**3GPP TSG-RAN4 Meeting #111 *R4-2410330***

**Fukuoka, Japan, 20 – 24 May, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | 1 | **Current version:** |  |  |
|  | | | | | | | | |
| *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 |  | Core Network |  |

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| ***Title:*** | draftCR on requirements for inter-RAT LTE measurement without gap | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MG\_enh2-Core | | | | |  | ***Date:*** | | | 2024-04-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | There are some issues in the inter-RAT LTE measurement requirements:   1. The definition of Tinter1 is TBD for the case when EMW is not configured 2. The scheduling restriction requirements need to differentiate Case b-1 and b-2, and for Case b-1 additional conditions to allow restrictions are needed, e.g. LTE MO and NR serving cell active BWP are overlappoing, or LTE MO and NR serving cell are in band pair UE does not support simultaneous Tx/Rx. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Define Tinter1 for the case when EMW is not configured 2. Update scheduling restriction requirements for above issues. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Requirements for inter-RAT LTE measurement are incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 9.4.8.2, 9.4.8.3.5.1, 9.4.8.4.5.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

### 9.4.1 Introduction

The requirements in this clause are specified for NR−E-UTRAN FDD and NR−E-UTRAN TDD measurements and are applicable without an explicit E-UTRAN neighbour cell list containing physical layer cell identities, for a UE:

- in RRC\_CONNECTED state, and

- configured

- with SA or NR-DC operation mode or configured in NE-DC operation mode by PCell with NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID RSRP and RSRQ) on E-UTRA non-serving frequency carrier, or

- with SA operation mode on NR carrier frequencies with CCA by PCell with NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR) on E-UTRA non-serving frequency carrier, and

- configured with an appropriate measurement gap pattern according to Table 9.1.2-3.

The requirements in this clause for concurrent measurement gaps are only applied for UE in NR SA operation mode.

For UE supporting *eutra-NeedForGapNCSG-reporting-r17* and indicating *NeedForGapNCSG-InfoEUTRA* for inter-RAT measurement,

- An inter-RAT measurement is defined as measurement without gap if

- the UE indicates ‘nogap-noncsg’ via *NeedForGapNCSG-InfoEUTRA* for the inter-RAT measurement

- for UE support FG 32-4, the inter-RAT EUTRAN measurements without gaps requirements are specified in clause 9.4.8.

- An inter-RAT measurement is defined as measurement with NCSG if

- the UE indicates ‘ncsg’ via *NeedForGapNCSG-InfoEUTRA* for the inter-RAT measurement

When network configures measurement gap or NCSG, the delay requirements are specified in clause 9.4.2 and 9.4.3.

- An inter-RAT SSB measurement is defined as measurement with gap if

- the UE indicates ‘gap’ via *NeedForGapNCSG-InfoEUTRA* for the inter-RAT measurement

When network configures measurement gap, the delay requirements are specified in clauses 9.4.2 and 9.4.3.

- For inter-RAT measurements with NCSG, UE may cause scheduling restriction as specified in clause 9.4.2.5 and 9.4.3.5.

For UE not supporting *eutra-NeedForGapNCSG-reporting-r17*,

- An inter-RAT measurement is defined as measurement without gap if

- the UE supports FG32-5 and the CRS is completely contained in the active BWP of the UE, and the inter-RAT EUTRAN measurements without gaps requirements are specified in clause 9.4.8.

For inter-RAT measurement is defined as measurement without gap the UE may cause scheduling restriction as specified in clause 9.4.8.3.5 and clause 9.4.8.4.5.

When the UE is in NE-DC operation mode and an NR−E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, or E-CID RSRP and RSRQ) configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements specified in clause 8.19 of TS 36.133 [15] shall apply.

When *highSpeedMeasFlag-r16* is configured but UE does not support either *measurementEnhancement-r16 or* *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 9.4.2.3-2 and Table 9.4.3.3-2.

