**3GPP TSG-RAN2 Meeting #109bis-e *R2-2003816***

**Electronic, 20 April – 30 April 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.306** | **CR** | **0283** | **rev** | **2** | **Current version:** | **15.9.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | CR on the capability of Basic CSI feedback (2-32) | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon, Orange, Telecom Italia S.p.A., Vodafone, CMCC, China Unicom, China Telecom, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
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| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2020-04-10 |
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| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | Based on the definitions of Basic CSI feedback (MIMO feature 2-32) and Type I single panel codebook (MIMO feature 2-36), see TR38.822, there is a linkage between 2-32 and 2-36 features. According to 2-32, the mandatory capability for Type I single panel codebook includes:  2) 2Tx codebook for FR1 and FR2  3) 4Tx codebook for FR1  4) 8Tx codebook for FR1 when configured as wideband CSI report  It is clear that for Type I single panel codebook the UE shall support 2Tx codebook for FR1 and FR2, 4Tx codebook for FR1, 8Tx codebook for FR1 when configured as wideband CSI report. However, no wideband or subband CSI reporting  mode is indicated is indicated for Type I single panel codebook (type1 singlePanel), therefore the network may configure the UE with wideband CSI report. Consequently, it is obvious that UE shall support 8Tx codebook for FR1 in case that wideband CSI report is configured by the network. This needs to be clearly explained in TS 38.306 to avoid any confusion on what capability values to be reported for 2-36. | | | | | | | | |
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| ***Summary of change:*** | | Considering that Rel-15 has the under reporting issue (see R1-1913295), it is proposed to add restriction for *maxNumberTxPortsPerResource* in the *supportedCSI-RS-ResourceList* that states: a UE shall support a minimum value of 8 in the case of a single active CSI-resource for codebook type I single panel in FR1.A UE shall support a minimum value of 2 in the case of a single active CSI-resource for codebook type I single panel in FR2.  **Impact Analysis**  Impacted 5G architecture options: SA, (NG)EN-DC, NE-DC, NR-DC  Impacted functionality:  UE radio capability (*codebookParameters*)  Inter-operability:  1. If the network is implemented according to the CR and the UE is not, UE may report the Tx codebook capability that is lower than mandatory capability, but network consider that mandatory capability is supported by the UE*.*  2. If the UE is implemented according to the CR and the network is not, there is no inter-operability problem, UE reports the Type I single panel codebook capability correctly*.* | | | | | | | | |
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| ***Consequences if not approved:*** | | The UE may report the Tx codebook capability that is lower than mandatory capability, but network consider that mandatory capability is supported by the UE, this mis-match may lead to failure configuration. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.7.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | | Rev.1: revise the title from “CR on the capability of Basic CSI feedback (2-23)” to “CR on the capability of Basic CSI feedback (2-32)”.  Rev.2: move the new added description under supportedCSI-RS-ResourceList, update the coversheet and Source companies. | | | | | | | | |

---------------------------------------------START OF CHANGE-------------------------------------------

#### 4.2.7.2 *BandNR parameters*

| Definitions for parameters | Per | M | FDD-TDD  DIFF | FR1-FR2  DIFF |
| --- | --- | --- | --- | --- |
| ***additionalActiveTCI-StatePDCCH***  Indicates whether the UE supports one additional active TCI-State for control in addition to the supported number of active TCI-States for PDSCH. The UE can include this field only if *maxNumberActiveTCI-PerBWP* in *tci-StatePDSCH* is set to *n1*. Otherwise, the UE does not include this field. | Band | CY | No | No |
| ***aperiodicBeamReport***  Indicates whether the UE supports aperiodic 'CRI/RSRP' or 'SSBRI/RSRP' reporting on PUSCH. The UE provides the capability for the band number for which the report is provided (where the measurement is performed). | Band | Yes | No | No |
| ***aperiodicTRS***  Indicates whether the UE supports DCI triggering aperiodic TRS associated with periodic TRS. | Band | No | No | Yes |
