**3GPP TSG-RAN WG4 Meeting #116 R4-2509459**

**Bengaluru, India, 25 – 29 August, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **draftCR** | **rev** |  | **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:*** | Inter-RAT measurements E-UTRAN TDD measurements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Apple | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_XR\_Ph3-Core | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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:*** | | 1. RRM requirements for XR is missing: Inter-RAT measurements E-UTRAN TDD measurements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Introduce RRM requirements for XR: Inter-RAT measurements E-UTRAN TDD measurements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | RRM requirements for XR would still be missing: Inter-RAT measurements E-UTRAN TDD measurements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 9.4.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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>

### 9.4.3 NR − E-UTRAN TDD measurements

#### 9.4.3.1 Introduction

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

#### 9.4.3.2 Requirements when no DRX is used

When the UE requires measurement gaps or NCSG to identify and measure inter-RAT cells and an appropriate measurement gap pattern or NCSG is scheduled, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are scheduled, or an appropriate pre-MG is scheduled and activated or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable TDD cell within TIdentify, E-UTRAN TDD according to the following expression:

- When configuration 0 or configuration 1 in table 9.4.3.2-1 is applied,

,

- When configuration 2 or configuration 3 in table 9.4.3.2-1 is applied,

,

where:

TBasicIdentify = 480 ms,

TInter1 is defined in clause 9.4.1,

CSSFinterRAT = CSSFwithin\_gap,i when measurement gaps are configured, or CSSFwithin\_ncsg,i when NCSGs are configured, is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in clause 9.1.5.2.

T1 = ceil( Lcancel×KgapEUTRA)×MGRP. For the UE supporting *measurement gap occasion cancellation* provided that the configuration and conditions in clause 9.1.y.4 are met, Lcancel is the number of gap occasions cancelled during measurement period during for PSS/SSS detection. T1 = 0 for UE not supporting *measurement gap occasion cancellation* or the configuration and conditions in clause 9.1.y.4 are not met.

For a UE supporting concurrent GAPs, if multiple concurrent GAPs are configured, the MGRP is the periodicity of the MG pattern associated to the inter-RAT layer. Otherwise, MGRP is the Measurement Gap Repetition Period of the configured MG.

For a UE supporting and configured with concurrent GAPs, or MUSIM gaps or both concurrent GAPs and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated GAP pattern. Kgap\_EUTRA = 1 when the UE is not configured with concurrent GAPs nor MUSIM gaps. Otherwise, Kgap\_EUTRA = Ntotal / Navailable for UE configured with concurrent GAPs or MUSIM gaps.

- For a window W of duration xRP\_max , where xRP\_max is the maximum xRP across all configured per-UE GAPs, periodic MUSIM gaps,and per-FR GAPs for FR1, and starting from the beginning of any associated gap occasion:

- Ntotal is the total number of associated GAP occasions within the window, including those overlapped with other GAPs and MUSIM gap ocassions within the window, and

- Navailable is the number of non-dropped associated GAP occasions after accounting for GAPs and MUSIM gap collisions by applying the GAP and MUSIM gap in clauses 9.1.8.3 and 9.1.10.5, respectively.

- xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

- Requirements do not apply for UE configured with concurrent GAPs or MUSIM gaps, if Navailable =0

When UE supports *musim-GapPreference-r17* and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in clause 9.1.10.4 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of TMeasure, E-UTRAN TDD defined in table 9.4.3.2-1.

Table 9.4.3.2-1: TMeasure, E-UTRAN TDD for different configurations

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) | | DwPTS | | TMeasure, E-UTRAN TDD (ms) |
|  |  | DL | UL | Normal CP | Extended CP |  |
| 0 | 6 | 2 | 2 | 19760×Ts | 20480×Ts | 480 x CSSFinterRAT x Ceil(Kgap\_EUTRA) + 480 x ceil(T1/480) x CSSFinterRAT |
| 1 (Note 1) | 50 | 2 | 2 | 19760×Ts | 20480×Ts | 240 x CSSFinterRAT x Ceil(Kgap\_EUTRA) + 480 x ceil(T1/480) x CSSFinterRAT |
| 2 | 6 | 1 | 3 | 19760×Ts | 20480×Ts | 720 x CSSFinterRAT x Ceil(Kgap\_EUTRA) + 480 x ceil(T1/480) x CSSFinterRAT |
| 3 (Note 1) | 50 | 1 | 3 | 19760×Ts | 20480×Ts | 480 x CSSFinterRAT x Ceil(Kgap\_EUTRA) + 480 x ceil(T1/480) x CSSFinterRAT |
| NOTE 1: This configuration is optional.  NOTE 2: Void  NOTE 3: Kgap\_EUTRA is only applicable for a UE supporting concurrent GAPs and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1  NOTE 4: T1 = ceil( Lcancel×KgapEUTRA)×MGRP. For the UE supporting *measurement gap occasion cancellation* provided that the configuration and conditions in clause 9.1.y.4 are met, Lcancel is the number of gap occasions cancelled during measurement period during Tmeasure, E-UTRAN TDD for measurement. T1 = 0 for UE not supporting *measurement gap occasion cancellation* or the configuration and conditions in clause 9.1.y.4 are not met. | | | | | | |

When measurement gaps are scheduled for E-UTRAN TDD inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period Tmeasure, E-UTRAN TDD given by table 9.4.3.2-1.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.3 Requirements when DRX is used

When DRX is in use and an appropriate measurement gap pattern or NCSG is configured, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are configured, or an appropriate pre-MG is scheduled and activated, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in table 9.4.3.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in table 9.4.3.3-2.

