3GPP TSG-RAN2 Meeting #123bis R2-231XXXX

Xiamen, China, October 9– 14, 2023

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **36.304** | **CR** | **XXXX** | **rev** | **-** | **Current version:** | **17.4.0** |  |
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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:***  | 36.304 Running CR for Rel-18 IoT NTN  |
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| ***Source to WG:*** | Nokia |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | IoT\_NTN\_enh-Core |  | ***Date:*** | 2023-21-10 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | Introduction of Release-18 enhancement for IoT-NTN |
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| ***Summary of change:*** | This running CR captures the following RAN2 agreements related to the idle mode procedure for IoT-NTN until RAN2-122.**RAN-123bis**Separate reference locations are introduced for earth-quasi fixed cells and earth-moving cells.**RAN2-123**For NB-IoT NTN, location-based measurement initiation can also be optionally used in RRC\_IDLE for cell re-selection purposes (like in NR-NTN), with the assumption that it is up to the UE to update GNSS location.**RAN2-122**R18 location and time-based trigger for measurements (for connected mode and for idle) apply to both NB-IoT and eMTC.**RAN2-121-bis**1. For eMTC NTN, for fixed cell, location-based measurement initiation can also be used in RRC\_IDLE for cell re-selection purposes (like in NR-NTN)2. For eMTC NTN, for moving cell, location-based measurement initiation can also be used in RRC\_IDLE for cell re-selection purposes (like in NR-NTN). FFS whether to consider a solution that does not require UE to update the GNSS for this same as in connected mode |
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| ***Consequences if not approved:*** | No support for Release-18 enhancements for NTN in IoT |
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| ***Clauses affected:*** | 5.2.4.2,5.2.4.2a, 5.2.4.7.X  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | R2-231XXXX – Changes based on RAN2-123bis agreementsR2-2311194 =-Changes based on RAN2-123 AgreementsR2-2306959 -Endorsed running CR after RAN2-122.R2-2308194 -Summary of changes updated. Base version for further updates in RAN2-123R2-2309330 – Endorsed running CR after RAN2-123 |

Start of changes

#### 5.2.4.2 Measurement rules for cell re-selection

For NB-IoT measurement rules for cell re-selection are defined in clause 5.2.4.2.a.

When evaluating Srxlev and Squal of non-serving cells for reselection purposes, the UE shall use parameters provided by the serving cell.

Following rules are used by the UE to limit needed measurements:

- If the measurements are performed using RSS as specified in [10] and the serving cell fulfils Srxlev> SIntraSearchP:

- If *distanceThresh* and *referenceLocation* are broadcasted in SIB31, and if UE supports location-based measurement initiation and has obtained its location information:

- If *referenceLocation* is *fixedCell*, the *referenceLocation* is used as serving cell reference location. If *referenceLocation* is *movingCell* UE derives the serving reference location based on *ephemeris*, *epochTime* and *referenceLocation* and its current location.

- If the distance between UE and the serving cell reference location is shorter than *distanceThresh* the UE may choose not to perform intra-frequency measurements.- Else,the UE shall perform intra-frequency measurements.

 - Else, the UE may choose not to perform intra-frequency measurements.

- Else if the serving cell fulfils Srxlev> SIntraSearchP and Squal > SIntraSearchQ :

- If *distanceThresh*  and *referenceLocation* are broadcasted in SIB31, and if UE supports location-based measurement initiation and has obtained its location information:

-If *referenceLocation* is *fixedCell*, the *referenceLocation* is used as serving cell reference location. If *referenceLocation* is *movingCell* UE derives the serving reference location based on *ephemeris*, *epochTime* and *referenceLocation* and its current location.

- If the distance between UE and the serving cell reference location is shorter than *distanceThresh*the UE may choose not to perform intra-frequency measurements.

- Else,the UE shall perform intra-frequency measurements.

 - Else, the UE may choose not to perform intra-frequency measurements.

- Otherwise, the UE shall perform intra-frequency measurements.

- The UE shall apply the following rules for E-UTRAN inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:

- For an E-UTRAN inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current E-UTRA frequency the UE shall perform measurements of higher priority E-UTRAN inter-frequency or inter-RAT frequencies according to TS 36.133 [10].

