 8, 12, 16, …, 512}Component 9 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] |  |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] | **Corrections to prerequisite FGs for 45-3 and 45-4**The TCI states (*CandidateTCI-State-r18*) for LTM are designed based on the Rel-17 unified TCI framework. This functionality is needed to support LTM TCI states, but it does not necessitate any relation between the LTM TCI states and the TCI states of the source cell and the target cell. It is important to note that both RAN1 and RAN2 agreed in the last meeting not to impose any constraint on the type of TCI state framework (Rel-17 or Rel-15/16 TCI states) supported in the target cell.Similarly, there is no requirement to impose any constraint on the TCI state framework in the source cell. In other words, the application of LTM TCI states should not depend on whether the source cell is using Rel-17 or Rel-15/16 TCI states. Currently, FG 45-3, FG 23-1-1, and FG 23 are prerequisites requiring the support of unified TCI states for intra-cell beam management. The support of LTM beam indication should be independent of source cell intra-cell beam management; therefore, we propose to remove that prerequisite. Similarly, we propose to remove 23-10-1 from FG 45-4.**Proposal: Adopt the changes proposed in the following table for UE features supporting Rel-18 Mobility.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. NR\_Mob\_enh2 | 45-3 | Beam indication with joint DL/UL LTM TCI states | 1. Support of unified TCI with joint DL/UL LTM TCI-state indication for LTM procedure.2. Maximum number of configured joint LTM TCI state(s) per candidate cell3. Support of indicating and activating a single joint LTM TCI state in a cell switch command.4. Supported QCL source RS in the LTM TCI-stateconfiguration5. Maximum number of configured joint LTM TCI state(s) across candidate cells6. Maximum number of configured cells for joint LTM TCI states | RAN2 FG for LTM | Yes | No | UE does not support Beam indication with joint DL/UL LTM TCI states | Per band | No | No | n/a | Component 2 candidate values: {8, 12, 16, 24, 32, 48, 64, 128}Component 4 candidate values: {SSB, TRS, both}Component 5 candidate values: {8, 16, 24, 32, …, 1024}Component 6 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |
| 45. NR\_Mob\_enh2 | 45-4 | Beam indication with separate DL/UL LTM TCI states | 1. Support of unified TCI with separate DL/UL TCI-state indication for LTM procedure.2. Maximum number of configured DL TCI state(s) per candidate cell3. Maximum number of configured UL TCI state(s) per candidate cell4. Support of indicating and activating a pair of UL/DL TCI-state in a cell switch command.5. Supported QCL source RS in the LTM TCI-state configuration7. Maximum number of configured separate DL LTM TCI state(s) across candidate cells8. Maximum number of configured separate UL LTM TCI state(s) across candidate cells9. Maximum number of configured cells for separate DL/UL LTM TCI states | RAN2 FG for LTM | Yes | No | UE does not support Rel-18 LTM operation with separate DL/UL TCI states | Per band | No | No | n/a | Component 2 candidate values: {4, 8, 12, 16, 24, 32, 48, 64, 128}Component 3 candidate values: {4, 8, 12, 16, 24, 32, 48, 64}Component 5 candidate values: {SSB, TRS, both}Component 7 candidate values: {8, 16, 24, 32, …, 1024}Component 8 candidate values: {4, 8, 12, 16, …, 512}Component 9 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |

 |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

**Other**

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] | In RAN1#117, RAN1 and RAN4 received a LS from RAN2 on LTM capabilities [2]. After discussion, RAN1 can’t reach consensus on either of the questions and will continue discuss question 2 at RAN1#118. These conclusions were replied to RAN2 in [3].

|  |
| --- |
| **Question 1 :** Are the above intra-frequency and inter-frequency L1 measurement and reporting features (45-1 and 45-1a) prerequisites to support intra-frequency and inter-frequency LTM, respectively?**Conclusion:** There is no consensus in RAN1 in regards to Question 1. At this point, RAN1 will not revisit question 1 and leaves final determination to other RAN WGs. **Question 2:** The above features, 45-1 and 45-1a, from RAN1 and related RAN4 features (39-1, 39-2, 39-3-1, 39-3-2, 39-3-3, 39-3-4, 39-3-5, 39-3-6) are defined per BC for both intra-frequency and inter-frequency measurements. RAN2 would like check with RAN1/4 for which BC (e.g. BC of current serving cells, BC including current serving cells and cell to be measured or something else) these capabilities are to be considered for L1 intra-frequency and inter-frequency LTM measurements?**Conclusion:** There is no consensus in RAN1 in regards to Question 2 at this point. It is RAN1’s understanding that RAN2 can implement this FG as is, and RAN1 will continue discussion at RAN1 #118. |

**On Question 2:**On whether the reported band combination includes cell to be measured, the proponents were almost equally split in RAN1 #117. For L1 intra-frequency measurement (45-1) in which the SSB of candidate cells locating at same centre frequency as the serving cell, the cell to be measured is always in the reported BC. For inter-frequency measurement, it was argued (by companies supporting the reported BC only including serving cells) that the BC corresponding to the legacy CA capability only applies to the serving cells and there is no restriction on the cell to be measured in L3 measurement. However, during the long debate in RAN1 on the report granularity of LTM feature group, the motivation to define the report granularity for L1 measurement (i.e. FG45-1/45-1a/45-2) as per BC is to allow UE to share the processing capability among serving cells and candidate cells. Thus, the cell to be measured should be included in the reported BC, which is similar as the case for R16 DAPS in which the BC includes both serving cell and cell to be measured. For UE having separate processing capability and can perform LTM inter-frequency measurement outside of the reported BC, we can add a component in 45-1a or a separate FG. **Proposed reply to Question 2: For intra frequency measurement (FG45-1), the current serving cell and candidate cell to be measured are on the same band in a band combination. The reported component value should be applicable to any band in the band combination. For inter-frequency measurement (FG45-1a), the current serving cell and candidate cell to be measured can be on any band in the band combination. A new component in FG45-1a or a separate FG can be added for UE to report the capability of inter-frequency measurement outside of the reported BC of 45-1a.** |
| CATT [4] | In LS [2], RAN2 asked two questions related to LTM L1 intra and inter-frequency measurements. According to the conclusion of the last meeting, RAN1 will not revisit Question 1 and leaves final determination to other RAN WGs [3], and RAN1 will continue the discussion of the response to Question 2 shown in the following:

|  |
| --- |
| Question 2: The above features, 45-1 and 45-1a, from RAN1 and related RAN4 features (39-1, 39-2, 39-3-1, 39-3-2, 39-3-3, 39-3-4, 39-3-5, 39-3-6) are defined per BC for both intra-frequency and inter-frequency measurements. RAN2 would like check with RAN1/4 for which BC (e.g. BC of current serving cells, BC including current serving cells and cell to be measured or something else) these capabilities are to be considered for L1 intra-frequency and inter-frequency LTM measurements? |