*Editor’s note: the exact signalling names in the above brackets and in Table 9.4.2.3-2 and Table 9.4.3.3-2 are subject to RAN2 definitions and the brackets shall be replaced by the correct signalling names according to RAN2 specification.*

Parameter TInter1 used in inter-RAT requirements in clause 9.4 is specified in Table 9.4.1-1 when measurement gap is used, and in Table 9.4.1-2 when NCSG is used.

The measurement reporting delay can be longer for the measurement reporting requirements in this clause when IDC autonomous denial is configured.

Table 9.4.1-1: Minimum available time for inter-RAT measurements measurements when measurement gap is configured

|  |  |  |  |
| --- | --- | --- | --- |
| Gap Pattern Id | MeasurementGap Length (MGL, ms) | Measurement Gap Repetition Period  (MGRP, ms) | Minimum available time for inter-frequency and inter-RAT measurements during 480 ms period  (Tinter1, ms) |
| 0 | 6 | 40 | 60 |
| 1 | 6 | 80 | 30 |
| 2 | 3 | 40 | 24Note 1 |
| 3 | 3 | 80 | 12Note 1 |
| 4 | 6 | 20 | 120 Note 1 |
| 6 | 4 | 20 | 72 Note 1,3,6 |
| 7 | 4 | 40 | 36 Note 1,4,6 |
| 8 | 4 | 80 | 18Note 1,5,6 |
| 10 | 3 | 20 | 48 Note 1 |
| NOTE 1: When determining UE requirements using Tinter1 for gap pattern IDs 2, 3, 4, 6, 7, 8, 10, Tinter1 = 60 for gap pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for gap pattern IDs 3 and 8 shall be used.  NOTE 2: Measurement gaps pattern configurations applicability is as specified in Table 9.1.2-1.  NOTE 3: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 48 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 4: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 24 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 5: When this gap pattern is used, the Tinter for E-UTRA inter-frequency measurements is 12 ms corresponding to the first 3 ms of the 4 ms gap.  NOTE 6: This gap pattern is applicable for E-UTRA inter-frequency measurements only if gap based NR measurements are also configured.  NOTE 7: If multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layers. | | | |

Table 9.4.1-2: Minimum available time for inter-RAT measurements when NCSG is configured

|  |  |  |  |
| --- | --- | --- | --- |
| NCSG Pattern Id | Measurement Length (ML, ms) | Visible Interruption Repetition Period  (VIRP, ms) | Minimum available time for inter-frequency and inter-RAT measurements during 480 ms period  (Tinter1, ms) |
| 0 | 5 | 40 | 60 |
| 1 | 5 | 80 | 30 |
| 2 | 2 | 40 | 24Note 1 |
| 3 | 2 | 80 | 12Note 1 |
| 4 | 5 | 20 | 120 Note 1 |
| 6 | 3 | 20 | 72 Note 1,3 |
| 7 | 3 | 40 | 36 Note 1,3 |
| 8 | 3 | 80 | 18Note 1,3 |
| 10 | 2 | 20 | 48 Note 1 |
| NOTE 1: When determining UE requirements using Tinter1 for NCSG pattern IDs 2, 3, 4, 6, 7, 8, 10, Tinter1 = 60 for NCSG pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for NCSG pattern IDs 3 and 8 shall be used.  NOTE 2: NCSG pattern configurations applicability is as specified in Table 9.1.2C-1.  NOTE 3: This NCSG pattern is applicable for E-UTRA inter-frequency measurements only if NCSG based NR measurements are also configured. | | | |

A UE configured with gap/NCSG pattern ID 2, 3 or 10 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500 μs from the start of the measurement gap, and

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends not later than 500 μs before the end of the measurement gap in case of FDD and not later than 750 μs before the end of measurement gap in case of TDD.

A UE configured with gap/NCSG pattern ID 6, 7 or 8 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500 μs from the start of the measurement gap, and

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 1500 μs before the end of the measurement gap in case of FDD and no later than 1750 μs before the end of measurement gap in case of TDD.

