**3GPP TSG-RAN4 Meeting #109 *R4-2321646***

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

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** | 7276 | **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:***  | Big CR to TS 36.133 on RRM requirements for IoT NTN enhancements |
|  |  |
| ***Source to WG:*** | MediaTek inc. |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | IoT\_NTN\_enh-Core |  | ***Date:*** | 2023-11-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** |  |
|  | *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:*** | Introduce RRM core requirements based on the endorsed CRs in RAN4#109, including:  For NB-IoT,

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Note** |
| R4-2318074 | CR on cell re-selection requirement for IoT NTN enhancement for UE category NB-IoT | MediaTek inc. | 4.6A.2 (4.6A.2.2, 4.6A.2.4, 4.6A.2.5, 4.6A.2.6) |
| R4-2321578 | DraftCR to 36.133 on Connected Mode Mobility for IoT NTN | Nokia, Nokia Shanghai Bell | (new) 8.14A.5(new) 8.14A.6 |
| R4-2321579 | Draft CR on RRM impact of GNSS re-acquisition for NB-IoT | Huawei, HiSilicon | 7.23A, 8.14A.1 |

For eMTC,

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| --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Note** |
| R4-2320015  | draftCR on IDLE mode requirements for eMTC over NTN | Huawei, HiSilicon | 4.7A.2 (4.7A.2.1.1A, 4.7A.2.1.2, 4.7A.2.1.3, 4.7A.2.2.1A, 4.7A.2.2.2, 4.7A.2.2.3) |
| R4-2321619 | Draft CR to TS 36.133: Conditional HO for Cat-M1 for IOT-NTN | CMCC | 5.5A (5.5A.2.3, 5.5A.3.3, 5.5A.3.4) |
| R4-2321581 | DraftCR to 36.133 on Connected Mode Mobility for Emtc NTN | Nokia, Nokia Shanghai Bell | 8.13A |
| R4-2321555 | IoT NTN RRM requirements during GNSS reacquisition | Ericsson | 8.13A |

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| ***Summary of change:*** | Introduce RRM performance requirements and test cases:

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| --- | --- | --- |
| **Clause** | **Description** | **Note** |
| 4.6A.2 (4.6A.2.2, 4.6A.2.4, 4.6A.2.5, 4.6A.2.6) | Update intra-/inter-frequency measurement requirements for location based cell re-selection for UE category NB-IoT for Satellite Access | R4-2318074 |
| 7.23A, 8.14A.1 | Add descriptions regarding GNSS re-acquisition happens during the measurement period | R4-2321579 |
| (new) 8.14A.5 | reserved | R4-2321578 |
| (new) 8.14A.6 | Introduce requirements for connected mode measurements for NB-IoT in NTN | R4-2321578 |
| 4.7A.2 (4.7A.2.1.1A, 4.7A.2.1.2, 4.7A.2.1.3, 4.7A.2.2.1A, 4.7A.2.2.2, 4.7A.2.2.3) | Update cell re-selection requirement for IoT enhancement for eMTC over NTN | R4-2320015 |
| 5.5A (5.5A.2.3, 5.5A.3.3, 5.5A.3.4) | Update the CHO requirements for NTN eMTC with time and location-based trigger conditions. | R4-2321619 |
| 8.13A | R4-2321581* Implementing the enhancements for connected mode measurements for eMTC in NTN

R4-2321555* Change 1: Measurement behaviour when GNSS gaps and mobility measurement gaps are overlapping is clarified according to agreement in R4-2317395.
* Change 2: For CEModeA, use of measurement gaps when configured with t-ServiceStartNeigh for a neighbour cell to be identified is clarified based on ongoing discussions.
* Change 3: For CEModeB, use of measurement gaps when configured with t-ServiceStartNeigh for a neighbour cell to be identified is clarified based on ongoing discussions.
 | R4-2321581R4-2321555 |

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| ***Consequences if not approved:*** | RRM core requirements are not applicable for IoT NTN enhancement |
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| ***Clauses affected:*** | (existing) 4.6A.2, 7.23A, 8.14A, 4.7A.2, 5.5A, 8.13A(new) 8.14A.5, 8.14A.6 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 36.521-3 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

### <Start of Change>

4.6A.2.2 Measurements of intra-frequency NB-IoT cells for UE category NB1 in normal coverage

The UE shall be able to identify new intra-frequency cells and perform NRSRP measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

If *distanceThresh* and *referenceLocation* are broadcasted, and if UE supports location-based measurement initiation and has obtained its location, the UE may not perform intra-frequency measurements if the distance between UE and serving cell reference location is shorter than *distanceThresh.*

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite\*Tdetect,NB\_Intra\_NCwhen Treselection= 0. 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.1.4 for a corresponding Band.

### <Next Change>

4.6A.2.4 Measurements of intra-frequency NB-IoT cells for UE category NB1 in enhanced coverage

The UE shall be able to identify new intra-frequency cells and perform NRSRP measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

If *distanceThresh* and *referenceLocation* are broadcasted, and if UE supports location-based measurement initiation and has obtained its location, the UE may not perform intra-frequency measurements if the distance between UE and serving cell reference location is shorter than *distanceThresh.*

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite\*Tdetect,NB\_Intra\_ECwhen that Treselection= 0. 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.1.4 for a corresponding Band.

### <Next Change>

4.6A.2.5 Measurements of inter-frequency NB cells for UE category NB1 in normal coverage

The UE shall be able to identify new inter-frequency cells and perform NRSRP measurements of identified inter-frequency cells if carrier frequency information is provided by the serving NB-IoT cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev ≤ SnonIntraSearchP then the UE shall search for and measure inter-frequency layers in preparation for possible reselection.

If *distanceThresh* and *referenceLocation* are broadcasted, and if UE supports location-based measurement initiation and has obtained its location, the UE may not perform inter-frequency measurements if the distance between UE and serving cell reference location is shorter than *distanceThresh.*

### <Next Change>

4.6A.2.6 Measurements of inter-frequency NB-IoT cells for UE category NB1 in enhanced coverage

The UE shall be able to identify new inter-frequency cells and perform NRSRP measurements of identified inter-frequency cells if carrier frequency information is provided by the serving NB-IoT cell, even if no explicit neighbour list with physical layer cell identities is provided.

If *distanceThresh* and *referenceLocation* are broadcasted, and if UE supports location-based measurement initiation and has obtained its location, the UE may not perform inter-frequency measurements if the distance between UE and serving cell reference location is shorter than *distanceThresh.*

### <Next Change>

7.23A Radio Link Monitoring for Category NB-IoT UE for Satellite Access

7.23A.1 Introduction

The applicability of the requirements for performing radio link monitoring for Category NB1 UE in subclause 7.23A is defined in Section 3.6.1.

The UE shall monitor the downlink link quality based on the narrowband reference signal in order to detect the downlink radio link quality of the NB-IoT cell served by satellite access node (SAN) as specified in [3]. The measurement delay could be longer if GNSS re-acquisition happens during the measurement period defined in 7.23A, and UE shall restart the cell measurement when the interval between two samples are larger than 5000 ms.

### <Next Change>

8.14A Measurements for UE category NB-IoT for Satellite Access

8.14A.1 Introduction

The requirements in clause 8.14A apply for intra-frequency measurements on an SAN carrier frequency.

This clause contains requirements on the UE category NB1 regarding measurement in RRC\_CONNECTED state. The requirements are specified for NB-IoT intra frequency measurements for serving NB-IoT cell. These measurements may be used by the NB-IoT for uplink power control. The measurement quantities are defined in [4], the measurement model is defined in [22] and measurement accuracies are specified in clause TBD. During the RRC\_CONNECTED state the UE shall continuously measure serving NB-IoT cell.

