**3GPP TSG-RAN WG2 Meeting #110 electronic R2-2005446**

**Online, June 1 – June 12 2020**

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| *CR-Form-v11.4* |
| **CHANGE REQUEST** |
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|  | **38.306** | **CR** | 0337 | **rev** | **-** | **Current version:** | **16.0.0** |  |
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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:***  | Introduction of inter-frequency measurement without gap |
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| ***Source to WG:*** | CMCC, [Huawei, HiSilicon] |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_RRM\_Enh\_Core |  | ***Date:*** | 2020-05-19 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-16 |
|  | *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:*** | Inter-frequency measurement requirement without MG is one objective in the R16 work item NR RRM requirements enhancement. RAN4 had sufficient discussion on the topic and made the following agreements:* The UE can perform inter-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE.* The capability of supporting Inter-frequency measurements without gap shall be introduced in R16.
* Option1: optional with UE capability signalling
* Option 2: mandatory with UE capability signalling
* When UE performs inter-frequency SSB based measurements without measurement gaps, if the SCS of the inter-frequency SSB is different with the SCS of serving cell PDCCH or PSDCH, whether UE can perform measurements and data reception depends on UE capability. From RAN4 point of view, both options listed below are feasible:
* Option A: update the UE capability *simultaneousRxDataSSB-DiffNumerology* to indicate whether the UE supports concurrent intra-frequency measurement on serving cell or neighbouring cell or inter-frequency measurement without measurement gap and PDCCH or PDSCH reception from the serving cell with a different numerology;
* Option B: introduce a new UE capability to indicate whether the UE supports concurrent inter-frequency measurement without measurement gap and PDCCH or PDSCH reception from the serving cell with a different numerology as defined in clause 8 and 9 of TS 38.133

No matter the neighbouring cell is intra-frequency or inter-frequency, as long as the SSB is in within active BWP, receving data and SSB at the same time is the same from UE capability perspective. So we propose to update the UE capability *simultaneousRxDataSSB-DiffNumerology* (Option A in RAN4 LS) |
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| ***Summary of change:*** | * Add the capability description for inter-frequency measurement without gap
* Update the capability description for *simultaneousRxDataSSB-DiffNumerology* to indicate whether the UE supports concurrent intra-frequency measurement on serving cell or neighbouring cell or inter-frequency measurement without measurement gap and PDCCH or PDSCH reception from the serving cell with a different numerology;
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| ***Consequences if not approved:*** | UE always use gap for inter-frequency measurement. It will result in performance lost. |
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| ***Clauses affected:*** | 4.2.9 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR TS 38.300 CR  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |

### 4.2.9 *MeasAndMobParameters*

| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
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| ***cli-RSSI-Meas-r16***Indicates whether the UE can perform CLI RSSI measurements as specified in TS 38.215 [13] and supports periodical reporting and measurement event triggering as specified in TS 38.331 [9]. | UE | No | TDD only | Yes |
| ***cli-SRS-RSRP-Meas-r16***Indicates whether the UE can perform SRS RSRP measurements as specified in TS 38.215 [13] and supports periodical reporting and measurement event triggering based on SRS-RSRP as specified in TS 38.331 [9]. | UE | No | TDD only | Yes |
| ***csi-RS-RLM***Indicates whether the UE can perform radio link monitoring procedure based on measurement of CSI-RS as specified in TS 38.213 [11] and TS 38.133 [5]. This parameter needs FR1 and FR2 differentiation. If the UE supports this feature, the UE needs to report *maxNumberResource-CSI-RS-RLM*. | UE | Yes | No | Yes |
| ***csi-RSRP-AndRSRQ-MeasWithSSB***Indicates whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured with an associated SS/PBCH. If this parameter is indicated for FR1 and FR2 differently, each indication corresponds to the frequency range of measured target cell. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*. | UE | No | No | Yes |
| ***csi-RSRP-AndRSRQ-MeasWithoutSSB***Indicates whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured for a cell that transmits SS/PBCH block and without an associated SS/PBCH block. If this parameter is indicated for FR1 and FR2 differently, each indication corresponds to the frequency range of measured target cell. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*. | UE | No | No | Yes |
| ***csi-SINR-Meas***Indicates whether the UE can perform CSI-SINR measurements based on configured CSI-RS resources as specified in TS 38.215 [13]. If this parameter is indicated for FR1 and FR2 differently, each indication corresponding to the frequency range of measured target cell. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*. | UE | No | No | Yes |
| ***eutra-AutonomousGaps-r16***Defines whether the UE supports, upon configuration of *useAutonomousGaps* by the network, acquisition of relevant information from a neighbouring E-UTRA cell by reading the SI of the neighbouring cell using autonomous gap and reporting the acquired information to the network as specified in TS 38.331 [9] when MR-DC is not configured.  | UE | No | Yes | No |
| ***eutra-CGI-Reporting***Defines whether the UE supports acquisition of relevant information from a neighbouring E-UTRA cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when the EN-DC is not configured. It is mandated if the UE supports EUTRA. | UE | CY | No | No |
| ***eventA-MeasAndReport***Indicates whether the UE supports NR measurements and events A triggered reporting as specified in TS 38.331 [9]. This field only applies to SN configured measurement when EN-DC is configured. For NR SA, this feature is mandatory supported. | UE | Yes | Yes | No |
| ***eventB-MeasAndReport***Indicates whether the UE supports EUTRA measurement and event B triggered reporting as specified in TS 38.331 [9]. It is mandated if the UE supports EUTRA. | UE | CY | No | No |
| ***handoverLTE-5GC***Indicates whether the UE supports HO to EUTRA connected to 5GC. It is mandated if the UE supports EUTRA connected to 5GC. | UE | CY | Yes | Yes |
| ***handoverFDD-TDD***Indicates whether the UE supports HO between FDD and TDD. It is mandated if the UE supports both FDD and TDD. This field only applies to NR SA (e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported. | UE | Yes | No | No |
| ***handoverFR1-FR2***Indicates whether the UE supports HO between FR1 and FR2. Support is mandatory for the UE supporting both FR1 and FR2. This field only applies to NR SA(e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported. | UE | Yes | No | No |
| ***handoverInterF***Indicates whether the UE supports inter-frequency HO. It indicates the support for inter-frequency HO from the corresponding duplex mode if this capability is included in *fdd-Add-UE-NR-Capabilities* or *tdd-Add-UE-NR-Capabilities*. It indicates the support for inter-frequency HO from the corresponding frequency range if this capability is included in *fr1-Add-UE-NR-Capabilities* or *fr2-Add-UE-NR-Capabilities*. This field only applies to NR SA (e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported. | UE | Yes | Yes | Yes |
| ***handoverLTE-EPC***Indicates whether the UE supports HO to EUTRA connected to EPC. It is mandated if the UE supports EUTRA connected to EPC. | UE | CY | Yes | Yes |
| ***handoverUTRA-FDD-r16***Indicates whether the UE supports NR to UTRA-FDD CELL\_DCH CS handover. It is mandatory to support both UTRA-FDD measurement and event B triggered reporting, and periodic UTRA-FDD measurement and reporting if the UE supports HO to UTRA-FDD. If this field is included, then UE shall support IMS voice over NR. | UE | No | Yes | Yes |
| ***independentGapConfig***This field indicates whether the UE supports two independent measurement gap configurations for FR1 and FR2 specified in clause 9.1.2 of TS 38.133 [5]. The field also indicates whether the UE supports the FR2 inter-RAT measurement without gaps when EN-DC is not configured. | UE | No | No | No |
| ***intraAndInterF-MeasAndReport***Indicates whether the UE supports NR intra-frequency and inter-frequency measurements and at least periodical reporting. This field only applies to SN configured measurement when EN-DC is configured. For NR SA, this feature is mandatory supported. | UE | Yes | Yes | No |
| ***interFrequencyMeas-NoGap-r16***Indicates whether the UE can perform inter-frequency SSB based measurements without measurement gaps if the SSB is completely contained in the active BWP of the UE as specified in TS 38.133 [5]. | UE | No | No | Yes |