| ***bandNR***  Defines supported NR frequency band by NR frequency band number, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. | Band | Yes | No | No |
| ***beamCorrespondenceWithoutUL-BeamSweeping***  Indicates how UE supports FR2 beam correspondence as specified in TS 38.101-2 [3], clause 6.6. The UE that fulfils the beam correspondence requirement without the uplink beam sweeping (as specified in TS 38.101-2 [3], clause 6.6) shall set the field to *supported*. The UE that fulfils the beam correspondence requirement with the uplink beam sweeping (as specified in TS 38.101-2 [3], clause 6.6) shall not report this field. | Band | Yes | No | FR2 only |
| ***beamManagementSSB-CSI-RS***  Defines support of SS/PBCH and CSI-RS based RSRP measurements. The capability comprises signalling of  - *maxNumberSSB-CSI-RS-ResourceOneTx* indicates maximum total number of configured one port NZP CSI-RS resources and SS/PBCH blocks that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] within a slot and across all serving cells (see NOTE). On FR2, it is mandatory to report >=8; On FR1, it is mandatory with capability signalling to report >=8.  - *maxNumberCSI-RS-Resource* indicates maximum total number of configured NZP-CSI-RS resources that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] across all serving cells (see NOTE). It is mandated to report at least n8 for FR1.  - *maxNumberCSI-RS-ResourceTwoTx* indicates maximum total number of two ports NZP CSI-RS resources that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] within a slot and across all serving cells (see NOTE).  - *supportedCSI-RS-Density* indicates density of one RE per PRB for one port NZP CSI-RS resource for RSRP reporting, if supported. On FR2, it is mandatory to report either "three" or "oneAndThree"; On FR1, it is mandatory with capability signalling to report either "three" or "oneAndThree".  - *maxNumberAperiodicCSI-RS-Resource* indicates maximum number of configured aperiodic CSI-RS resources across all serving cells (see NOTE). For FR1 and FR2, the UE is mandated to report at least n4.  NOTE: If the UE sets a value other than *n0* in an FR1 band, it shall set that same value in all FR1 bands. If the UE sets a value other than *n0* in an FR2 band, it shall set that same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. | Band | Yes | No | Yes |
| ***beamReportTiming***  Indicates the number of OFDM symbols between the last symbol of SSB/CSI-RS and the first symbol of the transmission channel containing beam report. The UE provides the capability for the band number for which the report is provided (where the measurement is performed). The UE includes this field for each supported sub-carrier spacing. | Band | Yes | No | No |
| ***beamSwitchTiming***  Indicates the minimum number of OFDM symbols between the DCI triggering of aperiodic CSI-RS and aperiodic CSI-RS transmission. The number of OFDM symbols is measured from the last symbol containing the indication to the first symbol of CSI-RS. The UE includes this field for each supported sub-carrier spacing. | Band | No | No | FR2 only |
| ***bwp-DiffNumerology***  Indicates whether the UE supports BWP adaptation up to 4 BWPs with the different numerologies, via DCI and timer. For the UE capable of this feature, the bandwidth of a UE-specific RRC configured DL BWP includes the bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB for PCell and PSCell (if configured). For SCell(s), the bandwidth of the UE-specific RRC configured DL BWP includes SSB, if there is SSB on SCell(s). | Band | No | No | No |
| ***bwp-SameNumerology***  Defines type A/B BWP adaptation (up to 2/4 BWPs) with the same numerology, via DCI and timer. For the UE capable of this feature, the bandwidth of a UE-specific RRC configured DL BWP includes the bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB for PCell and PSCell (if configured). For SCell(s), the bandwidth of the UE-specific RRC configured DL BWP includes SSB, if there is SSB on SCell(s). | Band | No | No | No |
| ***bwp-WithoutRestriction***  Indicates support of BWP operation without bandwidth restriction. The Bandwidth restriction in terms of DL BWP for PCell and PSCell means that the bandwidth of a UE-specific RRC configured DL BWP may not include the bandwidth of CORESET #0 (if configured) and SSB. For SCell(s), it means that the bandwidth of DL BWP may not include SSB. | Band | No | No | No |