In our opinion, features 45-1 and 45-1a are defined per BC, where BC means the band combination of the current serving cells. This is aligned with the band combination in CA/DC case, as definition in TS 38.101 [4].**Proposal 1: Features 45-1 and 45-1a are defined per BC, where BC means the band combination of the current serving cells.** |
| Samsung [5] |  |
| Nokia [6] | **Clarification on BC capability for 45-1 and 45-1a**In the last RAN1 meeting, there was an LS [R1-2404199] from RAN2 asking for clarification on the definition of the “per BC” FG type for FG 45-1 and FG 45-1a. This issue was discussed in RAN1, but no consensus was reached, and it was left open for further discussion. In the last RAN2 meeting, a similar issue was addressed in the context of FG 45-5a, and RAN4 FGs 39-4, 39-41, and 39-5, all related to PDCCH ordered RACH transmission towards a candidate cell). The following agreements were made:* RAN2 assumes that the target band for RACH transmission is any supported band within or outside the band combination. This can be revisited if RAN1 or RAN4 indicates otherwise in the future
* RAN2 pursues signalling solution where the target bands for RACH transmission are signalled per feature set, and further discuss how the target bands are indicated, by pointing to *appliedFreqBandList*.

Therefore, it was agreed that RACH transmission can be supported in supported bands within or outside the band combination. The target bands for RACH transmission will be signaled per feature set. A similar mechanism should be used for L1 measurements (FG 45-1 and FG 45-1a). The “per BC” in FG 45-1 and FG 45-1a should refer to the band combination of the current serving cells. However, the measurements should be supported in supported bands within or outside of the band combination. The signaling details on how the target bands will be indicated (e.g., per feature set) can be decided by RAN2.**Proposal: From the RAN1 perspective, “per BC” in FG 45-1 and FG 45-1a should refer to the band combination of the current serving cells. However, the measurements should be supported in supported bands within or outside of the band combination.** |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] |  |
| Qualcomm Incorporated [10] |  |
| Ericsson [11] |  |

## NR\_NTN\_enh

Void

## IoT\_NTN\_enh

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | [Rel. 18 2-3a] Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | [Rel. 18 2-3b], Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Summary |
| Huawei/HiSilicon [3] | For the highlight part of FG 2-4a and FG 2-4b, according to the agreement in RAN1#111, UE may perform autonomous GNSS measurement if there is no trigger is received.

|  |
| --- |
| **Agreement*** For GNSS measurement in RRC connected, if eNB aperiodically triggers connected UE to make GNSS measurement, UE can re-acquire GNSS position fix with a gap
* FFS details of gap configuration

The UE may re-acquire GNSS autonomously (when configured by the network) if UE does not receive eNB trigger to make GNSS measurement* FFS based on configured timing
 |

There are two cases UE does not receive the trigger, 1) UE support the aperiodic trigger-based GNSS measurement but eNB does not send the trigger; 2) UE do not report the capability of the aperiodic trigger-based GNSS measurement. The autonomous GNSS position fix can be enabled independently of the support of aperiodic GNSS measurement. Thus, FG 2-3a should not be the prerequisite feature group of FG 2-4a.The similar comments can be applied to FG 2-4b for NB-IoT.**Proposal IoT NTN-1:** **FG2-3a (FG2-3b) should not be** **the prerequisite feature group of FG 2-4a (FG 2-4b).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3a]~~ Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3b],~~ Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

 |
| CATT [4] |  |
| Samsung [5] |  |
| Nokia [6] | **Proposal: Adopt the changes proposed in the following table for UE features supporting Rel-18 IoT-NTN.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 18 2-3a Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 18 2-3b, Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

 |
| Apple [7] |  |
| NTT DOCOMO, INC. [8] |  |
| ZTE Corporation/Sanechips [9] | The eNB trigger based solution and UE autonomous solution can work independently. It is not preferred to couple the two methods when defining FGs. Therefore, the prerequisite [Rel. 18 2-3a] and [Rel. 18 2-3b] should be removed from FG 2-4a and FG2-4b, respectively. ***Proposal 2-1:*** *The updates on the UE features for IoT-NTN listed below should be supported.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3a]~~ Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3b]~~, Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

 |
| Qualcomm Incorporated [10] | In our view, it should be possible for a UE to implement autonomous reacquisition without supporting triggered gaps. Note that the implementation of triggered gaps is much more complex than autonomous gaps (requiring e.g. new MAC-CE support) and, therefore, it is likely that commercial deployments may only support autonomous reacquisition initially. Therefore, we make the following proposal:**Proposal 3.1: 2-3a / 2-3b are not prerequisites of 2-4a / 2-4b.** The proposal above is implemented in the following table:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3a]~~ Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | ~~[Rel. 18 2-3b],~~ Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

