**3GPP TSG-RAN WG4 Meeting #109 R4-2320742**

**Chicago, USA, November 13 – November 17, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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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 |  | Core Network |  |

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| ***Title:***  | DraftCR on NB-IoT Neighbor Cell Measurements in RRC\_Connected (36.133) |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | IoT\_NTN\_enh |  | ***Date:*** |  |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | Implementing the section for connected mode measurements for NB-IoT in NTN |
|  |  |
| ***Summary of change:*** | Introducing new feature |
|  |  |
| ***Consequences if not approved:*** | This feature will not be captured in specifications  |
|  |  |
| ***Clauses affected:*** | 8.14A.5 (new) AND 8.14A.6 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Change #1>

### 8.14A.5 Reserved

### 8.14A.6 NB-IoT neighbour cell measurements

#### 8.14A.6.1 Introduction

This clause contains requirements for the neighbour cell measurements performed by the UE category NB1 in RRC\_CONNECTED state. The requirements in this clause are applicable when:

* the UE is in normal coverage or in enhanced coverage on the serving cell and
* the target cell fulfils the criteria for normal coverage.

8.14A.6.2 Requirements

The UE supporting connected mode measurements, as indicated by the capabilities *connModeMeasIntraFreq-r17* and *connModeMeasInterFreq-r17* [31] shall measure neighbour cells when:

* the criterion for triggering the neighbour cell measurements defined in [1] is fulfilled; or
* before *t-service* if the UE supports time-based measurement initiation and t-service is configured by the serving cell [2]; or
* the UE supports location-based measurement initiation and the distance between the UE and the serving cell reference location is larger than distanceThresh [2]. The requirements apply provided that the distance exceeds the distanceThresh by a margin of 50 m.

The measurement quantities are defined in [4], the measurement model is defined in [22].

The requirements for intra-frequency neighbour cell measurement when the target carrier is same as serving carrier is defined in clause 8.14A.6.3, and are applicable for UEs supporting *connModeMeasIntraFreq-r17* .

The requirements for inter-frequency neighbour cell measurement when the target carrier is different from serving carrier is defined in clause 8.14A.6.4, and are applicable for UEs supporting *connModeMeasInterFreq-r17*.

If *t-serviceStartNeigh* is configured for the neighbor cells in a given frequency layer, the UE is not required to initiate measurements in this frequency layer in neighbor cells associated to this satellite until *t-serviceStartNeigh* is reached.

#### 8.14A.6.3 Intra-frequency neighbour cell measurements

The UE shall be able to identify a new detectable intra-frequency cell within Tidentify\_intra\_NB1-NC ­­­when the criteria for intra-frequency measurements is fulfilled [1]. An intra frequency cell is considered to be detectable according to NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot defined in Annex B.2.24 for a corresponding Band.

Tidentify\_intra\_NB1-NC = Tdetect\_intra\_NB1-NC + Tmeasure \_intra\_NB1-NC

If only intra-satellite measurements are configured by the serving cell in this frequency layer, or if the UE is configured to measure GSO satellites:

* When DRX is not used, Tdetect\_intra\_NB1-NC is 1400 ms, and Tmeasure \_intra\_NB1-NC is 800 ms and 1600 ms for NRS-based measurement and NSSS-based measurement respectively.
* When DRX is used, Tdetect\_intra\_NB1-NC and Tmeasure \_intra\_NB1-NC are defined in table 8.14A.6.3-1 and 8.14A.6.3-2.

Table 8.14A.6.3-1: Requirement for intra-frequency detection

|  |  |
| --- | --- |
| DRX cycle length (s) | Tdetect\_intra\_NB1-NC (s) (DRX cycles) |
| 0.256<DRX-cycle≤10.24 |  (6)Note 1 |
| Note1: Time depends upon the DRX cycle in use |

Table 8.14A.6.3-2: Requirement for intra-frequency measurement

|  |  |
| --- | --- |
| DRX cycle length (s) | Tmeasure\_intra\_NB1-NC (s) (DRX cycles) |
| 0.256<DRX-cycle≤10.24 |  (5)Note 1 |
| Note1: Time depends upon the DRX cycle in use |

If the UE is configured to measure a neighbor NGSO satellite, then Tdetect\_intra\_NB1-NC = Tdetect\_inter\_NB1-NC,m and Tmeasure\_intra\_NB1-NC = Tmeasure\_inter\_NB1-NC,m, where Tmeasure\_inter\_NB1-NC,m and Tdetect\_inter\_NB1-NC,m are defined in clause 8.14A.6.4 .

