**3GPP TSG-RAN4 Meeting #112 *R4-241XXXX***

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

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **4709** | **rev** | **1** | **Current version:** | **17.14.0** |  |
|  |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)*** *on using this form: comprehensive instructions can be found at <http://www.3gpp.org/Change-Requests>.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | (NR\_NTN\_solutions-Core) CR to TS 38.133 measurement procedure related corrections for NR NTN |
|  |  |
| ***Source to WG:*** | CMCC |
| ***Source to TSG:*** | RAN4 |
|  |  |
| ***Work item code:*** | NR\_NTN\_solutions-Core |  | ***Date:*** | 2024-08-02 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | The applicability exception for system information update should be also applied to different numerology caseSFN, frame boundary and SSB timing alignment assumption should not be valid under NTN scenarioThere are some TDD and CA related requirements, which could not be applied for NTN FDD only network |
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| ***Summary of change:*** | Add applicability exception for system information update for different numerology caseDelete SFN, frame boundary and SSB timing alignment assumption for inter-frequency measurement without MGDelete TDD and CA related scheduling availability  |
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| ***Consequences if not approved:*** | The NTN spec will not be accurate |
|  |  |
| ***Clauses affected:*** | 9.2C.5.3.1, 9.3C.4, 9.3C.7, 9.5C.2, 9.5C.4.2, 9.5C.5.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.533  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revised of R4-2411747 |

**<Start of change>**

##### 9.2C.5.3.1 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If *deriveSSB-IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2*is configured(in TS 38.331 [2]), the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

- If *deriveSSB-IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2*is configured in TS 38.331 [2], the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

The UE shall be able to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured., if the following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE’s reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

**<Next change>**

### 9.3C.4 Inter-frequency measurement with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

 Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

 Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

 TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 9.3C.4-1.

 TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 9.3C.4-2.

 TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3C.5-1.

 CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in clause 9.1C.5.2 for measurement conducted within measurement gaps.

 Kgap is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps. When the UE is configured with concurrent measurement gaps and the two measurement gaps are fully overlapping with MGRP=160ms, Kgap = 2. Otherwise, Kgap = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

 For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, and starting from the beginning of any SMTC occasion:

- Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- Navailable is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1.8.3.

 Kgap is only applicable for UE supporting *parallelMeasurementGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if Navailable =0, or if one SMTC overlaps more than one MGs associated to the frequency layer.

 K\_satellite: it is a satellite specific scaling factor.

If SMTCs within a measurement gap do not overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within SMTC

K\_satellite = 1, if GSO satellites are measured on the carrier

$K\\_satellite=\left⌈\frac{Num of LEO satellites to be measured in tℎe SMTC}{number of LEO satellites UE is capable to measure in one SMTC}\right⌉$, if LEO satellites are measured on the carrier.

If SMTCs within a measurement gap partially overlap with each other, and if LEO and/or GEO satellite(s) is/are required to be measured within overlapped SMTCs

$K\\_satellite=number of overlapped SMTCs$, if only GEO satellites are measured on the carrier

$K\\_satellite=\sum\_{i}^{}\left⌈\frac{Num of LEO satellites to be measured in tℎe SMTC i}{number of LEO satellites UE is capable to measure in one SMTC}\right⌉$, if only LEO satellites are measured on the carrier.

**<unchanged parts skipped>**

**<Next change>**

### 9.3C.7 Inter frequency measurements without measurement gaps

#### 9.3C.7.1 Inter frequency Cell identification

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

**<unchanged parts skipped>**

**<Next change>**

##### 9.3C.7.3.1 Void

**<Next change>**

##### 9.3C.7.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology-Inter-r16* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If UE performs inter-frequency measurements without measurement gaps in a FDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration.

**<Next change>**

9.5C.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS\_SAN.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 9.5C.4.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- P value for a CSI-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CSI-RS resource occasion:

- Ntotal is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, if UE does not support *parallelMeasurementWithoutRestriction* and LEO satellites are measured for intra-frequency measurement, and

- same as Noutside\_MG, otherwise

**<unchanged parts skipped>**

**<Next change>**

#### 9.5C.5.1 Measurement restriction for SSB based L1-RSRP

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If SSB and CSI-RS have different SCS,

- If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;

- If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

**<End of change>**