**3GPP TSG-WG SA2 Meeting #140E e-meeting *R2-200xxxx***

**Elbonia, August 19 – September 1, 2020**

Title: [DRAFT] LS on Incomplete LTE Physical Layer Capabilities

Response to: -

Release: Rel-15

Work Item: TEI15

Source: [Huawei to be] RAN2

To: RAN1

Cc:

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Attachments: [R2-2008157](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_111-e/Docs/R2-2008157.zip)

**1. Overall Description:**

RAN2 has identified a number of issues with regards to physical layer capabilities introduced in various releases from Rel-12 to Rel-14.

1. A number of physical layer capabilities do not have a value defined for whether FDD/TDD differentiation is needed. Noting that ASN.1 signalling allows for the UE to report different values for FDD and TDD, RAN2 intends to change the FDD/TDD differentiation for the concerned physical layer capabilities as shown in the table below and to introduce the changes in Rel-15 with early implementation allowed for the capabilities corresponding to an earlier release. Therefore, RAN2 would like to seek guidance on whether RAN1 has any concerns on the intended changes.

|  |  |  |  |
| --- | --- | --- | --- |
| ***UE-EUTRA-Capability field descriptions*** | **FDD/ TDD diff** | Release | Suggestion |
| ***beamformed (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode, the UE capabilities concerning beamformed EBF/ FD-MIMO operation (class B) applicable for band combinations for which the concerned capabilities are not signalled. | TBD | R13 | Yes |
| ***channelMeasRestriction***Indicates for a particular transmission mode whether the UE supports channel measurement restriction. | TBD | R13 | Yes |
| ***configN (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode whether the UE supports non-precoded EBF/ FD-MIMO (class A) related configuration N for band combinations for which the concerned capabilities are not signalled. | TBD | R13 | Yes |
| ***crs-DiscoverySignalsMeas***Indicates whether the UE supports CRS based discovery signals measurement, and PDSCH/EPDCCH RE mapping with zero power CSI-RS configured for discovery signals. | FFS | R12 | Yes |
| ***csi-ReportingAdvanced, csi-ReportingAdvancedMaxPorts (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode the maximum number of CSI-RS ports supported by the UE for advanced CSI reporting. The field csi-ReportingAdvanced indicates 32 CSI-RS ports whereas csi-ReportingAdvancedMaxPorts indicates 8, 12, 16, 20, 24 or 28 CSI-RS ports. The UE shall not include both csi-ReportingAdvanced and csi-ReportingAdvancedMaxPorts for a particular transmission mode.  | FFS | R14 | Yes |
| ***csi-ReportingNP (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode whether the UE supports CSI reporting on non-precoded CSI-RS with 20, 24, 28, or 32 antenna ports for band combinations for which the concerned capabilities are not signalled in MIMO-CA-ParametersPerBoBCPerTM, and the FD-MIMO processing capability condition as described in NOTE 8 is satisfied. | FFS | R14 | Yes |
| ***csi-RS-DiscoverySignalsMeas***Indicates whether the UE supports CSI-RS based discovery signals measurement. If this field is included, the UE shall also include crs-DiscoverySignalsMeas. | FFS | R12 | Yes |
| ***densityReductionNP, densityReductionBF***Indicates whether the UE supports CSI-RS density reduction with values 1, 1/2 and 1/3 for non-precoded CSI-RS and beamformed CSI-RS respectively. | FFS | R14 | Yes |
| ***discoverySignalsInDeactSCell***Indicates whether the UE supports the behaviour on DL signals and physical channels when SCell is deactivated and discovery signals measurement is configured as specified in TS 36.211 [21], clause 6.11A. This field is included only if UE supports carrier aggregation and includes crs-DiscoverySignalsMeas. | FFS | R12 | Yes |
| ***dmrs-Enhancements (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode whether the UE supports DMRS enhancements for the indicated transmission mode. | TBD | R13 | Yes  |
| ***hybridCSI***Indicates whether the UE supports hybrid CSI transmission as described in TS 36.213 [23]. | FFS | R14 | Yes |
| ***interferenceMeasRestriction***Indicates whether the UE supports interference measurement restriction. | TBD | R13 | Yes |
| ***k-Max (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode the maximum number of NZP CSI RS resource configurations supported within a CSI process applicable for band combinations for which the concerned capabilities are not signalled. | TBD | R13 | Yes |
| ***n-MaxList (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode the maximum number of NZP CSI RS ports supported within a CSI process applicable for band combinations for which the concerned capabilities are not signalled. For k-Max values exceeding 1, the UE shall include the field and signal k-Max minus 1 bits. The first bit indicates n-Max2, with value 0 indicating 8 and value 1 indicating 16. The second bit indicates n-Max3, with value 0 indicating 8 and value 1 indicating 16. The third bit indicates n-Max4, with value 0 indicating 8 and value 1 indicating 32. The fourth bit indicates n-Max5, with value 0 indicating 16 and value 1 indicating 32. The fifth bit indicates n-Max6, with value 0 indicating 16 and value 1 indicating 32. The sixt bit indicates n-Max7, with value 0 indicating 16 and value 1 indicating 32. The seventh bit indicates n-Max8, with value 0 indicating 16 and value 1 indicating 64. | TBD | R13 | Yes |
| ***nonPrecoded (in MIMO-UE-ParametersPerTM)***Indicates for a particular transmission mode the UE capabilities concerning non-precoded EBF/ FD-MIMO operation (class A) for band combinations for which the concerned capabilities are not signalled in MIMO-CA-ParametersPerBoBCPerTM, and the FD-MIMO processing capability condition as described in NOTE 8 is satisfied. | TBD | R13 | Yes |
| ***semiOL***Indicates whether the UE supports semi-open-loop transmission for the indicated transmission mode. | FFS | R14 | Yes |
| ***srs-Enhancements***Indicates whether the UE supports SRS enhancements. | TBD | R13 | Yes |
| ***ul-dmrs-Enhancements***Indicates whether the UE supports UL DMRS enhancements as defined in TS 36.211 [21], clause 6.10.3A. | FFS | R14 | Yes |
| ***zp-CSI-RS-AperiodicInfo***Indicates whether the UE supports aperiodic ZP-CSI-RS transmission for the indicated transmission mode. | FFS | R14 | Yes |

1. In addition, RAN2 has identified that in the context of the Rel-14 eFD-MIMO feature the value ranges for nMaxResource in both nzp-CSI-RS-AperiodicInfo-r14 and nzp-CSI-RS-PeriodicInfo-r14 are FFS and would like to seek guidance from RAN1 on what values to use.

MIMO-UE-ParametersPerTM-v1430 ::= SEQUENCE {

 nzp-CSI-RS-AperiodicInfo-r14 SEQUENCE {

 nMaxProc-r14 INTEGER(5..32),

 nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4}

 } OPTIONAL,

 nzp-CSI-RS-PeriodicInfo-r14 SEQUENCE {

 nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4}

 } OPTIONAL,

**2. Actions:**

**TO RAN1:**

1. To provide feedback on whether RAN1 has any concern with updating FDD/TDD differentiation for the listed physical layer capabilities from FFS/TBD to “Yes”.
2. To provide feedback on the correct value range to use for nMaxResource in both nzp-CSI-RS-AperiodicInfo-r14 and nzp-CSI-RS-PeriodicInfo-r14.

**3. Date of Next TSG RAN WG2 Meetings:**

3GPPRAN2#112-e 2 - 13 November 2020 Online

3GPPRAN2#113 1-5 March 2021 Athens