When UE is monitoring multiple carriers, Tidentify\_intra\_NB1-NC = Tdetect\_NB1-NC + Tmeasure\_NB1-NC, where Tdetect\_NB1-NC = Tdetect \_intra\_NB1-NC + and Tmeasure = Tmeasure \_intra\_NB1-NC +.

where

* Nfreq + X. X = 1 if the UE is configured to measure a neighbor NGSO satellite in intrafrequency; X = 0 otherwise.
* Nfreq is number of inter-frequency carriers to be measured according to the measurement capability.

#### 8.14A.6.4 Inter-frequency neighbour cell measurements

The UE shall be able to identify a new detectable inter-frequency cell in the within Tidentify\_inter\_NB1-NC,m ­­­when the criteria for inter-frequency measurement is fulfilled [1]. An inter frequency cell is considered to be detectable according to NRSRP, NRSRP Ês/Iot, NSCH\_RP and NSCH Ês/Iot defined in Annex B.2.25 for a corresponding Band.

 Tidentify \_inter\_NB1-NC = Tdetect\_inter\_NB1-NC,m + Tmeasure \_inter\_NB1-NC,m

Where

 ms

- ,

- Ta,i is the interval between available measurement samples in measurement occasions (MOdetect\_inter\_NB1-NC) for inter-frequency detection, where

 40 ms ≤ Ta,i ≤ 5000 ms

- The UE shall restart the cell detection when the interval between two samples are larger than 5000 ms.

- The UE is not required to monitor NPSS/NSSS more frequent than once per 40ms.

- MOdetect\_inter\_NB1-NC are time occasions containing NPSS/NSSS and fulfil the following conditions:

- Resources on which the UE is not scheduled for data transmission or reception,

- Resources on which the UE is not required to do NPDCCH monitoring,

- Resources occurring during the DRX inactive period

- Length of MOdetect\_inter\_NB1-NC  is at least 200 ms.

- The inter-frequency detection requirements apply when ≤ 60 seconds per inter-frequency carrier.

- *Ksatellite,m*is the number of satellites to be measured in this frequency layer and whose value is equal to:

* 1, if measurements are performed on GSO cells in this frequency layer; or if there is only one NGSO satellite associated to cells the UE is required to measure in this frequency layer;
* 2, if there are two or more NGSO satellites associated to the cells the UE is required to measure;

Tmeasure\_inter\_NB1-NC is the physical layer measurement period of NRSRP on the detected inter-frequency cell as defined below:

 ms

- M = 60 for NRS-based RRM measurement and M = 40 for NSSS based RRM measurement,

- Tb,i is the interval between available measurement samples in measurement occasions (MOmeasure\_inter\_NB1-NC) for inter-frequency measurement, where

 20 ms ≤ Tb,i ≤ 5000 ms for NRS based measurement or

 40 ms ≤ Tb,i ≤ 5000 ms for NSSS-based measurement

- The UE shall restart the measurement when the interval between two samples are larger than 5000 ms.

- The UE is not required to monitor NRS more frequent than once per 20ms for NRS-based measurement and NSSS more frequent than 40 ms for NSSS-based measurement.

- MOmeasure\_inter\_NB1-NC are time occasion containing at least NRS or NSSS that fulfil the following conditions:

- Resources on which the UE is not scheduled for data transmission or reception,

- Resources on which the UE is not required to do NPDCCH monitoring,

- Resources occurring during the DRX inactive period,

- Length of MOmeasure\_inter\_NB1-NC  is at least 50 ms.

- The inter-frequency measurement requirements apply when ≤ 50 seconds per inter-frequency carrier.

When UE is monitoring multiple carriers, Tidentify\_inter\_NB1-NC = Tdetect\_NB1-NC + Tmeasure\_NB1-NC, where Tdetect\_NB1-NC = Tdetect \_intra\_NB1-NC + and Tmeasure = Tmeasure\_intra\_NB1-NC +. Nfreq is number of inter-frequency carriers to be measured according to the measurement capability, where Tmeasure\_intra\_NB1-NC andTdetect \_intra\_NB1-NC are defined in clause 8.14A.6.2.

where

* Nf + X. X = 1 if the UE is configured to measure a neighbor NGSO satellite in intrafrequency; X = 0 otherwise.
* Nfreq is number of inter-frequency carriers to be measured according to the measurement capability.

#### 8.14A.6.5 Requirements for monitoring multiple carriers

For RRC\_CONNECTED state, the UE shall be capable of monitoring at least:

- Depending on UE capability, an intra-frequency carrier.

- Depending on UE capability, at least 2 inter-frequency carriers.