The UE shall meet all applicable requirements specified in clause 8.14A under the following conditions:

- at least 1 DL subframe per radio frame of serving NB-IoT cell is available at the UE during measurement period.

- Valid information for the serving satellite has been provided

The measurement delay could be longer if GNSS re-acquisition happens during the measurement period defined in 8.14A, UE shall restart the cell measurement when the interval between two samples are larger than 5000 ms.

### <Next Change>

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 +.

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.

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.

### <Next Change>

##### 4.7A.2.1.1A Relaxed measurement and evaluation of serving cell for UE category M1 in normal coverage

The UE which supports *wakeUpSignal-r15* shall meet the requirement defined for the DRX cycle length of N\*DRX\_cycle in Section 4.7A.2.1.1, provided the following conditions are met:

- WUS has been configured in the serving cell using *WUS-Config-r15*, and

- The serving cell measurement relaxation is signalled by the network using *num-DRX-CyclesRelaxed*, and

- Serving cell S criteria is met with at least 2 dB margin.

- The relaxed monitoring criteria for neighbour cells in TS 36.304 [1] clause 5.2.4.12.1 is fulfilled,

- If *t-Service* is configured, the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for *t-Service* is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is larger than Ttrigger, where

Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Kcarrier\* Tdetect,EUTRAN\_Inter\_NC),

where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Tdetect,EUTRAN\_Intra\_NC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.2,

- Tdetect,EUTRAN\_Inter\_NC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.3.

*Editor’s note:* FFS on following additional conditions when the UE is configured with ‘*t-Service*’ [2] in the serving cell:

- [If the UE is not configured with eDRX\_IDLE cycle and if the UE is configured with ‘*t-Service*’ [2] in the serving cell and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [4] DRX cycles before ‘*t-Service-r17*’, or

- [If the UE is configured with eDRX\_IDLE cycle and with ‘*t-Service*’ [2] in the serving cell and with eDRX\_IDLE cycle, and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [1] eDRX cycle before ‘*t-Service*’. ]

### <Next Change>

##### 4.7A.2.1.2 Measurements of intra-frequency cells for UE category M1 in normal coverage

The requirements in this subclause apply for the UE in the normal coverage area of the serving cell served by a satellite access node. The UE is considered to be in normal coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if the *distanceThresh* is configured and UE has location information, then the UE may not perform measurement of intra-frequency.

The UE shall be able to identify new intra-frequency cells and perform RSRP and RSRQ measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

- the UE supports measuring neighbour cell RSS on the same paging MPDCCH narrowband, and RSS of the measured cell are available within the paging MPDCCH narrowband for Tevaluate, E-UTRAN\_Intra\_NC\_RSS successive DRX cycles, and the last subframe of the RSS occasion of the measured cell is in the window [n-5, n-1] where n is the first subframe of paging MPDCCH, or

- the UE does not support measuring neighbour cell RSS on the same paging MPDCCH narrowband, and RSS of the measured cell are available within the same RB location as the RSS RB location of the serving cell for Tevaluate, E-UTRAN\_Intra\_NC\_RSS successive DRX cycles, and the last subframe of the RSS occasion of the measured cell is in the window [n-5, n-1] where n is the first subframe of paging MPDCCH, and

- UE is not configured with eDRX\_IDLE cycle, and

- RSS power offset (PRSS) with respect to CRS as defined in *rss-MeasPowerBias* [2], where PRSS ≥ 0 dB.

If UE performs RSRP measurement based on RSS on detected intra-frequency cell, it is not expected to perform RSRP measurement based on CRS on that measured cell. UE shall compensate the RSS power offset (PRSS) with respect to CRS when derving the RSRP measurement based on RSS.

For performing RSRP measurement based on RSS on detected intra-frequency cells, UE assumes BL/CE DL subframe configuration of each neighbor cell is same as serving cell. The requirements for RSRP measurement based on RSS for a neighbour cell apply provided that BL/CE DL subframe configuration of the neighbor cell is same as serving cell.

Additionally, for performing RSS-based RSRP measurements on detected intra-frequency cells, the UE assumes that the RSS transmission of each neighbor cell starts in the radio frame that is closest in time, i.e. within a window of +/- 5ms, around the corresponding radio frame offset calculated from RRC signalling in the serving cell, as described in TS 36.331 subclause 6.3. The requirements for RSS-based RSRP measurements for neighbor cells apply provided that the RSS transmission of each neighbor cell starts in the radio frame within a window of +/- 5ms around the calculated radio frame offset of the serving cell.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Tdetect,EUTRAN\_Intra\_NCwhen that Treselection= 0. An intra frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.3 for a corresponding Band.

The UE shall measure RSRP and RSRQ at least every Tmeasure,EUTRAN\_Intra\_NC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter RSRP and RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,EUTRAN\_Intra\_NC/2.

The UE shall not consider a E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_Intra\_NC when Treselection = 0, provided that the cell is at least 4dB better ranked for Cat-M1 UE. For neigbor cell measured with RSS, the Tevaluate,E-UTRAN\_Intra\_NC\_RSS as defined in Table 4.7A.2.1.2-1 applies.

If Treselection timer has a non zero value and the intra-frequency cell is better ranked than the serving cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC are specified in Table 4.7A.2.1.2-1.

For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC are specified in Table 4.7A.2.1.2-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC when multiple PTWs are used.

If ‘*t-Service*’ is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location is met or the legacy Srxlev/Squal condition are met, and when to start the detection, measurement and evaluation on neighbour cells is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger.

 Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Kcarrier\* Tdetect,EUTRAN\_Inter\_NC),

where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Tdetect,EUTRAN\_Intra\_NC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.2,

- Tdetect,EUTRAN\_Inter\_NC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.3.

If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_IDLE, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s for for Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC are specified in Table 4.7A.2.1.2-1 starting from [at least K] before ‘*t-Service-r17*’.

### <Next Change>

##### 4.7A.2.1.3 Measurements of inter-frequency cells for UE category M1 in normal coverage

The requirements in this subclause apply if UE is in the normal coverage area of the serving cell served by satellite access node. The UE is considered to be in normal coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

The UE shall be able to identify new inter-frequency cells and perform RSRP or RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided. The UE shall not cause any interruption to the paging reception and acquisition of SI while performing measurement on serving or any neighbor cells.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, or the distance between UE and serving cell reference location is larger than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. The requirements apply provided that the distance exceeds the *distanceThresh* by a margin of 50 m. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite \* Kcarrier\*Tdetect,EUTRAN\_Inter\_NC, if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 8 dB for reselections based on ranking or 8 dB for RSRP reselections based on absolute priorities or 5.5 dB for RSRQ reselections based on absolute priorities. Kcarrier is the number of inter-frequency carriers in the neighbour cell list. An inter frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.8 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,E-UTRAN\_Inter\_NC . If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure RSRP or RSRQ at least every Ksatellite \* Kcarrier\*Tmeasure,EUTRAN\_Inter\_NC for identified lower or equal priority inter-frequency cells. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter RSRP or RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Ksatellite \* Tmeasure,EUTRAN\_Inter\_NC/2.

The UE shall not consider a E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 36.304 within Ksatellite \* Kcarrier\*Tevaluate,E-UTRAN\_Inter\_NC, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 7 dB for reselections based on ranking or 7dB for RSRP reselections based on absolute priorities or 5dB for RSRQ reselections based on absolute priorities.