 |
| Ericsson [11] | For Rel-18 IoT-NTN, there are two methods for triggering a GNSS measurement gap during RRC connected mode, an “Aperiodic triggering” and an “Autonomous triggering”. During several meetings in a row (including RAN1#117), there have been discussions on whether the “Aperiodic triggering” method should be a pre-requisite for the “Autonomous triggering” method. Nonetheless, it has not been possible to reach consensus mainly due to different interpretations of a conclusion touching upon the “pre-requisite” aspect.The no consensus is preventing the completion of the UE capability report (a.k.a. UE Feature list) for GNSS Enhancements towards performing an Interoperability Development Testing (IoDT). Thus, aiming at moving things forward, during RAN1# 117 a middle-ground solution was proposed which is illustrated below:Figure 1: Way-Forward on the usage of both an “Aperiodic triggering” and an “Autonomous triggering” for triggering a GNSS measurement gap during RRC connected mode (Note: For simplification purposes it has been assumed that “*ul-TransmissionExtensionValue*” was not configured).The intention behind the middle-ground solution illustrated in Figure 1, is that the “Aperiodic triggering” and the “Autonomous triggering” complement each other. That is, the “Aperiodic triggering” should be available as to assist the UE in case the scenario-conditions change (e.g., passing from a stationary to a non-stationary condition) where the fully “Autonomous triggering” approach would not be suitable anymore. It is important to mention that a mutual trust between UE and Network is needed as to have a robust solution in place, where the “Aperiodic triggering” is expected to be used when strictly necessary as to avoid any potential misuse of it. Moreover, depending on whether the elapsed time “x” in Figure 1 were fixed in the specification or if a configurable value were introduced, an example of the specification impact is provided in our companion contribution in R1-2406810.1. For GNSS Enhancements, there is still an open issue impacting FGs 2-3a, 2-4a, 2-3b, 2-4b. The open issue is related with whether the “Aperiodic triggering” method should be captured or not as a pre-requisite of the “Autonomous triggering” method.
2. For GNSS Enhancements, the “Aperiodic triggering” and the “Autonomous triggering” complement each other. The “Aperiodic triggering” should be available as to assist the UE in case the scenario-conditions change (e.g., passing from a stationary to a non-stationary condition) where the fully “Autonomous triggering” approach would not be suitable anymore.
3. For GNSS Enhancements, it is important to mention that a mutual trust between UE and Network is needed as to have a robust solution in place, where the “Aperiodic triggering” is expected to be used when strictly necessary as to avoid any potential misuse of it.
4. For GNSS Enhancements, in relation with the previous observations, with the middle-ground solution the UE may receive an aperiodic triggering to start a GNSS measurement gap no earlier than [5] s starting from the beginning of the remaining GNSS validity duration indicated by the higher layer parameter GNSS-ValidityDuration, and otherwise may start the GNSS measurement gap upon the expiry of both the GNSS-ValidityDuration and ul-TransmissionExtensionValue, if configured).
5. For GNSS Enhancements adopt the “Way-Forward” on Autonomous and Aperiodic triggering, updating “FG 2-4a” and “FG 2-4b” with the following changes:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-3a | GNSS position fix in RRC Connected state for eMTC—triggered  | 1. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case 2. UE receives eNB GNSS measurement trigger 4. UE re-acquires GNSS position fix within a configured gap5. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get triggered GNSS position fix in RRC Connected state | ~~WA:~~ Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger1.1 In RRC connected-mode, a BL/CE UE may receive an aperiodic triggering to start a GNSS measurement gap no earlier than [5] s starting from the beginning of the remaining GNSS validity duration indicated by the higher layer parameter *GNSS-ValidityDuration*, and otherwise may start the GNSS measurement gap upon the expiry of both the *GNSS-ValidityDuration* and *ul-TransmissionExtensionValue*, if configured.2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 18 2-3a Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | ~~WA:~~ Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-3b | GNSS position fix in RRC Connected state for NB-IoT—triggered | 1. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB 2. UE receives eNB GNSS measurement trigger 4. UE re-acquires GNSS position fix within a configured gap5. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 17 2-1b | Yes | N/A | Release 18 NB-IoT UE cannot get triggered GNSS position fix in RRC Connected state | ~~WA:~~ Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger1.1 In RRC connected-mode, an NB-IoT UE may receive an aperiodic triggering to start a GNSS measurement gap no earlier than [5] s starting from the beginning of the remaining GNSS validity duration indicated by the higher layer parameter *GNSS-ValidityDuration*, and otherwise may start the GNSS measurement gap upon the expiry of both the *GNSS-ValidityDuration* and *ul-TransmissionExtensionValue*, if configured.2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode | Rel. 18 2-3b, Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | ~~WA:~~ Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

 |

## NR\_netcon\_repeater

Void

## NR\_BWP\_wor

Void

## NR\_ATG

Void

# Discussion Items during RAN1 #118

After review of contributions submitted to RAN1 #118 in this agenda item, the following topics were identified by the moderator for discussion during RAN1 #118.

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

## NR\_MIMO\_evo\_DL\_UL

After review of contributions submitted to RAN1 #118 in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

### Issue 1-1: FGs 40-2-1, 40-2-2, 40-2-8

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-1 | Basic feature for multi-DCI based intra-cell Multi-TRP operation with two TA enhancement | Support of two TA enhancement for multi-DCI based intra-cell Multi-TRP operation | 16-2a | yes | n/a | Two TA enhancement for multi-DCI based intra-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a | Note: If a UE reports this FG, then the UE must report FG 40-2-8 | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-2 | Basic feature for multi-DCI based inter-cell Multi-TRP operation with two TA enhancement | 1. Support of two TA enhancement for multi-DCI based inter-cell Multi-TRP operation2. Maximum number of n-TimingAdvanceOffset value per serving cell | 23-4, 40-1-7 | yes | n/a | Two TA enhancement for multi-DCI based inter-cell Multi-TRP operation is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1,2}Note: If a UE reports this FG, then the UE must report FG 40-2-8 | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-8 | Maximum number of TAGs across all CCs  | Maximum number of TAGs across all CCs in a band combination | 40-2-1 or 40-2-2 | yes | n/a | Maximum number of TAGs across all CCs is unknown when UE supports two TAGs per CC | Per BC | n/a | n/a | n/a | Component candidate values: {2,3,4}Note: UE only supports the configuration where all UL CCs of the same frequency band are configured with up to 2 Timing Advance Group IDNote: The same description of “supportedNumberTAG” in 38.306 applies to this FG as wellNote: If a UE reports this FG, then the UE must report at least one of FG 40-2-1 or FG 40-2-2 | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | Not needed. If the UE does not report 40-2-8, the legacy supportedNumberTAG applies |
| Huawei, Hisilicon | Agree with Ericsson. |

### Issue 1-2: FGs 40-2-4a, 40-2-6

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-4a | PDCCH order sent by one TRP triggers RACH procedure (specifically PRACH) towards a different TRP based on CFRA for intra-cell | Support of cross-TRP PDCCH order based on CFRA for intra-cell multi-DCI based mTRP | 16-2a |  | yes | N/A | Intra-cell cross-TRP PDCCH ordered PRACH transmission is not supported | Per band | No | No | N/A |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-2-6 | Rx timing difference larger than CP length | 1. Support of the Rx timing difference between the two DL reference timings is larger than CP length | 40-2-1 or 40-2-2 |  | yes | N/A | Rx timing difference larger than CP is not supported | Per FSPC | n/a | n/a | n/a |  | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | For 40-2-4a: not needed. For 40-2-6: OK |
| Huawei, Hisilicon | For 40-2-4a: Not support the proposal. In fact, cross-TRP CFRA for intra-cell mTRP can be applied (i.e., the PRACH association indicator field exists) only when two TAGs for inter-cell mTRP are configured. So, its prerequist should be 40-2-1.  |