| ***periodicEUTRA-MeasAndReport***Indicates whether the UE supports periodic EUTRA measurement and reporting. It is mandated if the UE supports EUTRA. | UE | CY | No | No |
| ***maxNumberCSI-RS-RRM-RS-SINR***Defines the maximum number of CSI-RS resources for RRM and RS-SINR measurement across all measurement frequencies per slot. If UE supports any of *csi-RSRP-AndRSRQ-MeasWithSSB*, *csi-RSRP-AndRSRQ-MeasWithoutSSB*, and *csi-SINR-Meas*, UE shall report this capability. | UE | CY | No | No |
| ***maxNumberResource-CSI-RS-RLM***Defines the maximum number of CSI-RS resources within a slot per spCell for CSI-RS based RLM. If UE supports any of *csi-RS-RLM* and *ssb-AndCSI-RS-RLM*, UE shall report this capability. | UE | CY | No | Yes |
| ***nr-AutonomousGaps-r16***Defines whether the UE supports, upon configuration of *useAutonomousGaps* by the network, acquisition of relevant information from a neighbouring NR cell by reading the SI of the neighbouring cell using autonomous gap and reporting the acquired information to the network as specified in TS 38.331 [9] when MR-DC is not configured.  | UE | No | Yes | Yes |
| ***nr-AutonomousGaps-ENDC-r16***Defines whether the UE supports, upon configuration of *useAutonomousGaps* by the network, acquisition of relevant information from a neighbouring NR cell by reading the SI of the neighbouring cell using autonomous gap and reporting the acquired information to the network as specified in TS 38.331 [9] when (NG)EN-DC is configured. | UE | No | Yes | Yes |
| ***nr-CGI-Reporting***Defines whether the UE supports acquisition of relevant information from a neighbouring intra-frequency or inter-frequency NR cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when EN-DC is not configured. | UE | Yes | No | No |
| ***nr-CGI-Reporting-ENDC***Defines whether the UE supports acquisition of relevant information from a neighbouring intra-frequency or inter-frequency NR cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when the (NG)EN-DC is configured. | UE | Yes | No | No |
| ***simultaneousRxDataSSB-DiffNumerology***Indicates whether the UE supports concurrent intra-frequency measurement on serving cell or neighbouring cell and PDCCH or PDSCH reception from the serving cell with a different numerology as defined in clause 8 and 9 of TS 38.133 [5]. | UE | No | No | Yes |
| ***simultaneousRxDataSSB-DiffNumerology-Inter-r16***Indicates whether the UE supports concurrent SSB based inter-frequency measurement without measurement gap on neighbouring cell and PDCCH or PDSCH reception from the serving cell with a different numerology as defined in clause 8 and 9 of TS 38.133 [5]. | UE | No | No | Yes |
| ***sftd-MeasPSCell***Indicates whether the UE supports SFTD measurements between the PCell and a configured PSCell. If this capability is included in UE-MRDC-Capability, it indicates that the UE supports SFTD measurement between PCell and PSCell in (NG)EN-DC. If this capability is included in UE-NR-Capability, it indicates that the UE supports SFTD measurement between PCell and PSCell in NR-DC. | UE | No | Yes | No |
| ***sftd-MeasPSCell-NEDC***Indicates whether the UE supports SFTD measurement between the NR PCell and a configured E-UTRA PSCell in NE-DC. | UE | No | Yes | No |
| ***sftd-MeasNR-Cell***Indicates whether the SFTD measurement with and without measurement gaps between the EUTRA PCell and the NR cells is supported by the UE which is capable of EN-DC/NGEN-DC when EN-DC/NGEN-DC is not configured. The SFTD measurement without gaps can be used when the UE supports at least one EN-DC band combination consisting of the set of the current E-UTRA serving frequencies and the NR frequency where SFTD measurement is configured. In UE-NR-Capability, this field is not used, and UE does not include the field. | UE | No | Yes | No |
| ***sftd-MeasNR-Neigh***Indicates whether the inter-frequency SFTD measurement with and without measurement gaps between the NR PCell and inter-frequency NR neighbour cells is supported by the UE when MR-DC is not configured. The SFTD measurement without gaps can be used when the UE supports at least one DC or CA band combination consisting of the set of the current NR serving frequencies and the NR frequency where SFTD measurement is configured.  | UE | No | Yes | No |
| ***sftd-MeasNR-Neigh-DRX***Indicates whether the inter-frequency SFTD measurement using DRX off period between the NR PCell and the inter-frequency NR neighbour cells is supported by the UE when MR-DC is not configured. | UE | No | Yes | No |
| ***ssb-RLM***Indicates whether the UE can perform radio link monitoring procedure based on measurement of SS/PBCH block as specified in TS 38.213 [11] and TS 38.133 [5]. This field shall be set to *supported*. | UE | Yes | No | No |
| ***ssb-AndCSI-RS-RLM***Indicates whether the UE can perform radio link monitoring procedure based on measurement of SS/PBCH block and CSI-RS as specified in TS 38.213 [11] and TS 38.133 [5]. If the UE supports this feature, the UE needs to report *maxNumberResource-CSI-RS-RLM*. | UE | No | No | No |
| ***ss-SINR-Meas***Indicates whether the UE can perform SS-SINR measurement as specified in TS 38.215 [13]. If this parameter is indicated for FR1 and FR2 differently, each indication corresponds to the frequency range of measured target cell. | UE | No | No | Yes |
| ***supportedGapPattern***Indicates measurement gap pattern(s) optionally supported by the UE for NR SA, for NR-DC, for NE-DC and for independent measurement gap configuration on FR2 in (NG)EN-DC. The leading / leftmost bit (bit 0) corresponds to the gap pattern 2, the next bit corresponds to the gap pattern 3, as specified in TS 38.133 [5] and so on. The UE shall set the bits corresponding to the measurement gap pattern 13 and 14 to 1 if the UE is an NR standalone capable UE that supports a band in FR2 or if the UE is an (NG)EN-DC capable UE that supports *independentGapConfig* and supports a band in FR2. | UE | CY | No | No |