**3GPP TSG-RAN2 Meeting #106 *R2-190xxxx***

 **Reno, Nevada, United States, 13th May 2019 - 17th May 2019**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **38.306** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **15.5.0** |  |
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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:***  | Modified UE capability on different numerologies within the same PUCCH group |
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| ***Source to WG:*** | NTT DOCOMO, INC. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2019-05-24 |
|  |  |  |  |  |
| ***Category:*** | **C** |  | ***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 canbe 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:*** | RAN2 received the (final) update of Rel-15 L1 UE feature list from RAN1 in [R2-1908485](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_106/LSin/R2-1908485.zip) which covers late drops. In the updated feature list, the existing UE feature of different numerologies across NR carriers within the same NR PUCCH group (6-9) is updated to clarity that PUCCH is transmitted on the carrrier with smaller Sub-Carrier Spacing (SCS). In addition, Another feature is added to cover the case where PUCCH is transmitted on the carrier with larger SCS (6-9a). These updates are applicable to EN-DC, NR-CA as well as late drop options, i.e. NE-DC and NR-DC. Therefore, the capability signalling needs to be updated, in accordance with their updates. |
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| ***Summary of change:*** | - The existing capability field name, diffNumerologyWithinPUCCH-Group is changed to diffNumerologyWithinPUCCH-Group**SmallerSCS**. The functional descrition is extended to cover NE-DC and NR-DC.- Another capability of diffNumerologyWithinPUCCH-Group**LargerSCS** is defined as per-band combination signalling.**Impact analysis:**Impacted 5G architecture options:Standalone, EN-DC, NGEN-DC, NE-DC, NR-DCImpacted functionality:Different numerologies across NR carriers within the same NR PUCCH groupInter-operability:There is no inter-operability issue due to the definition and clarification of the UE features. |
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| ***Consequences if not approved:*** | A UE cannot support another case that PUCCH is transmitted on the carrier with larger SCS |
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| ***Clauses affected:*** | 4.2.7.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR ABCD |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