### Issue 1-3: FG 40-4-2

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-2 | Capability on the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | Maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell | 2-10, 40-4-1g | Yes | n/a | ~~Capability on~~ the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell is ~~not supported~~ 2  | Per FS | No | No | n/a | Component candidate values: {2, 3, 4} | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 1-4: FGs 40-4-5, 40-4-7, 40-4-13, 40-4-14

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-5 | Rel-18 DL DMRS with single DCI based M-TRP | Support of Rel-18 DL DMRS with single DCI based M-TRP | 40-4-1 or 40-4-1a, at least one of {16-2b-1, 16-2b-2, 16-2b-3, 16-2b-4, 16-2b-5} | 40-4-1 or 40-4-1a | Yes | n/a | Rel-18 DL DMRS with single DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-7 | Rel-18 DL DMRS with M-DCI based M-TRP | Support of Rel-18 DL DMRS with multi- DCI based M-TRP PDSCH operation | 40-4-1 or 40-4-1a, 16-2a | 40-4-1 or 40-4-1a | Yes | n/a | Rel-18 DL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-13 |  Support Rel-18 UL DMRS with single-DCI based M-TRP | 1. Support Rel-18 UL DMRS with Single-DCI based M-TRP | 40-4-6 or 40-4-6a, at least one of {23-3-1, 23-3-1-2, 23-3-1-1, 23-3-1-3, 40-6-1, 40-6-1a, 40-6-2, or 40-6-2a} |  | Yes | n/a | Rel-18 UL DMRS with single-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-4-14 | Support Rel-18 UL DMRS with M-DCI based M-TRP | 1. Support Rel-18 UL DMRS with M-DCI based M-TRP | 40-4-6 or 40-4-6a, 16-2a |  | Yes | n/a | Rel-18 UL DMRS with M-DCI based M-TRP is not supported | Per FS | No | No | n/a |  | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | Open for discussion. But I’m wondering if we need these long list of “at least one of ”…. |

### Issue 1-5: FG 40-6-1-2

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-6-1-2 | New UL DMRS port entry for single-DCI based SDM scheme for Rel-15 DMRS port and/or Rel-18 DMRS port | Support of new UL DMRS port entry {0, 2, 3} | 40-6-1 or 40-6-1a, 40-4-13 | Yes | N/A | New UL DMRS port entry for single-DCI based SDM scheme is not supported | Per Band | n/a | FR2 only | n/a |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | The feature is both for Rel-15 and Rel-18 DMRS, so 40-4-13 cannot be a perquisite. |
| Huawei, Hisilicon | Do not support. Prerequist = 40-6-1 or 40-6-1a or 40-4-13 means even if UE support 40-4-13 but do not support 40-6-1 or 40-6-1a, UE can still support 40-6-1-2. This is not reasonable as the new UL DMRS port entry is only for STxMP. |

### Issue 1-6: FG 40-6-5

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-6-5 | Support grouped-based beam reporting for STx2P | 1. Support group based L1-RSRP reporting for STxMP based transmission2. Max number N of beam groups (M=2 beams per beam group) in a single L1-RSRP reporting instance based on measurement on two CMR resource sets 3. Maximum number of SSB and CSI-RS resources for measurement in both CMR sets within a slot across all CCs in a band4. Maximum number of configured SSB and CSI-RS resources for measurement in both CMR sets across all CCs in a band | 23-5-1, at least one of {40-6-1, 40-6-1a, 40-6-2, 40-6-2a, 40-6-3a, 40-6-3b, 40-6-4} | Yes | n/a | Grouped-based beam reporting for STx2P is not supported | Per Band | n/a | FR2 only | n/a | Component 1 candidate values: {JointULandDL, ULOnly, both}Component 2 candidate values: {1,2,3,4}Component 3 candidate values: {2,3,4,8,16,32,64}Component 4 candidate values: {8, 16, 32, 64, 128}Note: components 3 and 4 are also counted in FG 16-1g, 16-1g-1, and 23-5-1 | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | Not needed. From a testing point of view, the reporting is independent of the actual transmission. |
| Huawei, Hisilicon | Same view as Ericsson. |

### Issue 1-7: FGs 40-7-1g, 40-7-1g-1

**Proposal:**

* **Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**
* **Define two groups of 8 Tx full power Mode 2 precoders/TPMIs for FG 40-7-1g-2 according to the maximum rank supported by the UE for 8 Tx, where the full power precoders constitute a single non-zero submatrix** $\overbar{W}\_{j, i}$ **in the intermediate precoder matrix** $W'$ **from 38.211. The UE indicates support for only one of the groups.**
	+ **Should be captured directly in 38.306, as was done for Rel-16 UL FPTx Mode 2, since it is not straightforwardly included in the feature lists**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g | UL full power transmission mode 2 with 1/2/4 resources | 1. Support of UL full power transmission mode of fullpowerMode2 when UE is capable of 8 Tx codebook based PUSCH operation2. Maximum number of SRS resources in one SRS resource set with usage set to 'codebook' for 8Tx codebook based PUSCH for Mode 2 | 40-7-1 | yes | n/a | UL full power transmission mode 2 is not supported | Per FSPC | n/a | n/a | n/a | Component 2 candidate values: {1, 2, 4}Note: A UE that supports FG 40-7-1g supports at least full power operation with single portNote: A UE that supports FG 40-7-1g supports at least full power operation with single port | Optional with capability signalling |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1g-1 | SRS resources for UL full power transmission mode 2 | 1. SRS configurations with different number of antenna ports per SRS resource for mode 2 | 40-7-1g | yes | n/a | SRS resources for UL full power transmission mode 2 cannot be signaled  | Per FSPC | n/a | n/a | n/a | Component 1 candidate values: 3 bit bitmap {b0, b1, b2}b0 indicates whether SRS resource can be configured with 1 portb1 indicates whether SRS resource can be configured with 2 portb2 indicates whether SRS resource can be configured with 4 portNote: b0 is set to 1 in this release of the specification.Note: An SRS resource set supported by the UE for uplink full power Mode 2 must contain at least an 8 port SRS resource.Note: Any of the above values can be used if 40-7-1g is reported as 2 or 4. | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | **Regarding 8 Tx full power Mode 2 precoders/TPMIs for FG 40-7-1g-2:**This feature is incomplete as present, so progress is needed on this issue. Since 1 bit is to be used for the Component 1 “TPMI group(s) which delivers full power”, this is to us straightforwardly expressed according to the non-zero intermediate precoder submatrices $\overbar{W}$. A way to capture the TPMI groups in 38.306 could be as follows:

| ***Definitions for parameters*** | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***tpmi-FullPwrCodebook2-r18***Indicates which of a first or a second TPMI group delivers full power when UE is capable of, and configured with, 8 Tx codebook based PUSCH operation with codebook2. The TPMI groups are defined as follows, where intermediate precoder matrices $W'$ are provided in TS 38.211 [6] in Table 6.3.1.5-29 through Table 6.3.1.5-32 for 1 to 4 layers, respectively.A UE that indicates support of this feature shall also indicate support of *ul-FullPwrTransMode2-r18.*

|  |  |
| --- | --- |
|  | **TPMI Group** |
| **# Layers** | **first** | **second** |
| **TPMIs** | **Intermediate precoder matrix** $W'$ | **TPMIs** | **Intermediate precoder matrix** $W'$ |
| **1**  | 0-15 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{1, i}\\0\_{4×1}\end{matrix}\right]$$ | 16-31 | $$\left[\begin{matrix}0\_{4×1}\\\overbar{W}\_{1, (i−16)}\end{matrix}\right]$$ |
| **2**  | 0-7 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{2, i}\\0\_{4×2}\end{matrix}\right]$$ | 8-15 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×2}\\\overbar{W}\_{2, \left(i−8\right)}\end{matrix}\right]$$ |
| **3**  | 0-3 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{3, i}\\0\_{4×3}\end{matrix}\right]$$ | 4-7 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×3}\\\overbar{W}\_{3, \left(i−4\right)}\end{matrix}\right]$$ |
| **4**  | 0-1 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}\overbar{W}\_{4, i}\\0\_{4×4}\end{matrix}\right]$$ | 2-3 | $$\frac{1}{\sqrt{2}}\left[\begin{matrix}0\_{4×4}\\\overbar{W}\_{4, \left(i− 2\right)}\end{matrix}\right]$$ |

NOTE: A UE that supports this feature must report at least one of the values. | FSPC | No | N/A | N/A |

**Regarding the Note in 40-7-1g and setting b0 to 1 in 40-7-1g-1:** In RAN1#117, it was debated if the UE is required to support 1 port SRS with this FG. We think it is crystal clear that “Note: A UE that supports FG 40-7-1g supports at least full power operation with single port” requires UEs to support 1 port SRS resources in any multi-SRS-resource UL FPTx Mode 2 configuration. This follows Rel-16 behavior and uses the wording of Rel-16, is consistent with the need to support 1 port with DCI 0\_0, and follows Rel-18 agreements to reuse UL FPTx modes from Rel-16. Please find more details in section 2.1. Therefore we think the Note should be added to 40-7-1g.Regarding setting b0 to 1: Since the ASN.1 has been agreed in RAN2 after RAN1#117, the ASN.1 now has a bitmap. However, the outcome of RAN1#117 was that it can be further discussed whether some of the bits are set to fixed values. Since support for 1 port SRS with 40-7-1g-1 should be required, bit b0 should be fixed to 1.**Regarding 40-7-1g-1:** On the Note for the 8 port SRS resource: As discussed in the summary above in section 2.1, there seems to be a common understanding that an 8 port SRS is always included in combinations with other size SRS resources in FG 40-7-1g-1. Therefore, we think a note should be added to ensure that the lack of a bit for the 8 port resource in FG 40-7-1g-1 means that an 8 port resource is always used in the SRS resource combinations for UL FPTx Mode 2 with multiple SRS resources in an SRS resource set.For the last Note in 40-7-1g-1: In Rel-16, 4 SRS resources are supported for UL FPTx Mode 2, but the largest capability combination is 1\_2\_4 SRS resources, so 4 resources can only be achieved by having an SRS resource with the same size. For FG 40-7-1g, 2 or 4 resources are also supported, and it may not be clear that two SRS resources with the same size can be present in the set. Especially given the RAN1#112b agreement “To support full power transmission with Mode2, Rel-16 Mode2 (fullPowerMode2) is re-used.”, this same behavior is included in Rel-18. The note “Note: The first, second, or third state can be used if 16-5c is reported as 2 or 4.” was added for this purpose in Rel-16 in our understanding, and we use essentially the same language here. |
|  |  |

### Issue 1-8: New FG

**Proposal: Introduce the following new FG/row**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. NR\_MIMO\_evo\_DL\_UL | 40-7-1h | Jointly supported codebook type and SRS type | Jointly supported codebook type and SRS type | 40-7-1 | yes | n/a | UL full power transmission mode 1 is not supported | Per FSPC | n/a | n/a | n/a | Component candidate values: * The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 2) with TDMed SRS
* The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS
* The UE support coherent 8 Tx PUSCH (codebook 1) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS
* The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support partial coherent 8 Tx PUSCH (codebook 3) with TDMed SRS
* The UE support partial coherent 8 Tx PUSCH (codebook 2) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS
* The UE support partial coherent 8 Tx PUSCH (codebook 3) with noTDMed SRS, but only support noncoherent 8 Tx PUSCH (codebook 4) with TDMed SRS
 | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | For our understanding, is this new FG needed given the agreements from RAN1#117? FG 40-7-1 (basic 8 Tx) was updated with “Note: the candidate value signalled in component 3 only applies to codebook2/codebook3/codebook4”, while FG 40-7-1a (fully coherent 8 Tx CB) now has “Component 3 candidate values: {noTDM, TDM and noTDM}”.  |
|  |  |

## NR\_pos\_enh2

After review of contributions submitted to RAN1 #118 in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

### Issue 2-1: FGs 41-1-7a/b

**Proposal: With regards to FG 41-1-7a and FG 41-1-7b, consider the following options:**

* **Option 1: Remove component 3 from both FGs, since there is no corresponding feature specified in SLPP**
* **Option 2: Send an LS to RAN2 to inform them that this UE capability component has been specified, but there is no corresponding report specified in the ProvideLocationInformation message of TDOA and TOA methods.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| ZTE | Generally we do not think it is necessary. UE can report multiple RSTDs or RTOA for different SL-PRS reception for the same pair of UEs. The Rx ARP ID is optional, if there is no Rx ARP ID reported, a UE still can report up to 4 RSTD for the same pair of UE.SL-TDOA-SignalMeasurementInformation ::= SEQUENCE { sl-TDOA-MeasList SEQUENCE (SIZE(1..maxNrOfUEs)) OF SL-TDOA-MeasElementPerARP-ID-Rx, ...}SL-TDOA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-TDOA-MeasElementSL-TDOA-MeasElement ::= SEQUENCE { applicationLayerID OCTET STRING OPTIONAL, -- Cond FirstElement los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-RxIf we have to choose, we may go with option 1 |