| ***channelBWs-DL***  Indicates for each subcarrier spacing the UE supported channel bandwidths. Absence of the *channelBWs-DL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry.  For FR1, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1.  For FR1, the leading/leftmost bit in *channelBWs-DL-v1590* indicates 70MHz, and all the remaining bits in *channelBWs-DL-v1590* shall be set to 0.  NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingDL* and the *scs-60kHz*. To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombinationSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthDL*. | Band | Yes | No | No |
| ***channelBWs-UL***  Indicates for each subcarrier spacing the UE supported channel bandwidths.  Absence of the *channelBWs-UL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry.  For FR1, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1.  For FR1, the leading/leftmost bit in *channelBWs-UL-v1590* indicates 70 MHz, and all the remaining bits in *channelBWs-UL-v1590* shall be set to 0.  NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingUL* and the *scs-60kHz*. To determine whether the UE supports a channel bandwidth of 90 MHz the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombiantionSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-UL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthUL*. | Band | Yes | No | No |
| ***codebookParameters***  Indicates the codebooks and the corresponding parameters supported by the UE.  Parameters for type I single panel codebook (type1 singlePanel) supported by the UE, which are mandatory to report:  - *supportedCSI-RS-ResourceList*;  - a UE shall support a minimum value of 4 for codebook type I single panel in FR1 in the case of a single active CSI-resource across all bands in a band combination;  - a UE shall support a minimum value of 8 in case of wideband CSI report for codebook type I single panel in FR1 in the case of a single active CSI-resource across all bands in a band combination;  - a UE shall support a minimum value of 2 for codebook type I single panel in FR2 in the case of a single active CSI-resource across all bands in a band combination.  - *modes* indicates supported codebook modes (mode 1, both mode 1 and mode 2);  - *maxNumberCSI-RS-PerResourceSet* indicates the maximum number of CSI-RS resource in a resource set.  Parameters for type I multi-panel codebook (type1 multiPanel) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *modes* indicates supported codebook modes (mode 1, mode 2, or both mode 1 and mode 2);  - *maxNumberCSI-RS-PerResourceSet* indicates the maximum number of CSI-RS resource in a resource set;  - *nrofPanels* indicates supported number of panels.  Parameters for type II codebook (type2) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *parameterLx* indicates the parameter "Lx" in codebook generation where x is an index of Tx ports indicated by *maxNumberTxPortsPerResource*;  - *amplitudeScalingType* indicates the amplitude scaling type supported by the UE (wideband or both wideband and sub-band);  - *amplitudeSubsetRestriction* indicates whether amplitude subset restriction is supported for the UE.  Parameters for type II codebook with port selection (type2-PortSelection) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *parameterLx* indicates the parameter "Lx" in codebook generation where x is an index of Tx ports indicated by *maxNumberTxPortsPerResource*;  - *amplitudeScalingType* indicates the amplitude scaling type supported by the UE (wideband or both wideband and sub-band).  *supportedCSI-RS-ResourceList* includes list of the following parameters:  - *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource;.  - *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs within a band simultaneously;  - *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs within a band simultaneously. | Band | FD | No | No |
| ***crossCarrierScheduling-SameSCS***  Indicates whether the UE supports cross carrier scheduling for the same numerology with carrier indicator field (CIF) in carrier aggregation where numerologies for the scheduling cell and scheduled cell are same. | Band | No | No | No |