The paraemter Ksatellite is the scaling factor for measurements corresponding to multiple NGSO satellites. Ksatellite = TBD

If Treselection timer has a non zero value and the inter-frequency cell is better ranked than the serving cell, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC are specified in Table 4.7A.2.1.3-1.

For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC are specified in Table 4.7A.2.1.3-2. Additionally, the requirements in Table 4.7A.2.1.3-2 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC when multiple PTWs are used.

If *t-Service* is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location or the legacy Srxlev/Squal condition are met, and when to start detection, measurement, and evaluation is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger, and Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Kcarrier\* Tdetect,EUTRAN\_Inter\_NC), when serving cell is below the search threshold, and Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Nlayer\* [60s]) when serving cell is above the search threshold, where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Nlayer is the total number of higher priority carrier frequencies broadcasted in system information,

- Tdetect,EUTRAN\_Intra\_NC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.2,

- Tdetect,EUTRAN\_Inter\_NC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.3.

If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_IDLE, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s for for Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC are specified in Table 4.7A.2.1.3-1starting from [at least K] before ‘*t-Service-r17*’.

### <Next Change>

##### 4.7A.2.2.1A Relaxed measurement and evaluation of serving cell for UE category M1 in enhaned coverage

The UE which supports *wakeUpSignal-r15* shall meet the requirement defined for the DRX cycle length of N\*DRX\_cycle in Section 4.7A.2.2.1, provided the following conditions are met:

- WUS has been configured in the serving cell using *WUS-Config-r15*, and

- The serving cell measurement relaxation is signalled by the network using *num-DRX-CyclesRelaxed*, and

- Serving cell S criteria is met with at least 2 dB margin.

- The relaxed monitoring criteria for neighbour cells in TS 36.304 [1] clause 5.2.4.12.1 is fulfilled,

- If *t-Service* is configured, the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for *t-Service* is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is larger than Ttrigger, where

Ttrigger = max(Tdetect,EUTRAN\_Intra\_EC, Kcarrier\* Tdetect,EUTRAN\_Inter\_EC),

where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Tdetect,EUTRAN\_Intra\_EC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.2.2,

- Tdetect,EUTRAN\_Inter\_EC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.2.3.

*Editor’s note:* FFS on following additional conditions when the UE is configured with ‘*t-Service*’ [2] in the serving cell:

- [If the UE is not configured with eDRX\_IDLE cycle and if the UE is configured with ‘*t-Service*’ [2] in the serving cell and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [4] DRX cycles before ‘*t-Service-r17*’, or

- If the UE is configured with eDRX\_IDLE cycle and with ‘*t-Service*’ [2] in the serving cell and with eDRX\_IDLE cycle, and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [1] eDRX cycle before ‘*t-Service*’.]

### <Next Change>

##### 4.7A.2.2.2 Measurements of intra-frequency cells for UE category M1 in enhanced coverage

The requirements in this subclause apply for UE in the enhanced coverage area of the serving cell served by a satellite access node. The UE is considered to be in enhanced coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if the *distanceThresh* is configured and UE has location information, then the UE may not perform measurement of intra-frequency.

The UE shall be able to identify new intra-frequency cells and perform RSRP and RSRQ measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities. The UE shall not cause any interruption to the paging reception and acquisition of SI while performing measurement on serving or any neighbor cells.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

- the UE supports measuring neighbour cell RSS on the same paging MPDCCH narrowband, and RSS of the measured cell are available within the paging MPDCCH narrowband for Tevaluate, E-UTRAN\_Intra\_EC\_RSS successive DRX cycles, and the last subframe of the RSS occasion of the measured cell is in the window [n-5, n-1] where n is the first subframe of paging MPDCCH, or

- the UE does not support measuring neighbour cell RSS on the same paging MPDCCH narrowband, and RSS of the measured cell are available within the same RB location as the RSS RB location of the serving cell for Tevaluate, E-UTRAN\_Intra\_EC\_RSS successive DRX cycles, and the last subframe of the RSS occasion of the measured cell is in the window [n-5, n-1] where n is the first subframe of paging MPDCCH, and

- UE is not configured with eDRX\_IDLE cycle, and

- RSS power offset (PRSS) with respect to CRS as defined in *rss-MeasPowerBias* [2], where PRSS ≥ 0 dB.

If UE performs RSRP measurement based on RSS on detected intra-frequency cell, it is not expected to perform RSRP measurement based on CRS on that measured cell. UE shall compensate the RSS power offset (PRSS) with respect to CRS when derving the RSRP measurement based on RSS.

For performing RSRP measurement based on RSS on detected intra-frequency cells, UE assumes BL/CE DL subframe configuration of each neighbor cell is same as serving cell. The requirements for RSRP measurement based on RSS for a neighbour cell apply provided that BL/CE DL subframe configuration of the neighbor cell is same as serving cell.

Additionally, for performing RSS-based RSRP measurements on detected intra-frequency cells, the UE assumes that the RSS transmission of each neighbor cell starts in the radio frame that is closest in time, i.e. within a window of +/- 5ms, around the corresponding radio frame offset calculated from RRC signalling in the serving cell, as described in TS 36.331 subclause 6.3. The requirements for RSS-based RSRP measurements for neighbor cells apply provided that the RSS transmission of each neighbor cell starts in the radio frame within a window of +/- 5ms around the calculated radio frame offset of the serving cell.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Tdetect,EUTRAN\_Intra\_ECwhen that Treselection= 0. An intra-frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.3 for a corresponding Band.

The UE shall measure RSRP and RSRQ at least every Tmeasure,EUTRAN\_Intra\_EC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter RSRP and RSRQ measurements of each measured intra-frequency cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,EUTRAN\_Intra\_EC/2.

The UE shall not consider an E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_intra\_EC when Treselection = 0, provided that the cell is at least 5dB better ranked. For neigbor cell measured with RSS, the Tevaluate,E-UTRAN\_Intra\_EC\_RSS as defined in Table 4.7A.2.2.2-1 and Table 4.7A.2.2.2-2 applies.

If Treselection timer has a non zero value and the intra-frequency cell is better ranked than the serving cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7A.2.2.2-1.

For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7A.2.2.2-2. Additionally, the requirements in Table 4.7A.2.2.2-2 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC when multiple PTWs are used.

If ‘*t-Service*’ is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location is met or the legacy Srxlev/Squal condition are met, and when to start the detection, measurement and evaluation on neighbour cells is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger.

 Ttrigger = max(Tdetect,EUTRAN\_Intra\_EC, Kcarrier\* Tdetect,EUTRAN\_Inter\_EC),

where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Tdetect,EUTRAN\_Intra\_EC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.2.2,

- Tdetect,EUTRAN\_Inter\_EC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.2.3.

If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_IDLE, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s for Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7A.2.2.2-1 starting from [at least K] before ‘*t-Service-r17*’.

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##### 4.7A.2.2.3 Measurements of inter-frequency cells for UE category M1 in enhanced coverage

The requirements in this subclause apply if UE is in the enhanced coverage area of the serving cell. The UE is considered to be in enhanced coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

The UE shall be able to identify new inter-frequency cells and perform RSRP or RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided. The UE shall not cause any interruption to the paging reception and acquisition of SI while performing measurement on serving or any neighbor cells.