### Issue 2-2: FG 41-1-19a

**Proposal: To address the absence of a number of ARP-IDs the device supports, introduce a new component in FG 41-1-19a:**

* **Add a new component in FG 41-1-19a, “Maximum number of Rx ARP-IDs it supports”, with values {1,2,3,4}**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 2-3: FG 41-5-2a

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. NR\_pos\_enh2 | 41-5-2a | Support of positioning SRS with Tx frequency hopping in RRC\_INACTIVE for RedCap UEs | 1. Maximum SRS bandwidth across all hops2. Maximum number of hops3. RF Tx retuning time between consecutive hops4. Switching time between active BWP and frequency hop5. Overlapping PRB(s) between adjacent hops6. Support of {0,1,2,4} overlapping PRB(s) between adjacent hops7. Maximum number of positioning SRS resources with Tx frequency hopping | 27-15b~~, one of {28-1,48-1}~~ | Yes | n/a | Positioning SRS with Tx hopping in RRC\_INACTIVE is not supported | Per band | n/a | n/a | n/a | Component 1 candidate values:FR1: {40, 50, 80, 100, 200, 300}FR2: {100, 200, 400}Component 2 candidate values: {2,3,4,5,6}Component 3 candidate values:FR1: {70us, 140us, 210us}FR2: {35us, 70us, 140us}Component 4 candidate values:{100us, 140us, 200us, 300us, 500us}Component 7 candidate values:Periodic: {1,2,4,8,16,32,64}Semi-persistent: {0,1,2,4,8,16,32,64}Note: No additional UE requirements shall be specified for the case of Tx hopping with non-overlapping hops compared to the case of Tx hopping with overlapping hops, e.g., a UE is not responsible for keeping phase continuity across the hops in either case of overlapping or non-overlapping hopsNeed for location server to know if the feature is supported | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Qualcomm | If my understanding is correct regarding the proposal, the intention is to extend the feature to non-redcap UEs. Even though we sympathize with the intention from ZTE, the WID clearly says that this feature is for Redcap devices. This discussion also already occurred for DL Frequnecy hopping in a few occasions.  |
| ZTE | We support this proposal to make use of the intra-band contiguous CCs and the up-to-300MHz frequency resources in FR1 and to further increase positioning accuracy. |

## Netw\_Energy\_NR

After review of contributions submitted to RAN1 #118 in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

### Issue 3-1: Prerequisites

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35 | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35, 2-32b | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35, 2-32a | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35 | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35 | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35, 2-32b | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35, 2-32a | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | ~~FFS~~ 2-35 | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-8 | simultaneousCSI-SubReportsPerCC-r18 | Indicates the number of CSI report(s) for which the UE can measure and process reference signals simultaneously in a CC of the band for which this capability is provided. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsPerCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports | ~~FFS~~ 2-35 | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per Band | No | No | N/A | Component 1 candidate values: {1, 2, 3, 4, 5, 6, 7, 8}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsPerCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-9 | simultaneousCSI-SubReportsAllCC-r18 | Indicates whether the UE supports CSI report framework and the number of CSI report(s) which the UE can simultaneously process across all CCs, and across MCG and SCG in case of NR-DC. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-SubReportsAllCC-r18* includes the beam report, and CSI report without sub-configurations plus CSI sub-report across CSI reports. This parameter may further limit *simultaneousCSI-SubReportsPerCC-r18* in MIMO-ParametersPerBand and Phy-ParametersFRX-Diff for each band in a given band combination | ~~FFS~~ 2-35 | Yes |  | UE does not support spatial or power domain adaptation for CSI reporting | Per BC | No | No | N/A | Component 1 candidate values: {5, 6, 7, ..., 32}Note: UE shall report the value in this feature group being equal to or larger than that in *simultaneousCSI-ReportsAllCC*Note: UE supporting at least one of FG 42-1/1a/1b/1c/2/2a/2b/2c shall report this FG | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-2: New Notes

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FG 42-1 and FG 42-2, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FG 42-1 and 42-2, then the supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1 and 42-2. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1b and FG 42-2b, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1b and 42-2b, then the supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1b and 42-2b. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FG 42-1 and FG 42-2, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FG 42-1 and 42-2, then the supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1 and 42-2. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1b and FG 42-2b, and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1b and 42-2b, then the supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1b and 42-2b. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |
|  |  |

### Issue 3-3: Corrections of Notes

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports ~~both~~ more than one FG from FGs 42-1a/1c and 42-~~1~~2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-1a/1c and 42-~~1~~2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-1a and 42-1c~~. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports ~~both~~ more than one FG from FGs 42-1a/1c and 42-~~1~~2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-1a/1c and 42-~~1~~2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-1a and 42-1c~~. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports ~~both~~ more than one FG from FGs 42-~~2~~1a/1c and 42-2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-~~2~~1a/1c and 42-2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-2a and 42-2c~~. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports ~~both~~ more than one FG from FGs 42-~~2~~1a/1c and 42-2a/2c and if the UE is configured with CSI report settings with sub-configurations corresponding to ~~both~~ a subset of the reported FGs 42-~~2~~1a/1c and 42-2a/2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset ~~both FGs 42-2a and 42-2c~~. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-4: New Note

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c.Note: The value reported for Components 2 and 3 is no larger than the value reported for Components 2 and 3 in FG 42-1a (if supported), respectively. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c.Note: The value reported for Components 2 and 3 is no larger than the value reported for Components 2 and 3 in FG 42-2a (if supported), respectively. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-5: Clarifocation on SD-type1 and SD-type2

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to all sub-configuration that contain~~s~~ one port subsetNote: SD-type2 refers to all sub-configuration that contain~~s~~ list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to all sub-configuration that contain~~s~~ one port subsetNote: SD-type2 refers to all sub-configuration that contain~~s~~ list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to all sub-configuration that contain~~s~~ one port subsetNote: SD-type2 refers to all sub-configuration that contain~~s~~ list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to all sub-configuration that contain~~s~~ one port subsetNote: SD-type2 refers to all sub-configuration that contain~~s~~ list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-6: Replace “maximum” with “total number”

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported total number ~~maximum~~ of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-7: New Notes