| ***csi-ReportFramework***  Indicates whether the UE supports CSI report framework. This capability signalling comprises the following parameters:  - *maxNumberPeriodicCSI-PerBWP-ForCSI-Report* indicates the maximum number of periodic CSI report setting per BWP for CSI report;  - *maxNumberPeriodicCSI-PerBWP-ForBeamReport* indicates the maximum number of periodic CSI report setting per BWP for beam report.  - *maxNumberAperiodicCSI-PerBWP-ForCSI-Report* indicates the maximum number of aperiodic CSI report setting per BWP for CSI report;  - *maxNumberAperiodicCSI-PerBWP-ForBeamReport* indicates the maximum number of aperiodic CSI report setting per BWP for beam report;  - *maxNumberAperiodicCSI-triggeringStatePerCC* indicates the maximum number of aperiodic CSI triggering states in *CSI-AperiodicTriggerStateList* per CC;  - *maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report* indicates the maximum number of semi-persistent CSI report setting per BWP for CSI report;  - *maxNumberSemiPersistentCSI-PerBWP-ForBeamReport* indicates the maximum number of semi-persistent CSI report setting per BWP for beam report;  - *simultaneousCSI-ReportsPerCC* 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-ReportsPerCC includes the beam report and CSI report. | Band or UE | Yes | No | No |
| ***csi-RS-ForTracking***  Indicates support of CSI-RS for tracking (i.e. TRS). This capability signalling comprises the following parameters:  - *maxBurstLength* indicates the TRS burst length. Value 1 indicates 1 slot and value 2 indicates both of 1 slot and 2 slots. In this release UE is mandated to report value 2;  - *maxSimultaneousResourceSetsPerCC* indicates the maximum number of TRS resource sets per CC which the UE can track simultaneously;  - *maxConfiguredResourceSetsPerCC* indicates the maximum number of TRS resource sets configured to UE per CC. It is mandated to report at least 8 for FR1 and 16 for FR2;  - *maxConfiguredResourceSetsAllCC* indicates the maximum number of TRS resource sets configured to UE across CCs. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. The UE is mandated to report at least 16 for FR1 and 32 for FR2. | Band | Yes | No | No |
| ***csi-RS-IM-ReceptionForFeedback***  Indicates support of CSI-RS and CSI-IM reception for CSI feedback. This capability signalling comprises the following parameters:  - *maxConfigNumberNZP-CSI-RS-PerCC* indicates the maximum number of configured NZP-CSI-RS resources per CC;  - *maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC* indicates the maximum number of ports across all configured NZP-CSI-RS resources per CC;  - *maxConfigNumberCSI-IM-PerCC* indicates the maximum number of configured CSI-IM resources per CC;  - *maxNumberSimultaneousNZP-CSI-RS-PerCC* indicates the maximum number of simultaneous CSI-RS-resources per CC;  - *totalNumberPortsSimultaneousNZP-CSI-RS-PerCC* indicates the total number of CSI-RS ports in simultaneous CSI-RS resources per CC. | Band or UE | Yes | No | No |
| ***csi-RS-ProcFrameworkForSRS***  Indicates support of CSI-RS processing framework for SRS. This capability signalling comprises the following parameters:  - *maxNumberPeriodicSRS-AssocCSI-RS-PerBWP* indicates the maximum number of periodic SRS resources associated with CSI-RS per BWP;  - *maxNumberAperiodicSRS-AssocCSI-RS-PerBWP* indicates the maximum number of aperiodic SRS resources associated with CSI-RS per BWP;  - *maxNumberSP-SRS-AssocCSI-RS-PerBWP* indicates the maximum number of semi-persistent SRS resources associated with CSI-RS per BWP;  - *simultaneousSRS-AssocCSI-RS-PerCC* indicates the number of SRS resources that the UE can process simultaneously in a CC, including periodic, aperiodic and semi-persistent SRS. | Band or UE | No | No | No |
| ***extendedCP***  Indicates whether the UE supports 60 kHz subcarrier spacing with extended CP length for reception of PDCCH, and PDSCH, and transmission of PUCCH, PUSCH, and SRS. | Band | No | No | No |
| ***groupBeamReporting***  Indicates whether UE supports RSRP reporting for the group of two reference signals. | Band | No | No | No |
| ***maxNumberCSI-RS-BFD***  Indicates maximal number of CSI-RS resources across all CCs, and across MCG and SCG in case of NR-DC, for UE to monitor PDCCH quality. In this release, the maximum value that can be signalled is 16. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. | Band | CY | No | No |
| ***maxNumberCSI-RS-SSB-CBD***  Defines maximal number of different CSI-RS [and/or SSB] resources across all CCs, and across MCG and SCG in case of NR-DC, for new beam identifications. In this release, the maximum value that can be signalled is 128. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. The UE is mandated to report at least 32 for FR2. | Band | CY | No | No |
| ***maxNumberNonGroupBeamReporting***  Defines support of non-group based RSRP reporting using N\_max RSRP values reported. | Band | Yes | No | No |
| ***maxNumberRxBeam***  Defines whether UE supports receive beamforming switching using NZP CSI-RS resource. UE shall indicate a single value for the preferred number of NZP CSI-RS resource repetitions per CSI-RS resource set. Support of Rx beam switching is mandatory for FR2. | Band | CY | No | No |