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the distance between UE and serving cell reference location is smaller than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, or the distance between UE and serving cell reference location is larger than *distanceThresh* if *distanceThresh* is configured and UE has location information, then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. The requirements apply provided that the distance exceeds the *distanceThresh* by a margin of 50 m. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS36.304 within Ksatellite \* Kcarrier\*Tdetect,EUTRAN\_Inter\_EC, if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 8 dB for reselections based on ranking. Kcarrier is the number of inter-frequency carriers in the neighbour cell list. An inter frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.8 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,E-UTRAN\_Inter\_EC . If, after detecting a ce ll in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure RSRP or RSRQ at least every Ksatellite \* Kcarrier\*Tmeasure,EUTRAN\_Inter\_EC for identified lower or equal priority inter-frequency cells. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter RSRP or RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Ksatellite \* Tmeasure,EUTRAN\_Inter\_EC/2.

The UE shall not consider a E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 36.304 within Ksatellite \* Kcarrier\*Tevaluate,E-UTRAN\_Inter\_EC, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 8 dB for reselections based on ranking.

The paraemter Ksatellite is the scaling factor for measurements corresponding to multiple NGSO satellites. Ksatellite = TBD

If Treselection timer has a non zero value and the inter-frequency cell is better ranked than the serving cell, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7A.2.2.3-1.

For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7A.2.2.3-3. Additionally, the requirements in Table 4.7A.2.2.3-3 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC when multiple PTWs are used.

If *t-Service* is broadcasted and applicable, UE shall be able to detect, measure, and evaluate neighbour cells before the serving cell stops serving the area regardless of whether the distance condition based on serving cell reference location or the legacy Srxlev/Squal condition are met, and when to start detection, measurement, and evaluation is up to UE implementation. This requirement does not apply when the time span from the last slot of SI transmission within SI modification period where the broadcasting of the last updated value for t-Service is acquired by the UE for the first time to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than Ttrigger, and Ttrigger = max(Tdetect,EUTRAN\_Intra\_EC, Kcarrier\* Tdetect,EUTRAN\_Inter\_EC), when serving cell is below the search threshold, and Ttrigger = max(Tdetect,EUTRAN\_Intra\_EC, Nlayer\* [60s]) when serving cell is above the search threshold, where

- Kcarrier is the number of inter-frequency carriers indicated by the serving cell,

- Nlayer is the total number of higher priority carrier frequencies broadcasted in system information,

- Tdetect,EUTRAN\_Intra\_EC refers to intra-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.2,

- Tdetect,EUTRAN\_Inter\_EC refers to inter-frequency cell detection delay in IDLE/INACTIVE mode defined in clause 4.7A.2.1.3.

If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_IDLE, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s for Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7A.2.2.3-1 starting from [at least K] before ‘*t-Service-r17*’.

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5.5A.2.3 E-UTRAN FDD – FDD conditional HO for Cat-M1 FDD UEs

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handovers for a Cat-M1 FDD UE in CEModeA.

5.5A.2.3.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 36.331 [2].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover seconds from the end of the last TTI containing the RRC command.

 Dhandover = TRRC + TEvent\_DU + Tmeasure + TCHO\_execution + Tinterrupt

Where:

- TRRC is the maximum RRC procedure delay to be defined in clause 11.2 in TS 36.331 [2].

- TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

- Tmeasure is the measurements time stated in clause 5.5A.2.3.2.

- TCHO\_execution is the conditional execution preparation time in clause 5.5A.2.3.3.

- Tinterrupt is the interruption time stated in clause 5.5A.2.3.4.

5.5A.2.3.2 Measurement time

The measurement time delay Tmeasure is defined as the time period from the end of TEvent\_DU until the UE begins the preparation time for handover execution. If only *condEventD1* or *condEventT1* is configured, then Tmeasure = 0.

The measurement event evaluation delay measured without Time To Trigger (TTT) and L3 filtering shall be less than Tidentify intra defined in clause 8.13A.2.1 for intra-frequency conditional handover or Tidentify inter defined in clause 8.13A.2.2 for inter-frequency conditional handover. When TTT or L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra defined in clause 8.13A.2.1 or Tidentify inter defined in clause 8.13A.2.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TMeasurement\_Period, Intra or TMeasurement\_Period, Inter provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

5.5A.2.3.3 Preparation time

Preparation time is the time when the UE prepares the target cell for conditional handover. It begins after measurement time.

- TCHO\_execution is the time needed for preparing the conditional handover to the target cell.

- TCHO\_execution can be up to 10 ms.

5.5A.2.3.4 Interruption time

The interruption time is the time between when the UE completes the preparation time TCHO\_execution and the time when the UE starts the transmission of the PRACH to the target cell.

When intra-frequency conditional handover or inter-frequency conditional handover is commanded and the field *sameSFN-Indication* and *mib-RepetitionStatus* [2] are included in the handover command then the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TIU + 20 ms

When intra-frequency contional handover or inter-frequency conditional handover is commanded and the field *sameSFN-Indication* or *mib-RepetitionStatus* [2] is not included in the handover command then the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TMIB + TIU + 20 ms

Where:

- TIU is the time required to complete the transmission of PRACH in the target cell. The actual value of TIU shall depend upon the uncertainity in acquiring the first available PRACH occasion based on the PRACH configuration used in the target cell and the PRACH coverage enhancement level used by the UE for sending the random access preamble to the target cell.

- In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement for a time duration equal or longer than the time duration required for the cell identification. Otherwise, it is unknown. For intra-frequency handover the time duration required for the cell identification is specified in relevant intra-frequency cell identification requirements as described in Clause 8.13A.2.1 for CEModeA. For inter-frequency handover the time duration required for the cell identification is specified in relevant inter-frequency cell identification requirements as described in Clause 8.13A.2.2 for CEModeA.

- TMIB is the time required for acquiring the MIB and SIB information of the target cell.

- Tsearch is the time required to search the target cell. If the target cell is known, then Tsearch = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch = 80 ms. Otherwise, Tsearch shall be according to the non-DRX cell identification requirements specified in Clause 8.13A.2.1 for intra-frequency handover for a UE configured with CEModeA or Tsearch shall be according to the non-DRX cell identification requirements specified in Clause 8.13A.2.2 with KSAT =1 and Nfreq = 1 for inter-frequency handover for a UE configured with CEModeA. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement for a time duration equal or longer than the time duration required for the cell identification. Otherwise, it is unknown. For intra-frequency handover the time duration required for the cell identification is specified in relevant intra-frequency cell identification requirements as described in Clause 8.13A.2.1 for CEModeA. For inter-frequency handover the time duration required for the cell identification is specified in relevant inter-frequency cell identification requirements as described in Clause 8.13A.2.2 with KSAT =1 and Nfreq = 1 for CEModeA.

5.5A.2.4 E-UTRAN FDD – FDD conditional HO for Cat-M1 HD – FDD UEs

The requirements defined in clause 5.5A.2.3 are applicable to FDD intra-frequency conditional handovers and FDD inter-frequency conditional handovers for a Cat-M1 HD-FDD UE in CEModeA.

### <Next Change>

5.5A.3.3 E-UTRAN FDD – FDD conditional HO for Cat-M1 FDD UEs

The requirements in this clause are applicable to both intra-frequency and inter-frequency conditional handovers for a Cat-M1 FDD UE in CEModeA.

5.5A.3.3.1 Handover delay

Procedure delays for all procedures that can command a conditional handover are specified in TS 36.331 [2].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover seconds from the end of the last TTI containing the RRC command.

 Dhandover = TRRC + TEvent\_DU + Tmeasure + TCHO\_execution + Tinterrupt

Where:

- TRRC is the maximum RRC procedure delay to be defined in clause 11.2 in TS 36.331 [2].

- TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

- Tmeasure is the measurements time stated in clause 5.5A.3.3.2.