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE does not report only type 1 or only type 2 for components 4~7 in both FGs 42-1 and 42-1b and if the UE is configured with CSI report settings with sub-configurations corresponding to both SD-type 1 and SD-type 2, then the supported total number of NZP-CSI-RS resources/ports is determined by the minimum of the reported values for both SD-type 1 and SD-type 2. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports is determined by the minimum of the reported values from that subset.Note: If a UE does not report only type 1 or only type 2 for components 4~7 in both FGs 42-1 and 42-1b and if the UE is configured with CSI report settings with sub-configurations corresponding to both SD-type 1 and SD-type 2, then the supported total number of NZP-CSI-RS resources/ports is determined by the minimum of the reported values for both SD-type 1 and SD-type 2. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

### Issue 3-8: Corrections to Notes

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Netw\_Energy\_NR | 42-1 | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for periodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2b and components 3~6 in FG 42-2a and 42-2c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1a | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUSCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1c | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for semi-persistent CSI reporting on PUCCH2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128}Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations.  Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-1a and 42-1c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-1a and 42-1c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-1a and 42-1c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-1b | Spatial domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one port subset configuration/list of CSI-RS resource IDs for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support spatial domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 1 candidate values: {SD-type1, SD-type2, SD-type1and2}Note: SD-type1 refers to configuration contains one port subsetNote: SD-type2 refers to configuration contains list of CSI-RS resource IDsComponent 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values {2,3,4}Component 4 candidate values: SD Type 1: {1, 2, 3 … 32}SD Type 2: {1, 2, 3 … 32}Component 5 candidate values: SD Type 1: {8, 16, 24, … 128 }SD Type 2: {8, 16, 24, … 128 }Component 6 candidate values: SD Type 1: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}SD Type 2: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: SD Type 1: {8, 16, 24, …, 248, 256}SD Type 2: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2 | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for periodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of periodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across periodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for periodicCSI reporting | Per band | No | No | N/A | Component 2 candidate value: {2,3,4}Component 4 candidate value: {1, 2, 3 … 32}Component 5 candidate value: {8, 16, 24, … 128 }Component 6 candidate value: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate value: {8, 16, 24, …, 248, 256}Note: Components 6 and 7 are signaled per BCComponent 9 candidate values: {2, 3, 4}Note: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2a | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUSCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting1. The max number of sub-configurations Lmax in one CSI report configuration on PUSCH2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUSCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4,5,6,7,8}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128 }Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4,5,6,7,8,9,10,11,12}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2c | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for semi-persistent CSI reporting on PUCCH | Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for semi-persistent CSI reporting on PUCCH1. The max number of sub-configurations Lmax in one CSI report configuration2. Report of N CSI sub-report(s) included in one SP-CSI report where each CSI sub-report corresponds to one sub-configuration.3. Supported maximum number of simultaneous NZP-CSI-RS resources per CC4. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs6. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Support of single-panel type 1 codebook8. Supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for semi-persistent CSI reporting on PUCCH | Per band | No | No | N/A | Component 1 candidate values: {2,3,4}Component 2 candidate values: {2,3,4}Component 3 candidate values: {1, 2, 3 … 32}Component 4 candidate values: {8, 16, 24, … 128}Component 5 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 6 candidate values: {8, 16, 24, …, 248, 256}Component 8 candidate values: {2, 3, 4}Note: Components 5 and 6 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset.Note: If a UE reports both FGs 42-2a and 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to both FGs 42-2a and 42-2c, then the supported total number of semi-persistent CSI reporting settings without sub-configurations plus the total number of sub-configurations across semi-persistent CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from both FGs 42-2a and 42-2c. | Optional with capability signaling |
| 42. Netw\_Energy\_NR | 42-2b | Power domain adaptation with CSI feedback based on CSI report sub-configuration(s) for aperiodic CSI reporting | 1. Support of CSI feedback based on CSI report sub-configuration(s), each containing one power offset for aperiodic CSI reporting2. The max number of sub-configurations Lmax in one CSI report configuration3. Report of N CSI sub-report(s) included in one CSI report where each CSI sub-report corresponds to one sub-configuration4. Supported maximum number of simultaneous NZP-CSI-RS resources per CC5. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources per CC6. Supported maximum number of simultaneous NZP-CSI-RS resources in active BWPs across all CCs7. Supported maximum number of total CSI-RS ports in simultaneous NZP-CSI-RS resources in active BWPs across all CCs8. Support of single-panel type 1 codebook9. Supported total number of aperiodic CSI reporting settings without sub-configurations plus the total number of sub-configurations across aperiodic CSI report settings with sub-configurations per BWP | FFS | Yes |  | UE does not support power domain adaptation for aperiodic CSI reporting | Per band | No | No | N/A | Component 2 candidate values: {2,3,4,5,6,7,8}Component 3 candidate values: {2,3,4}Component 4 candidate values: {1, 2, 3 … 32}Component 5 candidate values: {8, 16, 24, … 128 }Component 6 candidate values: {5, 6, 7, 8, 9, 10, 12, 14, 16, …, 62, 64}Component 7 candidate values: {8, 16, 24, …, 248, 256}Component 9 candidate values: {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}Note: Components 6 and 7 are signaled per BCNote: For components 4~7 in FG42-1, 42-1a/b/c, 42-2, 42-2b and components 3~6 in FG42-2a/c, NZP-CSI-RS resource and CSI-RS ports are counted for reporting settings with and without sub-configurations. Note: If a UE reports more than one FG from FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c and if the UE is configured with CSI report settings with sub-configurations corresponding to a subset of the reported FGs 42-1, 42-1a, 42-1b, 42-1c, 42-2, 42-2a, 42-2b, 42-2c, then the supported maximum of NZP-CSI-RS resources/ports across all periodic, semi-persistent, aperiodic CSI report settings with sub-configurations per BWP is determined by the minimum of the reported values from that subset. | Optional with capability signaling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

## NR\_Mob\_enh2

After review of contributions submitted to RAN1 #118 in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