<End of Change 1>

<Start of Change 2>

9.4.8.2 General requirements

If an NR – E-UTRAN measurement does not cause scheduling restriction as defined in clause 9.4.8.3.5 or 9.4.8.4.5, the measurement is performed outside measurement gaps.

If an NR – E-UTRAN measurement causes scheduling restriction as defined in clause 9.4.8.3.5 or 9.4.8.4.5, the measurement is performed within measurement gaps if one of the following conditions is met, and the requirements in clause 9.4.2 or 9.4.3 apply.

- EMW is configured and fully overlapped with measurement gap, and the periodicity of measurement gap and EMW is same, or

- EMW is not configured.

Otherwise, the measurement is performed within EMW occasions and requirements in clause 9.4.8 apply.

When UE is configured with EMW and measurement gap, EMW and measurement gap occasions are considered colliding if the two occasions are fully or partially overlapping in time domain.

When UE is configured with EMW and SMTC orSSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement, EMW and SMTC or SSB/CSI-RS occasions are considered colliding if the two occasions are fully or partially overlapping in time domain, provided that inter-RAT measurement during EMW would cause scheduling restriction.

In case of collision between EMW and measurement gap and EMW periodicity is smaller than MGRP, scheduling restriction specified in clause 9.4.8.2 does not apply in the EMW occasions colliding with measurement gap.

In case of collision between EMW and SMTC or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement, scheduling restriction specified in clause 9.4.8.2 does not apply in the EMW occasions colliding with SMTC or SSB/CSI-RS configured for RLM/BFD/CBD/L1-RSRP measurement.

Parameter TInter1 used in inter-RAT requirements in clause 9.4.8 is [60]ms if the measurement is performed outside measurement gaps, and is defined based on Table 9.4.8.2-1 if the measurement is performed within EMW:

**Table 9.4.8.2-1: The effective measurement window**

|  |  |  |  |
| --- | --- | --- | --- |
| **Configuration** | **[Effective measurement window periodicity] [ms]** | **[Effective measurement window duration] [ms]** | **Tinter1** |
| 0 | 40 | 5 | [60] |
| 1 | 80 | 5 | [30] |
| 2 | 40 | 2 | [60] |
| 3 | 80 | 2 | [30] |
| 4 | 40 | 5.5 | [60] |
| 5 | 80 | 5.5 | [30] |

<End of Change 2>

<Start of Change 3>

9.4.8.3.5.1 Scheduling availability of UE performing inter-RAT measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

When UE performs inter-RAT measurement outside MG and the E-UTRA carrier is fully or partially overlapping with the DL active BWP of the serving cell, for UE which do not support [*FG32-7]* [14] the following restrictions apply due to RSRP/RSRQ/SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on [all symbols within EMW duration].

<End of Change 3>

<Start of Change 4>

9.4.8.4.5.1 Scheduling availability of UE performing inter-RAT measurements in TDD bands on FR1

*Editor Notes: FFS the scheduling restriction will be applied to the whole EMW or with the symbols level.*

When the UE performs inter-RAT measurements in a TDD band outside MG and the E-UTRA carrier is within DL active BWP of the serving cell, the following restrictions apply on the NR serving cell due to RSRP, RS-SINR and RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on [all symbols within EMW duration].

When the UE performs inter-RAT measurement in a TDD band outside MG and the E-UTRA carrier is outside DL active BWP of the serving cell, the following restrictions apply on the NR serving cell due to RSRP/RSRQ/SINR measurement, when the NR serving cell and E-URTA carrier are in a band pair for which UE does not have the capability of supporting *simultaneousRxTxInterBandCA*

- The UE is not expected to transmit PUCCH/PUSCH/SRS on [all symbols within EMW duration].

9.4.8.4.5.2 Scheduling availability of UE performing inter-RAT measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

When UE performs inter-RAT measurement outside MG and the E-UTRA carrier is fully or partially overlapping with the DL active BWP of the serving cell, for UE which do not support [*FG32-7]* [14] the following restrictions apply due to RSRP/RSRQ/SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on [all symbols within EMW duration].

<End of Change 4>