- TCHO\_execution is the conditional execution preparation time in clause 5.5A.3.3.3.

- Tinterrupt is the interruption time stated in clause 5.5A.3.3.4.

5.5A.3.3.2 Measurement time

The measurement time delay Tmeasure is defined as the time period from the end of TEvent\_DU until the UE begins the preparation time for handover execution. If only *condEventD1* or *condEventT1* is configured, then Tmeasure = 0.

The measurement event evaluation delay measured without Time To Trigger (TTT) and L3 filtering shall be less than T identify intra defined in clause 8.13A.3.1 for intra-frequency conditional handover or Tidentify inter defined in clause 8.13A.3.2 for inter-frequency conditional handover. When TTT or L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra defined in clause 8.13A.3.1 or T identify inter defined in clause 8.13A.3.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than TMeasurement\_Period, Intra or TMeasurement\_Period, Inter provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

5.5A.3.3.3 Preparation time

Preparation time is the time when the UE prepares the target cell for conditional handover. It begins after measurement time.

TCHO\_execution is the time needed for preparing the conditional handover to the target cell.

TCHO\_execution can be up to 10 ms.

5.5A.3.3.4 Interruption time

The interruption time is the time between when the UE completes the preparation time TCHO\_execution and the time when the UE starts the transmission of the PRACH to the target cell.

When intra-frequency conditional handover or inter-frequency conditional handover is commanded and the field *sameSFN-Indication* and *mib-RepetitionStatus* [2] are included in the handover command then the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TIU + 20 ms

When intra-frequency contional handover or inter-frequency conditional handover is commanded and the field *sameSFN-Indication* or *mib-RepetitionStatus* [2] is not included in the handover command then the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TMIB + TIU + 20 ms

Where:

- TIU is the time required to complete the transmission of PRACH in the target cell. The actual value of TIU shall depend upon the uncertainity in acquiring the first available PRACH occasion based on the PRACH configuration used in the target cell and the PRACH coverage enhancement level used by the UE for sending the random access preamble to the target cell.

- In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement for a time duration equal or longer than the time duration required for the cell identification. Otherwise, it is unknown. For intra-frequency handover the time duration required for the cell identification is specified in relevant intra-frequency cell identification requirements as described in Clause 8.13A.3.1 for CEModeA. For inter-frequency handover the time duration required for the cell identification is specified in relevant inter-frequency cell identification requirements as described in Clause 8.13A.3.2 for CEModeA

- TMIB is the time required for acquiring the MIB and SIB information of the target cell.

- Tsearch is the time required to search the target cell when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then Tsearch = 80 ms. Otherwise, Tsearch shall be according to the non-DRX cell identification requirements specified in Clause 8.13A.3.1 for intra-frequency handover for a UE configured with CEModeB or Tsearch shall be according to the non-DRX cell identification requirements specified in Clause 8.13A.3.2 with KSAT =1 and Nfreq = 1 for inter-frequency handover for a UE configured with CEModeB. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

- In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement for a time duration equal or longer than the time duration required for the cell identification. Otherwise, it is unknown. For intra-frequency handover the time duration required for the cell identification is specified in relevant intra-frequency cell identification requirements as described in Clause 8.13A.3.1 for CEModeB. For inter-frequency handover the time duration required for the cell identification is specified in relevant inter-frequency cell identification requirements as described in Clause 8.13A.3.2 with KSAT =1 and Nfreq = 1 for CEModeB.

5.5A.3.4 E-UTRAN FDD – FDD conditional HO for Cat-M1 HD – FDD UEs

The requirements defined in clause 5.5A.3.3 are applicable to FDD intra-frequency conditional handovers and FDD inter-frequency conditional shandovers for a Cat-M1 HD-FDD UE configured with CEModeB.

### <Next Change>

8.13A Measurements for UE Category M1 for Satellite Access

8.13A.1 Introduction

The UE category M1 applicability of the requirements in subclause 8.13A is defined in Section 3.6.

This clause contains requirements on the UE regarding measurement reporting in RRC\_CONNECTED state for UE Category M1 for Satellite Access. The requirements are specified for E-UTRA intra- and inter-frequency measurements. These measurements may be used by the E-UTRAN, e.g. for handover decisions. The measurement quantities are defined in TS 36.214 [4], the measurement model is defined in TS 36.302 [22] and measurement accuracies are specified in clause 9. Control of measurement reporting is specified in TS 36.331 [2].

The UE shall meet the requirements in Section 8.13A, provided:

- the UE does not require measurement gaps for the corresponding measurements, or

- the UE requires measurement gaps for the corresponding measurements and is configured with the measurement gap pattern Id 0 or 1 and is not configured with any measurement gap pattern from Table 8.1.2.1-3.

If the UE is configured with any of the GNSS measurement gap patterns specified in [REF to RAN1 GNSS gaps] for the GNSS signal reception and also configured with measurement gap pattern ID#0 or ID#1 defined in Table 8.1.2.1-1 for performing measurements defined in subclause 8.13A, then the UE shall suspend the configured measurement gap pattern ID#0 or ID#1 during at least the time period over which the two measurement gap patterns overlap with each other in time. When measurement gap overlaps with GNSS measurmen gap, measurement gap applies if GNSS measurement is terminated earlier than measurement gap and after the UE has performed RACH procedure to indicate the early termination of the GNSS measurement.

When the UE is provided with IDC solution, the UE shall also perform RRM measurements and meet the corresponding requirements in clause 8.

8.13A.2 Requirements for UE category M1 with CE mode A

The UE category M1 applicability of the requirements in subclause 8.13A.2 is defined in Section 3.6. The requirements defined in clause 8.13A.2 apply provided the following conditions are met:

- UE is configured with measurement gap pattern ID#0 or ID#1 defined in Table 8.1.2.1-1.

If the UE is configured with *t-ServiceStartNeigh* [2] for a neighbour cell to be identified and also configured with measurement measurement gap pattern ID#0 or ID#1 defined in Table 8.1.2.1-1 for performing the measurements defined in clause 8.13A.3, then UE shall suspend the configured measurement gap pattern until the earliest *t-ServiceStartNeigh* [2] has been reached if *t-ServiceStartNeigh* is configured for all satellites.

Alternatively, the UE shall meet the requirements in subclause 8.13A.2 defined for gap pattern ID#0 without using any measurement gaps provided:

- UE indicates it does not need gaps with the capability intraFreq-CE-NeedForGaps-r13 [2, TS 36.331] for the frequency band of the serving cell and the UE is measuring a GSO intra-frequency cell or a NGSO intra-frequency cell provided by the same satellite as the serving cell, or

- UE is not configured with any reporting configuration that requires measurement on any intra-frequency neighbour cell.For the requirements in this clause, Ksatellite\_intra  is a scaling factor to consider the UE measurements across multiple satellites with different doppler shifts in the intra-frequency layer and and Ksatellite\_inter\_i  is a scaling factor to consider the UE measurements across multiple satellites with different doppler shifts in the i-th inter frequency layer. And the value of Ksatellite\_intra  and Ksatellite\_inter\_i  are 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;

For a given frequency layer, the UE is not required to measure cells associated to a satellite if t-serviceStartNeigh is configured for cells in that satellite and t-serviceStartNeigh has not been reached yet. 8.13A.2.1 E-UTRAN intra frequency measurements by UE category M1 with CE mode A

The UE shall be able to identify new intra-frequency cells and perform RSRP and RSRQ measurements of identified intra-frequency cells without an explicit intra-frequency neighbour cell list containing physical layer cell identities. During the RRC\_CONNECTED state the UE shall continuously measure identified intra frequency cells and additionally search for and identify new intra frequency cells.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

- If measurement gaps are configured, the measured subframes containing RSS are available before or after the measurement gaps and UE shall measure RSS outside the gaps, and

- RSS frequency location of the cell being measured occurs in the NB(s) that UE monitors for MPDDCH if UE supports measuring neighbour cell RSS in the same MPDCCH bandwidth, or within the same RSS RB location of the serving cell if UE does not support measuring neighbour cell RSS in the same MPDCCH bandwidth, for 3 successive DRX cycles or MPDCCH monitoring cycles and the last subframe of the RSS occasion of the measured cell is in the window of [n-5, n-1] where n is the first subframe of DRX ON duration or MPDCCH monitoring occasion, and

- RSS-based measurement period (Tmeasure\_intra\_UE cat M1) is not longer than CRS-based measurement period, and

- RSS power offset (PRSS) with respect to CRS as defined in *RSS-Config* or *rss-MeasPowerBias* [2], where PRSS ≥ 0 dB.