### Issue 4-1: FGs 45-3, 45-4

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. NR\_Mob\_enh2 | 45-3 | Beam indication with joint DL/UL LTM TCI states | 1. Support of unified TCI with joint DL/UL LTM TCI-state indication for LTM procedure.2. Maximum number of configured joint LTM TCI state(s) per candidate cell3. Support of indicating and activating a single joint LTM TCI state in a cell switch command.4. Supported QCL source RS in the LTM TCI-stateconfiguration5. Maximum number of configured joint LTM TCI state(s) across candidate cells6. Maximum number of configured cells for joint LTM TCI states | ~~23-1-1,~~ RAN2 FG for LTM | Yes | No | UE does not support Beam indication with joint DL/UL LTM TCI states | Per band | No | No | n/a | Component 2 candidate values: {8, 12, 16, 24, 32, 48, 64, 128}Component 4 candidate values: {SSB, TRS, both}Component 5 candidate values: {8, 16, 24, 32, …, 1024}Component 6 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |
| 45. NR\_Mob\_enh2 | 45-4 | Beam indication with separate DL/UL LTM TCI states | 1. Support of unified TCI with separate DL/UL TCI-state indication for LTM procedure.2. Maximum number of configured DL TCI state(s) per candidate cell3. Maximum number of configured UL TCI state(s) per candidate cell4. Support of indicating and activating a pair of UL/DL TCI-state in a cell switch command.5. Supported QCL source RS in the LTM TCI-state configuration7. Maximum number of configured separate DL LTM TCI state(s) across candidate cells8. Maximum number of configured separate UL LTM TCI state(s) across candidate cells9. Maximum number of configured cells for separate DL/UL LTM TCI states | ~~23-10-1,~~ RAN2 FG for LTM | Yes | No | UE does not support Rel-18 LTM operation with separate DL/UL TCI states | Per band | No | No | n/a | Component 2 candidate values: {4, 8, 12, 16, 24, 32, 48, 64, 128}Component 3 candidate values: {4, 8, 12, 16, 24, 32, 48, 64}Component 5 candidate values: {SSB, TRS, both}Component 7 candidate values: {8, 16, 24, 32, …, 1024}Component 8 candidate values: {4, 8, 12, 16, …, 512}Component 9 candidate values: {1,2,3,4,5,6,7,8} | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | Support |
| Nokia | Support |

### Issue 4-2: LS Response

**Proposal:**

* **For intra frequency measurement (FG45-1), the current serving cell and candidate cell to be measured are on the same band in a band combination. The reported component value should be applicable to any band in the band combination.**
* **For inter-frequency measurement (FG45-1a), the current serving cell and candidate cell to be measured can be on any band in the band combination.**
* **A separate FG is added for UE to report the capability of inter-frequency measurement outside of the reported BC of 45-1a**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Nokia | For inter-frequency, it would make sense to align this with the UE capability for early RACH transmission to a candidate cell where the UE can report which target bands can be supported for each band of the serving cells' supported BC.  |

## NR\_NTN\_enh

Void

## IoT\_NTN\_enh

After review of contributions submitted to RAN1 #118 in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

### Issue 6-1: Prerequisites

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. IoT\_NTN\_enh | 2-4a | GNSS position fix in RRC Connected state for eMTC—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete and RRCConnectionReconfigurationComplete for HO case3. UE reports the remaining GNSS validity duration with MAC CE in connected mode4. In RRC connected-mode, a BL/CE UE may receive an aperiodic triggering to start a GNSS measurement gap no earlier than [5] s starting from the beginning of the remaining GNSS validity duration indicated by the higher layer parameter *GNSS-ValidityDuration*, and otherwise may start the GNSS measurement gap upon the expiry of both the *GNSS-ValidityDuration* and *ul-TransmissionExtensionValue*, if configured. | ~~[~~Rel. 18 2-3a,~~]~~ Rel. 17 2-1 | Yes | N/A | Release 18 eMTC UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No  | No | Note: This applies to non-DRX | Optional with capability signalling |
| 2. IoT\_NTN\_enh | 2-4b | GNSS position fix in RRC Connected state for NB-IoT—autonomous | 1. UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger2. UE reports GNSS position fix time duration for measurement at least during the initial access stage and in connected mode via RRCConnectionReestablishmentComplete-NB3. UE reports the remaining GNSS validity duration with MAC CE in connected mode4. In RRC connected-mode, an NB-IoT UE may receive an aperiodic triggering to start a GNSS measurement gap no earlier than [5] s starting from the beginning of the remaining GNSS validity duration indicated by the higher layer parameter *GNSS-ValidityDuration*, and otherwise may start the GNSS measurement gap upon the expiry of both the *GNSS-ValidityDuration* and *ul-TransmissionExtensionValue*, if configured. | ~~[~~Rel. 18 2-3b~~]~~,Rel. 17 2-1b |  |  | Release 18 NB-IoT UE cannot get autonomous GNSS position fix in RRC Connected state | Per UE | No | No | Note: This applies to non-DRX | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
| Ericsson | We support the proposal. Since Companies views have not changed over several meetings in a row, the proposal above is a compromise/intermediate solution for which is ok to leave for further discussion the exact value of the number surrounded by brackets. FYI: Under AI 8.1, there is a Moderator Summary about this compromise/intermediate solution. |
| Qualcomm | We still don’t understand how the proposal is a compromise. The proposal would force a UE to implement GNSS trigger even if commercial deployments only deploy autonomous GNSS. Apart from the obvious additional implementation burden, this may lead to IODT issues in case there is no network vendor that has implemented GNSS triger. We propose to make both features independent. |
| ZTE | Not support. The proposal makes trigger solution as pre-requisite of autonomous solution and adds even more constraints on when autonomous solution can be applied. This will lead to more complicated RAN1 spec and the benefit is not clear. The trigger solution and autonomous solution can work independently and prefer to make the features independent. |

## NR\_netcon\_repeater

Void

## NR\_BWP\_wor

Void

## NR\_ATG

Void

# Conclusion

Agreements reached during RAN1 #118 as part of this agenda item are summarized in [ ].

# References

1. R1-2405564, Updated RAN1 UE features list for Rel-18 NR after RAN1 #117, Moderators (AT&T, NTT DOCOMO, INC.)
2. R1-2405567, Updated RAN1 UE features list for Rel-18 LTE after RAN1 #117, Moderators (AT&T, NTT DOCOMO, INC.)
3. R1-2405835, UE features for other Rel-18 work items (Topics B), Huawei/HiSilicon
4. R1-2406352, Remaining issues on UE features for Rel-18 LTM, CATT
5. R1-2406636, UE features for other Rel-18 work items (Topics B), Samsung
6. R1-2406798, UE Features for Other Topics B (NES, MobEnh, IoT-NTN), Nokia
7. R1-2406825, Views on UE features for other Rel-18 work items (Topics B), Apple
8. R1-2406919, Discussion on UE features for other Rel-18 work items (Topics B), NTT DOCOMO, INC.
9. R1-2406961, UE features for other Rel-18 work items (Topics B), ZTE Corporation/Sanechips
10. R1-2407018, UE features for other Rel-18 work items (Topics B), Qualcomm Incorporated
11. R1-2407055, Rel-18 UE features topics set B, Ericsson