- For an E-UTRAN inter-frequency with an equal or lower reselection priority than the reselection priority of the current E-UTRA frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current E-UTRAN frequency:

- If the measurements are performed using RSS as specified in [10] and the serving cell fulfils Srxlev > SnonIntraSearchP:,

-If *distanceThresh* and *referenceLocation* are broadcasted in SIB31, and if UE supports location-based measurement initiation and has obtained its location:

- If *referenceLocation* is *fixedCell*, the *referenceLocation* is used as serving cell reference location. If *referenceLocation* is *movingCell* UE derives the serving reference location based on *ephemeris*, *epochTime* and *referenceLocation* and its current location.

-If the distance between UE and serving cell reference location is shorter than *distanceThresh* the UE may choose not to perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority unless the UE is triggered to measure an E-UTRAN inter-frequency which is configured with *redistributionInterFreqInfo*.

- Else, the UE shall perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 36.133 [10].

-Else, UE may choose not to perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority unless the UE is triggered to measure an E-UTRAN inter-frequency which is configured with *redistributionInterFreqInfo*.

- Else if the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ:

- If *distanceThresh* and *referenceLocation* are broadcasted in SIB31, and if UE supports location-based measurement initiation and has obtained its location:

* If *referenceLocation* is *fixedCell*, the *referenceLocation* is used as serving cell reference location. If *referenceLocation* is *movingCell* UE derives the serving reference location based on *ephemeris*, *epochTime* and *referenceLocation* and its current location.
* If the distance between UE and serving cell reference location is shorter than *distanceThresh* the UE may choose not to perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority unless the UE is triggered to measure an E-UTRAN inter-frequency which is configured with *redistributionInterFreqInfo*.
* Else, the UE shall perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 36.133 [10].

- Else, UE may choose not to perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority unless the UE is triggered to measure an E-UTRAN inter-frequency which is configured with redistributionInterFreqInfo.

- Otherwise,the UE shall perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 36.133 [10].

- If the UE supports relaxed monitoring and *s-SearchDeltaP* is present in *SystemInformationBlockType3*, the UE may further limit the needed measurements, as specified in clause 5.2.4.12.

If *t-Service* is present in *SystemInformationBlockType3* of the serving cell, UE shall perform intra-frequency, inter-frequency or inter-RAT measurements, before the time *t-Service* regardless whether the serving cell fulfils Srxlev> SIntraSearchP and Squal > SIntraSearchQ, or Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ. The exact time to start measurements before *t-Service* is up to UE implementation. UE shall perform measurements of higher priority inter-frequencies or inter-RAT frequencies regardless of the remaining service time of the serving cell.

#### 5.2.4.2a Measurement rules for cell re-selection for NB-IoT

When evaluating Srxlev and Squal of non-serving cells for reselection purposes, the UE shall use parameters provided by the serving cell.

Following rules are used by the UE to limit needed measurements:

- If the serving cell fulfils Srxlev> SIntraSearchP

- If *distanceThresh* and *referenceLocation are* broadcasted in *SystemInformationBlock31-NB*, and if UE supports location-based measurement initiation and has obtained its location:

-If referenceLocation is fixedCell, the referenceLocation is used as serving cell reference location. If referenceLocation is movingCell UE derives the serving reference location based on ephemeris, epochTime and referenceLocation and its current location.

- If the distance between UE and serving cell reference location is shorter than *distanceThresh* the UE may choose not to perform intra-frequency measurements.

- Else,the UE shall perform intra-frequency measurements.

 - Else, the UE may choose not to perform intra-frequency measurements.

- Otherwise, the UE shall perform intra-frequency measurements.

- The UE shall apply the following rules for NB-IoT inter-frequencies which are indicated in system information:

- If the serving cell fulfils Srxlev > SnonIntraSearchP:

- If *distanceThresh* and *referenceLocation are* broadcasted in *SystemInformationBlock31-NB*, and if UE supports location-based measurement initiation and has obtained its location:

-If referenceLocation is fixedCell, the referenceLocation is used as serving cell reference location. If referenceLocation is movingCell UE derives the serving reference location based on ephemeris, epochTime and referenceLocation and its current location.