| ***maxNumberRxTxBeamSwitchDL***  Defines the number of Tx and Rx beam changes UE can perform on this band within a slot. UE shall report one value per each subcarrier spacing supported by the UE. In this release, the number of Tx and Rx beam changes for scs-15kHz and scs-30kHz are not included. | Band | No | No | FR2 only |
| ***maxNumberSSB-BFD***  Defines maximal number of different SSBs across all CCs, and across MCG and SCG in case of NR-DC, for UE to monitor PDCCH quality. In this release, the maximum value that can be signalled is 16. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. | Band | CY | No | No |
| ***maxUplinkDutyCycle-PC2-FR1***  Indicates the maximum percentage of symbols during a certain evaluation period that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic energy absorption requirements provided by regulatory bodies. This field is only applicable for FR1 power class 2 UE as specified in clause 6.2.1 of TS 38.101-1 [2]. If the field is absent, 50% shall be applied. Value n60 corresponds to 60%, value n70 corresponds to 70% and so on. | Band | No | No | FR1 only |
| ***maxUplinkDutyCycle-FR2***  Indicates the maximum percentage of symbols during 1s that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic power density exposure requirements provided by regulatory bodies. This field is applicable for all power classes UE in FR2 as specified in TS 38.101-2 [3]. Value n15 corresponds to 15%, value n20 corresponds to 20% and so on. If the field is absent or the percentage of uplink symbols transmitted within any 1s evaluation period is larger than *maxUplinkDutyCycle-FR2*, the UE behaviour is specified in TS 38.101-2 [3]. | Band | No | No | FR2 only |
| ***modifiedMPR-Behaviour***  Indicates whether UE supports modified MPR behaviour defined in TS 38.101-1 [2] and TS 38.101-2 [3]. | Band | No | No | No |
| ***multipleTCI***  Indicates whether UE supports more than one TCI state configurations per CORESET. UE is only required to track one active TCI state per CORESET. UE is required to support minimum between 64 and number of configured TCI states indicated by *tci-StatePDSCH*. This field shall be set to *supported*. | Band | Yes | No | No |
| ***pdsch-256QAM-FR2***  Indicates whether the UE supports 256QAM modulation scheme for PDSCH for FR2 as defined in 7.3.1.2 of TS 38.211 [6]. | Band | No | No | FR2 only |
| ***periodicBeamReport***  Indicates whether UE supports periodic 'CRI/RSRP' or 'SSBRI/RSRP' reporting using PUCCH formats 2, 3 and 4 in one slot. | Band | Yes | No | No |
| ***powerBoosting-pi2BPSK***  Indicates whether UE supports power boosting for pi/2 BPSK, when applicable as defined in 6.2 of TS 38.101-1 [2]. | Band | No | TDD only | FR1 only |
| ***ptrs-DensityRecommendationSetDL***  For each supported sub-carrier spacing, indicates preferred threshold sets for determining DL PTRS density. It is mandated for FR2. For each supported sub-carrier spacing, this field comprises:  - two values of *frequencyDensity*;  - three values of *timeDensity*. | Band | CY | No | No |
| ***ptrs-DensityRecommendationSetUL***  For each supported sub-carrier spacing, indicates preferred threshold sets for determining UL PTRS density. For each supported sub-carrier spacing, this field comprises:  - two values of *frequencyDensity*;  - three values of *timeDensity*;  - five values of *sampleDensity*. | Band | No | No | No |
| ***pucch-SpatialRelInfoMAC-CE***  Indicates whether the UE supports indication of *PUCCH-spatialrelationinfo* by a MAC CE per PUCCH resource. It is mandatory for FR2 and optional for FR1. | Band | CY | No | No |
| ***pusch-256QAM***  Indicates whether the UE supports 256QAM modulation scheme for PUSCH as defined in 6.3.1.2 of TS 38.211 [6]. | Band | No | No | No |
| ***pusch-TransCoherence***  Defines support of the uplink codebook subset by the UE for UL precoding for PUSCH transmission as described in clause 6.1.1.1 of TS 38.214 [12]. UE indicated support of partial coherent codebook subset shall also support non-coherent codebook subset. UE indicated support of full coherent codebook subset shall also support partial and non-coherent codebook subset. | Band | No | No | No |
| ***rateMatchingLTE-CRS***  Indicates whether the UE supports receiving PDSCH with resource mapping that excludes the REs determined by the higher layer configuration LTE-carrier configuring common RS, as specified in TS 38.214 [12]. | Band | Yes | No | No |