#### 4.2.7.4 *CA-ParametersNR*

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
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| ***aperiodic-CSI-diffSCS***Indicates whether the UE supports triggering of aperiodic CSI-RS where the CSI-RS is on a carrier with one sub-carrier spacing and the triggering PDCCH is on another carrier with a different sub-carrier spacing compared to the carrier with CSI-RS. | BC | No | No | No |
| ***csi-RS-IM-ReceptionForFeedbackPerBandComb***Indicates support of CSI-RS and CSI-IM reception for CSI feedback. This capability signalling comprises the following parameters:- *maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the maximum number of simultaneous CSI-RS resources in active BWPs across all CCs. This parameter limits the total number of NZP-CSI-RS resources that the NW may configure across all CCs (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> maxNumberSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> maxNumberSimultaneousNZP-CSI-RS-PerCC*;- *totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the total number of CSI-RS ports in simultaneous CSI-RS resources in active BWPs across all CCs. This parameter limits the total number of ports that the NW may configure across all NZP-CSI-RS resources across all CCs (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC*. | BC | Yes | No | No |
| ***diffNumerologyAcrossPUCCH-Group***Indicates whether different numerology across two NR PUCCH groups for data and control channel at a given time in NR CA and EN-DC is supported by the UE. | BC | No | No | No |
| ***diffNumerologyWithinPUCCH-GroupLargerSCS***Indicates whether UE supports different numerology across carriers within a PUCCH group and a same numerology between DL and UL per carrier for data/control channel at a given time in NR CA, EN-DC/NE-DC and NR-DC. In case of NR CA and EN-DC/NE-DC with one NR PUCCH group, the UE supports different numerologies across NR carriers within the same NR PUCCH group up to two different numerologies within the same NR PUCCH group for data and control channel at a given time. In case of NR CA with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group, wherein NR PUCCH is sent on the carrier with larger SCS for data and control channel at a given time. In case of EN-DC/NE-DC with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1, wherein NR PUCCH is sent on the carrier with larger SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data and control channel at a given time. In case of NR-DC, the UE supports different numerologies across NR carriers within the same NR PUCCH group in MCG (in FR1) and up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with larger SCS for data/control channel at a given time; and same numerology across NR carriers in SCG (in FR2). | BC | No | No | No |
| ***diffNumerologyWithinPUCCH-GroupSmallerSCS***Indicates whether UE supports different numerology across carriers within a PUCCH group and a same numerology between DL and UL per carrier for data/control channel at a given time in NR CA, EN-DC/NE-DC and NR-DC. In case of NR CA and EN-DC/NE-DC with one NR PUCCH group, the UE supports different numerologies across NR carriers within the same NR PUCCH group up to two different numerologies within the same NR PUCCH group for data and control channel at a given time. In case of NR CA with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group, wherein NR PUCCH is sent on the carrier with smaller SCS for data and control channel at a given time. In case of EN-DC/NE-DC with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1, wherein NR PUCCH is sent on the carrier with smaller SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data and control channel at a given time. In case of NR-DC, the UE supports different numerologies across NR carriers within the same NR PUCCH group in MCG (in FR1) and up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with smaller SCS for data/control channel at a given time; and same numerology across NR carriers in SCG (in FR2). | BC | No | No | No |
| ***dualPA-Architecture***For band combinations with single-band with UL CA, this field indicates the support of dual PA. If absent in such band combinations, the UE supports single PA for all the ULs. For other band combinations, this field is not applicable. | BC | No | No | No |
| ***multipleTimingAdvances***Indicates whether multiple timing advances are supported by the UE. For NR CA band combination, if the band combination comprised of more than one band entry (i.e., inter-band or intra-band non-contiguous band combination), the field indicates that different timing advances on different band entries are supported. For EN-DC band combination, this field is not presented and it is mandatory for the UE supporting EN-DC band combination. In this release, up to two timing advances are supported for EN-DC band combination or NR CA band combination.For NR CA, it is mandatory with IOT bit for inter-band NR CA, otherwise optional. For EN-DC, it is mandatory without IOT bit.  | BC | CY | No | No |
| ***parallelTxSRS-PUCCH-PUSCH***Indicates whether the UE supports parallel transmission of SRS and PUCCH/ PUSCH across CCs in an inter-band CA band combination. | BC | No | No | No |
| ***parallelTxPRACH-SRS-PUCCH-PUSCH***Indicates whether the UE supports parallel transmission of PRACH and SRS/PUCCH/PUSCH across CCs in an inter-band CA band combination. | BC | No | No | No |
| ***simultaneousCSI-ReportsAllCC***Indicates whether the UE supports CSI report framework and the number of CSI report(s) which the UE can simultaneously process across all CCs. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-ReportsAllCC* includes the beam report and CSI report. This parameter may further limit *simultaneousCSI-ReportsPerCC* in *MIMO-ParametersPerBand* and *Phy-ParametersFRX-Diff* for each band in a given band combination. | BC | Yes | No | No |
| ***simultaneousRxTxInterBandCA***Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band NR CA. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. | BC | CY | No | No |
| ***simultaneousRxTxSUL***Indicates whether the UE supports simultaneous reception and transmission for a NR band combination including SUL. Mandatory/Optional support depends on band combination and captured in TS 38.101-1 [2]. | BC | CY | No | No |
| ***simultaneousSRS-AssocCSI-RS-AllCC***Indicates support of CSI-RS processing framework for SRS and the number of SRS resources that the UE can process simultaneously across all CCs, including periodic, aperiodic and semi-persistent SRS. This parameter may further limit *simultaneousSRS-AssocCSI-RS-PerCC* in *MIMO-ParametersPerBand* and *Phy-ParametersFRX-Diff* for each band in a given band combination. | BC | No | No | No |
| ***supportedNumberTAG***Defines the number of timing advance groups are supported by the UE. It is applied to NR-NR CA and EN-DC. For EN-DC, it indicates number of TAGs only for NR CG. The number of TAGs for the LTE MCG is signalled by existing LTE TAG capability signalling. | BC | Tbd | No | No |