- If the distance between UE and serving cell reference location is shorter than *[distanceThresh]* the UE may choose not to perform intra-frequency measurements. - Else,the UE shall perform inter-frequency measurements.

 - Else, the UE may choose not to perform inter-frequency measurements.

- Otherwise,the UE shall perform inter-frequency measurements.

- If the UE supports relaxed monitoring and *s-SearchDeltaP* is present in *SystemInformationBlockType3-NB*, the UE may further limit the needed measurements, as specified in clause 5.2.4.12.

If *t-Service* is present in *SystemInformationBlockType3-NB* of the serving cell, UE shall perform intra-frequency or inter-frequency measurements before the time *t-Service* regardless whether the serving cell fulfils Srxlev> SIntraSearchP or Srxlev > SnonIntraSearchP. The exact time to start measurements before *t-Service* is upon the *t-ServiceStartNeigh* for the corresponding neighbour satellite if it is present in *SystemInformationBlockTypeXX* or up to UE implementation.

Next Change

#### 5.2.4.7 Cell reselection parameters in system information broadcasts

Cell reselection parameters are broadcast in system information and are read from the serving cell as follows:

**altCellReselectionPriority**

This specifies the absolute priority of E-UTRAN frequency used by the UE, if *altFreqPriorities* is configured.

**altCellReselectionSubPriority**

This specifies fractional priority value added to *altCellReselectionPriority* for E-UTRAN frequency used by the UE, if *altFreqPriorities* is configured.

**distanceThresh**

This specifies the distance threshold from serving cell that is used by UE to be used in distance based measurement initiation.

**cellReselectionPriority**

This specifies the absolute priority for E-UTRAN frequency or NR frequency or UTRAN frequency or group of GERAN frequencies or band class of CDMA2000 HRPD or band class of CDMA2000 1xRTT.

**cellReselectionSubPriority**

This specifies the fractional priority value added to cellReselectionPriority for E-UTRAN frequency or NR frequency.

**nrs-PowerOffsetNonAnchor**

This specifies the power offset of the downlink narrowband reference-signal EPRE of the anchor/non-anchor carrier relative to the anchor carrier for NB-IoT UE.

**Poffset**

This specifies the offset for 14 dBm power class for BL or NB-IoT UE.

**Qoffsetauthorization**

This specifies the offset for enhanced coverage authorization for NB-IoT.

**Qoffsets,n**

This specifies the offsetbetween the two cells.

**Qoffsetfrequency**

Frequency specific offset for equal priority E-UTRAN frequencies.

**Qoffsetscptm**

This specifies the offset to be used for cell re-selection for SC-PTM service reception for BL UE, UE in enhanced coverage and NB-IoT UE. The same offset is applicable to all frequencies providing MBMS services via SC-PTM.

**Qoffsettemp**

This specifies the additional offset to be used for cell selection and re-selection. It is temporarily used in case the T300 expires consecutively on the cell as specified in TS 36.331 [3].

**Qhyst**

This specifies the hysteresis value for ranking criteria.

**Qqualmin**

This specifies the minimum required quality level in the cell in dB.

**Qqualmin\_CE, Qqualmin\_CE1**

This specifies the coverage specific minimum required quality level in the cell in dB.

**Qrxlevmin**

This specifies the minimum required Rx level in the cell in dBm.

**Qrxlevmin\_CE, Qrxlevmin\_CE1**

This specifies the coverage specific minimum required Rx level in the cell in dBm.

**RedistributionFactorFreq**

This specifies the redistribution factor for a neighbour E-UTRAN frequency.

**RedistributionFactorCell**

This specifies the redistribution factor for a neighbour E-UTRAN cell.

**RedistributionFactorServing**

This specifies the redistribution factor for serving cell or serving frequency.

**referenceLocation**

This specifies the referenceLocation of the serving satellite and also whether the serving cell is fixed cell or moving cell, to be used in distance based measurement initiation.