| ***spatialRelations***  Indicates whether the UE supports spatial relations. The capability signalling comprises the following parameters.  - *maxNumberConfiguredSpatialRelations* indicates the maximum number of configured spatial relations per CC for PUCCH and SRS. It is not applicable to FR1 and applicable to FR2 only. The UE is mandated to report 16 or higher values;  - *maxNumberActiveSpatialRelations* indicates the maximum number of active spatial relations with regarding to PUCCH and SRS for PUSCH, per BWP per CC. It is not applicable to FR1 and applicable and mandatory to report for FR2 only;  - *additionalActiveSpatialRelationPUCCH* indicates support of one additional active spatial relation for PUCCH. It is mandatory with capability signalling if *maxNumberActiveSpatialRelations* is set to n1;  - *maxNumberDL-RS-QCL-TypeD* indicates the maximum number of downlink RS resources used for QCL type D in the active TCI states and active spatial relation information, which is optional. | Band | FD | No | FD |
| ***sp-BeamReportPUCCH***  Indicates support of semi-persistent 'CRI/RSRP' or 'SSBRI/RSRP' reporting using PUCCH formats 2, 3 and 4 in one slot. | Band | No | No | Yes |
| ***sp-BeamReportPUSCH***  Indicates support of semi-persistent 'CRI/RSRP' or 'SSBRI/RSRP' reporting on PUSCH. | Band | No | No | Yes |
| ***srs-AssocCSI-RS***  Parameters for the calculation of the precoder for SRS transmission based on channel measurements using associated NZP CSI-RS resource (srs-AssocCSI-RS) as described in clause 6.1.1.2 of TS 38.214 [12]. UE supporting this feature shall also indicate support of non-codebook based PUSCH transmission.  This capability signalling includes list of the following parameters:  - *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource;  - *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs within a band simultaneously;  *-* *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs within a band simultaneously. | Band | No | No | No |
| ***tci-StatePDSCH***  Defines support of TCI-States for PDSCH. The capability signalling comprises the following parameters:  - *maxNumberConfiguredTCIstatesPerCC* indicates the maximum number of configured TCI-states per CC for PDSCH. For FR2, the UE is mandated to set the value to 64. For FR1, the UE is mandated to set these values to the maximum number of allowed SSBs in the supported band;  - *maxNumberActiveTCI-PerBWP* indicates the maximum number of activated TCI-states per BWP per CC, including control and data. If a UE reports X active TCI state(s), it is not expected that more than X active QCL type D assumption(s) for any PDSCH and any CORESETs for a given BWP of a serving cell become active for the UE. The UE shall include this field.  Note the UE is required to track only the active TCI states. | Band | Yes | No | No |
| ***twoPortsPTRS-UL***  Defines whether UE supports PT-RS with 2 antenna ports for UL transmission. | Band | No | No | No |
| ***ue-PowerClass***  For FR1, if the UE supports the different UE power class than the default UE power class as defined in clause 6.2 of TS 38.101-1 [2], the UE shall report the supported UE power class in this field. For FR2, UE shall report the supported UE power class as defined in clause 6 and 7 of TS 38.101-2 [3] in this field. | Band | Yes | No | No |
| ***uplinkBeamManagement***  Defines support of beam management for UL. This capability signalling comprises the following parameters:  - *maxNumberSRS-ResourcePerSet-BM* indicates the maximum number of SRS resources per SRS resource set configurable for beam management, supported by the UE.  - *maxNumberSRS-ResourceSet* indicates the maximum number of SRS resource sets configurable for beam management, supported by the UE.  If the UE does not set *beamCorrespondenceWithoutUL-BeamSweeping* to *supported*, the UE shall report this capability. This feature is optional for the UE that supports beam correspondence without uplink beam sweeping as defined in clause 6.6, TS 38.101-2 [3].  NOTE: The network uses *maxNumberSRS-ResourceSet* to determine the maximum number of SRS resource sets that can be configured to the UE for periodic/semi-persistent/aperiodic configurations as below:   |  |  | | --- | --- | | Maximum number of SRS resource sets across all time domain behaviour (periodic/semi-persistent/aperiodic) reported in *maxNumberSRS-ResourceSet* | Additional constraint on the maximum number of SRS resource sets configured to the UE for each supported time domain behaviour (periodic/semi-persistent/aperiodic) | | 1 | 1 | | 2 | 1 | | 3 | 1 | | 4 | 2 | | 5 | 2 | | 6 | 2 | | 7 | 4 | | 8 | 4 | | Band | No | No | FR2 only |

---------------------------------------------END OF CHANGE---------------------------------------------