- RSRQ is not configured as trigger quantity or report quantity for intra-frequency measurement

If UE performs RSRP measurement based on RSS for serving or neighbour cell, it is not expected to perform RSRP measurement based on CRS on that cell. UE shall compensate the RSS power offset (PRSS) with respect to CRS when derving the RSRP measurement based on RSS.

For performing RSRP measurement based on RSS on detected intra-frequency cells, UE assumes BL/CE DL subframe configuration of each neighbor cell is same as serving cell. The requirements for RSRP measurement based on RSS for a neighbour cell apply provided that BL/CE DL subframe configuration of the neighbor cell is same as serving cell.

Additionally, for performing RSS-based RSRP measurements on detected intra-frequency cells, the UE assumes that the RSS transmission of each neighbor cell starts in the radio frame that is closest in time, i.e. within a window of +/- 5ms, around the corresponding radio frame offset calculated from RRC signalling in the serving cell, as described in TS 36.331 subclause 6.3. The requirements for RSS-based RSRP measurements for neighbor cells apply provided that the RSS transmission of each neighbor cell starts in the radio frame within a window of +/- 5ms around the calculated radio frame offset of the serving cell.

8.13A.2.1.1 E-UTRAN FDD intra frequency measurements

8.13A.2.1.1.1 E-UTRAN intra frequency measurements when no DRX is used

When no DRX is in use the UE shall be able to identify and measure a new detectable FDD intra frequency cell according to requirements in Table 8.13A.2.1.1.1-1 when SCH Ês/Iot >= -6 dB, provided

- G=1, or

- rmax\*G < 80ms, or

- UE is receiving PDSCH.

Otherwise, requirements in Table 8.13A.2.1.1.1-3 apply, where rmax and G are given by higher layer parameter *mPDCCH-NumRepetition* and *mPDCCH-startSF-UESS* respectively as defined in TS 36.213 [3].

**Table 8.13A.2.1.1.1-1: Requirement on cell identification delay and measurement delay for FDD intrafrequency cell**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **Cell identification delay (Tidentify\_intra\_UE cat M1)** | **Measurement delay (Tmeasure\_intra\_UE cat M1)** |
| 0 | 1.44 \* Kintra\_M1\_NC \*  KSatellite\_intra seconds | 480 \* Kintra\_M1\_NC \*  KSatellite\_intra ms |
| 1 | 2.88 \* Kintra\_M1\_NC \*  KSatellite\_intra seconds | 960 \* Kintra\_M1\_NC \*  KSatellite\_intra ms |
| N/A | N/A | 3 x TRSS (Note 1) |
| Note 1: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

Kintra\_M1\_NC = 100 / X where X is signalled by the RRC parameter *measGapSharingScheme* [2] and is defined as in Table 8.13A.2.1.1.1-2 when *highSpeedMeasGapCE-ModeA* [2]is not configured, and in Table 8.13A.2.1.1.1-2A when *highSpeedMeasGapCE-ModeA* [2] is configured.  is total number of inter-frequency layers to be monitored as defined in 8.1.2.1.1. When inter frequency measurement is not configured, Kintra\_M1\_NC=1 regardless whether or how parameter measGapSharingScheme [2] is configured.

**Table 8.13A.2.1.1.1-2: Value of parameter X for CEModeA**

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 40 |
| ‘10’ | 50 |
| ‘11’ | 60 |

**Table 8.13A.2.1.1.1-2A: Value of parameter X for CEModeA for UE configured with *highSpeedMeasGapCE-ModeA***

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 50 |
| ‘10’ | 80 |
| ‘11’ | 90 |

**Table 8.13A.2.1.1.1-3: Requirement on cell identification delay and measurement delay for FDD intrafrequency cell with MPDCCH scaling**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **Cell identification delay (Tidentify\_intra\_UE cat M1)** | **Measurement delay (Tmeasure\_intra\_UE cat M1)** |
| 0 | Max(20 \* rmax\*G / 1000, 1.44) \* Kintra\_M1\_NC \*  KSatellite\_intra seconds | Max(5 \* rmax\*G, 480) \* Kintra\_M1\_NC \*  KSatellite\_intra ms |
| 1 | Max(20 \* rmax\*G / 1000, 2.88) \* Kintra\_M1\_NC \*  KSatellite\_intra seconds | Max(5 \* rmax\*G, 960) \* Kintra\_M1\_NC \*  KSatellite\_intra ms |
| N/A | N/A | Max(rmax\*G, TRSS) x 3 (Note 1) |
| Note 1: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.1 and 9.1.21.2 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.6 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-1 for a corresponding Band.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of Tmeasure\_intra\_UE cat M1. If higher layer filtering is used, an additional cell identification delay can be expected.

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is according to Table 8.13A.2.1.1.1-1. When measurement gaps are activated the UE shall be capable of performing measurements for at least 6cells. If the UE has identified more than 6 cells, the UE shall perform measurements but the reporting rate of RSRP and RSRQ measurement of cells from UE physical layer to higher layers may be decreased.

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.1 and 9.1.21.2.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.6.

8.13A.2.1.1.1.1 Measurement Reporting Requirements

8.13A.2.1.1.1.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

8.13A.2.1.1.1.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.1.1.1.1.3.

8.13A.2.1.1.1.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

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.This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify intra\_UE cat M1\_NC defined in Clause 8.13A.2.1.1.1.When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_NC defined in clause 8.13A.2.1.1.1 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period\_UE cat M1, Intra provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.1.1.2 E-UTRAN intra frequency measurements when DRX is used

When DRX is in use the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_NC as shown in table 8.13A.2.1.1.2-1.

When eDRX\_CONN is in use the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_NC as shown in table 8.13A.2.1.1.2-1A.

**Table 8.13A.2.1.1.2-1: Requirement to identify a newly detectable FDD intrafrequency cell**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_intra\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | ≤0.04 | 1.44 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| 0.04<DRX-cycle≤0.08 | Note 2 (40 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.128 | 3.2 \* Kintra\_M1\_NC \*  KSAT (25 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.128<DRX-cycle≤2.56 | Note 2(20 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 1 | <0.128 | 2.88 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| 0.128 | 3.2 \* Kintra\_M1\_NC \*  KSAT (25 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.128<DRX-cycle≤2.56 | Note 2(20 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.1.1.2-1A: Requirement to identify a newly detectable FDD intrafrequency cell when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_intra\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (20 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.1 and 9.1.21.2 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.6 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex B.2.14-1 for a corresponding Band

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is Tmeasure\_intra\_UE cat M1. When DRX is used, Tmeasure\_intra\_UE cat M1\_NC is as specified in table 8.13A.2.1.1.2-2. When eDRX\_CONN is used, Tmeasure\_intra\_UE cat M1\_NC is as specified in table 8.13A.2.1.1.2-3. The UE shall be capable of performing RSRP and RSRQ measurements for 6 identified-intra-frequency cells, and the UE physical layer shall be capable of reporting measurements to higher layers with the measurement period of Tmeasure\_intra\_UE cat M1.