**TreselectionRAT**

This specifies the cell reselection timer value. For each target E-UTRA frequency and for each RAT (other than E-UTRA) a specific value for the cell reselection timer is defined, which is applicable when evaluating reselection within E-UTRAN or towards other RAT (i.e. TreselectionRAT for E-UTRAN is TreselectionEUTRA, for NR TreselectionNR, for UTRAN TreselectionUTRA for GERAN TreselectionGERA, for TreselectionCDMA\_HRPD, and for TreselectionCDMA\_1xRTT). For NB-IoT intra-frequency and inter-frequency specific values for the cell reselection timer are defined, which are applicable when evaluating reselection within NB-IoT.

NOTE: TreselectionRAT is not sent on system information, but used in reselection rules by the UE for each RAT.

**TreselectionEUTRA\_ CE**

This specifies the cell reselection timer value TreselectionRAT for E-UTRAN when a neighbour cell is evaluated for camping in enhanced coverage. The parameter can be set per E-UTRAN frequency.

**TreselectionEUTRA**

This specifies the cell reselection timer value TreselectionRAT for E-UTRAN. The parameter can be set per E-UTRAN frequency TS 36.331 [3].

**TreselectionNR**

This specifies the cell reselection timer value TreselectionRAT for NR.

**TreselectionNB-IoT\_Intra**

This specifies the intra-frequency cell reselection timer value TreselectionRAT for NB-IoT.**TreselectionNB-IoT\_Inter**

This specifies the inter-frequency cell reselection timer value TreselectionRAT for NB-IoT.

**TreselectionUTRA**

This specifies the cell reselection timer value TreselectionRAT for UTRAN.

**TreselectionGERA**

This specifies the cell reselection timer value TreselectionRAT for GERAN.

**TreselectionCDMA\_HRPD**

This specifies the cell reselection timer value TreselectionRAT for CDMA HRPD.

**TreselectionCDMA\_1xRTT**

This specifies the cell reselection timer value TreselectionRAT for CDMA 1xRTT.

**Tservice**

This indicates the time when a quasi-Earth fixed cell is going to stop serving the area it is currently covering, to be used in time-based measurement initiation.

**TserviceStartNeigh**

This indicates the time when a quasi-Earth fixed neighbour satellite cell is going to start serving the coverage area currently served by the serving cell, to be used in time-based measurement initiation.

**ThreshX, HighP**

This specifies the Srxlev threshold (in dB) used by the UE when reselecting towards a higher priority RAT/ frequency than the current serving frequency. Each frequency of E-UTRAN, NR and UTRAN, each group of GERAN frequencies, each band class of CDMA2000 HRPD and CDMA2000 1xRTT might have a specific threshold.

**ThreshX, HighQ**

This specifies the Squal threshold (in dB) used by the UE when reselecting towards a higher priority RAT/ frequency than the current serving frequency. Each frequency of E-UTRAN, NR and UTRAN FDD might have a specific threshold.

**ThreshX, LowP**

This specifies the Srxlev threshold (in dB) used by the UE when reselecting towards a lower priority RAT/ frequency than the current serving frequency. Each frequency of E-UTRAN, NR and UTRAN, each group of GERAN frequencies, each band class of CDMA2000 HRPD and CDMA2000 1xRTT might have a specific threshold.

**ThreshX, LowQ**

This specifies the Squal threshold (in dB) used by the UE when reselecting towards a lower priority RAT/ frequency than the current serving frequency. Each frequency of E-UTRAN, NR and UTRAN FDD might have a specific threshold.

**ThreshServing, LowP**

This specifies the Srxlev threshold (in dB) used by the UE on the serving cell when reselecting towards a lower priority RAT/ frequency.

**ThreshServing, LowQ**

This specifies the Squal threshold (in dB) used by the UE on the serving cell when reselecting towards a lower priority RAT/ frequency.

**SIntraSearchP**

This specifies the Srxlev threshold (in dB) for intra-frequency measurements.

**SIntraSearchQ**

This specifies the Squal threshold (in dB) for intra-frequency measurements.

**SnonIntraSearchP**

This specifies the Srxlev threshold (in dB) for E-UTRAN inter-frequency and inter-RAT measurements.

**SnonIntraSearchQ**

This specifies the Squal threshold (in dB) for E-UTRAN inter-frequency and inter-RAT measurements.

**SSearchDeltaP**

This specifies the Srxlev delta threshold (in dB) during relaxed monitoring.