3GPP RAN WG2 Meeting #123bis R2-231XXXX

Xiamen, China, October 9– 14, 2023

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.304** | **CR** | **XXXX** | **rev** | **-** | **Current version:** | **17.4.0** |  |
|  | | | | | | | | |
| *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 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IoT\_NTN\_enh | | | | |  | ***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 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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of Release-18 enhancement for IoT-NTN | | | | | | | | |
|  | |  | | | | | | | | |
| ***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 | | | | | | | | |
|  | |  | | | | | | | | |
| ***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 agreements  R2-2311194 =-Changes based on RAN2-123 Agreements  R2-2306959 -Endorsed running CR after RAN2-122.  R2-2308194 -Summary of changes updated. Base version for further updates in RAN2-123  R2-2309330 – 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 referenceLocationType is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If referenceLocationType is set to *[MovingRef]* UE derives the serving reference location based the *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 referenceLocationType is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If referenceLocationType is set to *[MovingRef]* UE derives the serving reference location based the *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 *referenceLocationType* is set to  *[FixedRef]* the referenceLocation is used as serving cell reference location. If *referenceLocationType* is set to *[MovingRef]* UE derives the serving reference location based the *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 referenceLocationType is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If referenceLocationType is set to *[MovingRef]* UE derives the serving reference location based the *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.

Editor Note: FFS whether RSS-based measurement condition check is applicable for IoT-NTN.

#### 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 *referenceLocationType* is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If *referenceLocationType* is set to *[MovingRef]* UE derives the serving reference location based the *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 *referenceLocationType* is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If *referenceLocationType* is set to *[MovingRef]* UE derives the serving reference location based the *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. If *referenceLocationType* is set to *[FixedRef]* the *referenceLocation* is used as serving cell reference location. If *referenceLocationType* is set to *[MovingRef]* UE derives the serving reference location based the *referenceLocation* and its current location.

- 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 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.

**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.

**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.

**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.

##### 5.2.4.7.1 Speed dependant reselection parameters

**TCRmax**

This specifies the duration for evaluating allowed amount of cell reselection(s).

**NCR\_M**

This specifies the maximum number of cell reselections to enter Medium-mobility state.

**NCR\_H**

This specifies the maximum number of cell reselections to enter High-mobility state.

**TCRmaxHyst**

This specifies the additional time period before the UE can enter Normal-mobility state.

**Speed dependent ScalingFactor for Qhyst**

This specifies scaling factor for Qhyst in *sf-High* for High-mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionNR**

This specifies scaling factor for TreselectionNR in *sf-High* for High-mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionEUTRA**

This specifies scaling factor for TreselectionEUTRA in *sf-High* for High-mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionUTRA**

This specifies scaling factor for TreselectionUTRA in *sf-High* for High-mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionGERA**

This specifies scaling factor for TreselectionGERAin H *sf-High* for High-mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionCDMA\_HRPD**

This specifies scaling factor for TreselectionCDMA\_HRPDin *sf-High* for High mobility state and *sf-Medium* for Medium-mobility state

**Speed dependent ScalingFactor for TreselectionCDMA\_1xRTT**

This specifies scaling factor for TreselectionCDMA\_1xRTTin *sf-High* for High mobility state and *sf-Medium* for Medium-mobility state

##### 5.2.4.7.X Satellite assistance information of neighbour cells

Editor Note: FFS any information in SIB XX relevant for cell reselection to be captured here