**Table 8.13A.2.1.1.2-2: Requirement to measure FDD intrafrequency cells**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | <0.128 | 0.48 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note1) |
| 0.128≤DRX-cycle≤2.56 | Note 2 (5 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 1 | <0.256 | 0.960 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| 0.256≤DRX-cycle≤2.56 | Note 2 (\*Kintra\_M1\_NC \*  KSatellite\_intra) |
| N/A | N/A | Max(DRX cycle length, TRSS ) x 3(Note 3) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use Note 3 It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

**Table 8.13A.2.1.1.2-3: Requirement to measure FDD intrafrequency cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.1 and 9.1.21.2.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.6.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.2.1.1.2.1 Measurement Reporting Requirements

8.13A.2.1.1.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

8.13A.2.1.1.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.1.1.2.1.3.

8.13A.2.1.1.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

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 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.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\_intra, UE cat M1 defined in Clause 8.13A.2.1.1.2 When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_NC  defined in clause 8.13A.2.1.1.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_intra\_UE cat M1\_NC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.1.2 E-UTRAN intra frequency measurements for HD-FDD

8.13A.2.1.2.1 E-UTRAN intra frequency measurements when no DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

The requirements defined in clause 8.13A.2.1.1.1 also apply for this section provided the following conditions are met:

- at least downlink subframe # 0 or downlink subframe # 5 per radio frame of an intra-frequency cell to be identified by the UE is available at the UE over Tidentify\_intra\_UE cat M1;

- at least one downlink subframe per radio frame of measured cell is available at the UE for RSRP measurement assuming measured cell is identified cell over Tmeasure\_intra\_UE cat M1.

- RSRP related side conditions given in Sections 9.1.2.1 and 9.1.2.2 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.6 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-2 for a corresponding Band

8.13A.2.1.2.2 E-UTRAN intra frequency measurements when DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

When DRX is in use the UE shall be able to identify a new detectable HD-FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_NC  as shown in table 8.13A.2.1.2.2-1.

When eDRX\_CONN is in use, the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_NC as shown in table 8.13A.2.1.2.2-1A.

**Table 8.13A.2.1.2.2-1: Requirement to identify a newly detectable HD-FDD intrafrequency cell**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_intra\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | ≤0.04 | 1.44 \* Kintra\_M1\_NC  \*  KSatellite\_intra (Note 1) |
| 0.04<DRX-cycle≤0.08 | Note 2 (40 \* Kintra\_M1\_NC \*  KSAT) |
| 0.128 | 3.2 \* Kintra\_M1\_NC  \*  KSatellite\_intra (32 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.128<DRX-cycle≤2.56 | Note 2 (25 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 1 | ≤0.08 | 2.88 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| 0.128 | 3.2 \* Kintra\_M1\_NC \*  KSAT (32 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.128<DRX-cycle≤2.56 | Note 2 (25 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.1.2.2-1A: Requirement to identify a newly detectable HD-FDD intrafrequency cell when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_intra\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (25 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.1 and 9.1.21.2 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.6 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-2 for a corresponding Band

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is Tmeasure\_intra\_UE cat M1. When DRX is used, Tmeasure\_intra\_UE cat M1\_NC is as specified in table 8.13A.2.1.2.2-2. When eDRX\_CONN is used, Tmeasure\_intra\_UE cat M1\_NC is as specified in table 8.13A.2.1.2.2-3. The UE shall be capable of performing RSRP and RSRQ measurements for 6 identified-intra-frequency cells, and the UE physical layer shall be capable of reporting measurements to higher layers with the measurement period of Tmeasure\_intra\_UE cat M1.

**Table 8.13A.2.1.2.2-2: Requirement to measure HD-FDD intrafrequency cells**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | <0.08 | 0.48 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| 0.08≤DRX-cycle≤0.16 | Note 2 (7 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.16<DRX-cycle≤2.56 | Note 2 (5 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 1 | <0.16 | 0.96 \* Kintra\_M1\_NC \*  KSatellite\_intra (Note 1) |
| DRX-cycle=0.16 | 1.12 \* Kintra\_M1\_NC \*  KSAT (7 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| 0.16<DRX-cycle≤2.56 | Note 2 (5 \* Kintra\_M1\_NC \* KSatellite\_intra) |
| N/A | N/A | Max(DRX cycle length, TRSS ) x 3 (Note 3) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use Note 3: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

**Table 8.13A.2.1.2.2-3: Requirement to measure HD-FDD intrafrequency cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kintra\_M1\_NC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.1 and 9.1.21.2.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.6.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.2.1.2.2.1 Measurement Reporting Requirements

8.13A.2.1.2.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

8.13A.2.1.2.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2, and 9.1.21.6.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.1.2.2.1.3.

8.13A.2.1.2.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.1, 9.1.21.2 and 9.1.21.6.

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 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.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\_intra\_UE cat M1\_NC defined in Clause 8.13A.2.1.2.2When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_NC defined in clause 8.13A.2.1.2.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_intra\_UE cat M1\_NC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.2 E-UTRAN inter frequency measurements by UE category M1 with CE mode A

The UE shall be able to identify new inter-frequency cells and perform RSRP and RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided. During the RRC\_CONNECTED state the UE shall continuously measure identified inter frequency cells and additionally search for and identify new inter frequency cells.

8.13A.2.2.1 E-UTRAN FDD - FDD inter frequency measurements

8.13A.2.2.1.1 E-UTRAN FDD - FDD inter frequency measurements when no DRX is used

When no DRX is in use the UE shall be able to identify and measure a new detectable FDD inter-frequency cell according to requirements in Table 8.13A.2.2.1.1-1 when SCH Ês/Iot >= -6 dB, provided

- G=1, or

- rmax\*G < 80ms, or

- UE is receiving PDSCH.

Otherwise, requirements in Table 8.13A.2.2.1.1-3 apply, where rmax and G are given by higher layer parameter *mPDCCH-NumRepetition* and *mPDCCH-startSF-UESS* respectively as defined in TS 36.213 [3].

**Table 8.13A.2.2.1.1-1: Requirement on cell identification delay and measurement delay for FDD interfrequency cell in frequency layer i**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **Cell identification delay (Tidentify\_inter\_UE cat M1\_NC)** | **Measurement delay (Tmeasure\_inter\_UE cat M1\_NC\_NC)** |
| 0 | 1.44 \* Kinter\_M1\_NC Ksatellite\_inter\_i  T seconds | 480 \* Kinter\_M1\_NC \* Ksatellite\_inter\_i  ms |
| 1 | 2.88 \* Kinter\_M1\_NC \* Ksatellite\_inter\_i  seconds | 960 \* Kinter\_M1\_NC \* Ksatellite\_inter\_i  ms |

 

where X is signalled by the RRC parameter *measGapSharingScheme* [2] and is defined as in Table 8.13A.2.2.1.1-2 when *highSpeedMeasGapCE-ModeA* [2] is not configured, and in Table 8.13A.2.2.1.1-2A when *highSpeedMeasGapCE-ModeA* [2] is configured.  is total number of inter-frequency layers to be monitored as defined in 8.1.2.1.1.