For a UE supporting and configured with concurrent GAPs, or MUSIM gaps or both concurrent GAPs and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated GAP pattern. Kgap\_EUTRA = 1 when the UE is not configured with concurrent GAPs nor MUSIM gaps.. Otherwise, Kgap\_EUTRA = Ntotal / Navailable for UE configured with concurrent GAPs or MUSIM gaps.

For a window W of duration xRP\_max, where xRP\_max is the maximum xRP across all configured per-UE GAPs s, periodic MUSIM gap(s), and per-FR measurement GAPs for FR1, and starting from the beginning of any associated gap occasion: GAPs

Ntotal is the total number of associated GAP occasions within the window, including those overlapped with other measurement GAP and MUSIM gap instances within the window, and

Navailable is the number of non-dropped associated GAP occasions after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the GAP and MUSIM gap in clauses 9.1.8.3, 9.1.10.5, 9.1.12.3, and 9.1.13.3, respectively.

- xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG, also xRP = MGRP for periodic MUSIM gap.

Requirements do not apply for UE configured with concurrent GAPs or MUSIM gaps, if Navailable = 0

When UE supports *musim-GapPreference-r17* and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in clause 9.1.10.4 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell

|  |  |  |
| --- | --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) | |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.256 | (5.12 +Lcancel,PSS/SSS \*0.256)\* CSSFinterRAT x Ceil(Kgap\_EUTRA)  ((20 +Lcancel,PSS/SSS \*0.256)\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | (7.68 +Lcancel,PSS/SSS \*0.256)\* CSSFinterRAT x Ceil(Kgap\_EUTRA)  ((30 +Lcancel,PSS/SSS \*0.256))\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32 | (6.4 +Lcancel,PSS/SSS \*0.32)\* CSSFinterRAT x Ceil(Kgap\_EUTRA)  ((20 +Lcancel,PSS/SSS \*0.32)\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | (7.68 [+Lcancel,PSS/SSS \*0.32)\* CSSFinterRAT x Ceil(Kgap\_EUTRA)  ((24 +Lcancel,PSS/SSS \*0.32))\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32< DRX-cycle ≤10.24 | Note1 ((20 +Lcancel,PSS/SSS \* DRX-cycle)\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note1 ((20 +Lcancel,PSS/SSS \* DRX-cycle))\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.  NOTE 3: Kgap\_EUTRA is only applicable for a UE supporting concurrent GAPs and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1  NOTE 4: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer.  NOTE 5: For the UE supporting *measurement gap occasion cancellation* provided that the configuration and conditions in clause 9.1.y.4 are met, Lcancel,PSS/SSS is the number of gap occasions cancelled during for PSS/SSS detection. Lcancel,PSS/SSS = 0 for UE not supporting *measurement gap occasion cancellation* or the configuration and conditions in clause 9.1.y.4 are not met. | | |

Table 9.4.3.3-2: Requirement to identify a newly detectable E-UTRAN TDD cell when *highSpeedMeasFlag-r16* is configured

|  |  |  |
| --- | --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) | |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle≤0.32 | Note 1(15\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |  |
| 0.32<DRx cycle ≤ 0.64 | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |  |
| DRX cycle = 1.024 | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| DRX cycle = 1.28 | Note 1(8\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note 1(8\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.  NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16.*  NOTE 4: Kgap\_EUTRA is only applicable for a UE supporting concurrent GAPs and/or MUSIM gaps. Otherwise Kgap\_EUTRA = 1  NOTE 5: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer. | | |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period Tmeasure, E-UTRAN TDD specified in table 9.4.3.3-3.

Table 9.4.3.3-3: Requirement to measure E-UTRAN TDD cells

|  |  |
| --- | --- |
| DRX cycle length (s) | Tmeasure, E-UTRAN TDD (s) (DRX cycles) |
| ≤ 0.08 | Non-DRX Requirements in clause 9.4.3.2 apply |
| 0.128 | For configuration 2 Note3, non-DRX requirements in clause 9.4.3.2 apply,  Otherwise: Note1 ((5 +Lcancel,meas \* 0.128)\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.128 < DRX-cycle ≤ 10.24 | Note1 ((5 +Lcancel,meas \* DRX-cycle)\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.  NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.  NOTE 3: See Table 9.4.3.2-1.  NOTE 4: Kgap\_EUTRA is only applicable for a UE supporting concurrent GAPs and/or MUSIM gaps. Otherwise Kgap\_EUTRA = 1  NOTE 5: For the UE supporting *measurement gap occasion cancellation* provided that the configuration and conditions in clause 9.1.y.4 are met, Lcancel,meas is the number of gap occasions cancelled during Tmeasure, E-UTRAN TDD for measurement. Lcancel,meas = 0 for UE not supporting *measurement gap occasion cancellation* or the configuration and conditions in clause 9.1.y.4 are not met. | |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.4 Measurement reporting requirements

##### 9.4.3.4.1 Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

##### 9.4.3.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.3.4.3.

##### 9.4.3.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T Identify, E-UTRAN TDD defined in clauses 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively.When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period TIdentify, E-UTRAN TDD becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than TMeasure, E-UTRAN TDD provided the timing to that cell has not changed more than ± 50 Ts while measurement gap or NCSG has not been available and the L3 filter has not been used.

#### 9.4.3.5 Scheduling Availability During NR − E-UTRAN TDD measurements with NCSG

When UE supports *simultaneousRxTxInterBandENDC* for a band combination, no scheduling restriction is applicable to NR − E-UTRAN TDD measurements with NCSG in this band combination; otherwise UE is not expected to transmit PUCCH/PUSCH/SRS on all symbols within NCSG ML.

When a serving cell and an E-UTRA TDD measurement object are in bands with overlapping frequency with different subcarrier spacings, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within NCSG ML. Otherwise, no scheduling restriction to the serving cell is allowed due to NR − E-UTRAN TDD measurements with NCSG.

# <End of Change 1>