**Table 8.13A.2.2.1.1-2: Value of parameter X for CEModeA**

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 40 |
| ‘10’ | 50 |
| ‘11’ | 60 |

**Table 8.13A.2.2.1.1-2A: Value of parameter X for CEModeA for UE configured with *highSpeedMeasGapCE-ModeA***

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 50 |
| ‘10’ | 80 |
| ‘11’ | 90 |

**Table 8.13A.2.2.1.1-3: Requirement on cell identification delay and measurement delay for FDD interfrequency cell with MPDCCH scaling in frequency layer i**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **Cell identification delay (Tidentify\_inter\_UE cat M1)** | **Measurement delay (Tmeasure\_inter\_UE cat M1)** |
| 0 | Max(20 \* rmax\*G / 1000, 1.44) \* Kinter\_M1\_NC \*   Ksatellite\_inter\_i  seconds | Max(5 \* rmax\*G, 480) \* Kinter\_M1\_NC \*   Ksatellite\_inter\_i  ms |
| 1 | Max(20 \* rmax\*G / 1000, 2.88) \* Kinter\_M1\_NC \*   Ksatellite\_inter\_i  T seconds | Max(5 \* rmax\*G, 960) \* Kinter\_M1\_NC \*   Ksatellite\_inter\_i  ms |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.9 and 9.1.22.10 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.13 and 9.1.21.14 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-1 for a corresponding Band.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of Tmeasure\_inter\_UE cat M1\_NC. If higher layer filtering is used, an additional cell identification delay can be expected.

In the RRC\_CONNECTED state the measurement period for inter frequency measurements is according to Table 8.13A.2.2.1.1-1. When measurement gaps are scheduled for FDD inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP and RSRQ measurements to higher layers with measurement accuracy as specified in sub-clauses 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

The UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency for up to 2 FDD inter-frequencies and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements to higher layers with the measurement period defined in Table 8.13A.2.2.1.1-1.

8.13A.2.2.1.1.1 Measurement Reporting Requirements

8.13A.2.2.1.1.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

8.13A.2.2.1.1.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.2.1.1.1.3.

8.13A.2.2.1.1.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

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.This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify inter\_UE cat M1\_NC defined in Clause 8.13A.2.2.1.1.When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_UE cat M1\_NC defined in clause 8.13A.2.2.1.1 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period\_UE cat M1\_NC, Inter provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.2.1.2 E-UTRAN inter frequency measurements when DRX is used

When DRX is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_NC as shown in table 8.13A.2.2.1.2-1.

When eDRX\_CONN is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_NC as shown in table 8.13A.2.2.1.2-1A.

**Table 8.13A.2.2.1.2-1: Requirement to identify a newly detectable FDD interfrequency cell**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_inter\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | ≤0.04 | 1.44 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note 1) |
| 0.04<DRX-cycle≤0.08 | Note 2 (40 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128 | 3.2 \* Kinter\_M1 \*  KSAT (25 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128<DRX-cycle≤2.56 | Note 2(20 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 1 | <0.128 | 2.88 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note 1) |
| 0.128 | 3.2 \* Kinter\_M1 \*  KSAT (25 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128<DRX-cycle≤2.56 | Note 2(20 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.2.1.2-1A: Requirement to identify a newly detectable FDD interfrequency in frequency layer i cell when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_inter\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (20 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.9 and 9.1.21.10 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.13 and 9.21.14 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex B.2.14-1 for a corresponding Band

When DRX or eDRX\_CONN is in use, the UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency and the UE physical layer shall be capable of reporting RSRP and RSRQ to higher layers with the measurement period Tmeasure\_inter\_UE cat M1\_NC, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps. When DRX is used, Tmeasure\_inter\_UE cat M1\_NC is as defined in Table 8.13A.2.2.1.2-2, and when eDRX\_CONN is in use, Tmeasure\_inter\_UE cat M1\_NC is as defined in Table 8.13A.2.2.1.2-3.

**Table 8.13A.2.2.1.2-2: Requirement to measure FDD interfrequency cells in frequency layer i**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | <0.128 | 0.48 \* Kinter\_M1 cat M1\_NC \*  Ksatellite\_inter\_i  (Note 1) |
| 0.128≤DRX-cycle≤2.56 | Note 2 (5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 1 | <0.256 | 0.960 \* Kinter\_M1 cat M1\_NC \*  Ksatellite\_inter\_i  (Note 1) |
| 0.256≤DRX-cycle≤2.56 | Note 2 (5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.2.1.2-3: Requirement to measure FDD interfrequency in frequency layer i cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.9 and 9.1.21.10.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.13 and 9.1.21.14.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.2.2.1.2.1 Measurement Reporting Requirements

8.13A.2.2.1.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

8.13A.2.2.1.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.2.1.2.1.3.

8.13A.2.2.1.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

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 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.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\_inter, UE cat M1\_NC defined in Clause 8.13A.2.2.1.2 When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_UE cat M1\_NC defined in clause 8.13A.2.2.1.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_inter\_UE cat M1\_NC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.2.2 E-UTRAN inter-frequency measurements for HD-FDD

8.13A.2.2.2.1 E-UTRAN inter-frequency measurements when no DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

The requirements defined in clause 8.13A.2.2.1.1 also apply for this section provided the following conditions are met:

- at least downlink subframe # 0 or downlink subframe # 5 per radio frame of an inter-frequency cell to be identified by the UE is available at the UE over Tidentify\_inter\_UE cat M1\_NC;

- at least one downlink subframe per radio frame of measured cell is available at the UE for RSRP measurement assuming measured cell is identified cell over Tmeasure\_inter\_UE cat M1\_NC.

- RSRP related side conditions given in Sections 9.1.21.9 and 9.1.21.10 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.13 and 9.1.21.14 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-2 for a corresponding Band

8.13A.2.2.2.2 E-UTRAN inter frequency measurements when DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

When DRX is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_NC as shown in table 8.13A.2.2.2.2-1.

When eDRX\_CONN is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_NC as shown in table 8.13A.2.2.2.2-1A.

**Table 8.13A.2.2.2.2-1: Requirement to identify a newly detectable HD-FDD interfrequency cell in frequency layer i**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_inter\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | ≤0.04 | 1.44 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| 0.04<DRX-cycle≤0.08 | Note 2 (40 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128 | 3.2 \* Kinter\_M1 \*  KSAT (32 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128<DRX-cycle≤2.56 | Note 2(25 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 1 | ≤0.08 | 2.88 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| 0.128 | 3.2 \* Kinter\_M1 \*  KSAT (32 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.128<DRX-cycle≤2.56 | Note 2(25 \* Kinter\_M \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.2.2.2-1A: Requirement to identify a newly detectable HD-FDD interfrequency cell in frequency layer i when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_inter\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (25 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.9 and 9.1.21.10 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.13 and 9.1.21.14 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-2 for a corresponding Band

When DRX or eDRX\_CONN is in use, the UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency and the UE physical layer shall be capable of reporting RSRP and RSRQ to higher layers with the measurement period Tmeasure\_inter\_UE cat M1\_NC, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps. When DRX is used, Tmeasure\_inter\_UE cat M1\_NC is as defined in Table 8.13A.2.2.2.2-2, and when eDRX\_CONN is in use, Tmeasure\_inter\_UE cat M1\_NC is as defined in Table 8.13A.2.2.2.2-3.

**Table 8.13A.2.2.2.2-2: Requirement to measure HD-FDD interfrequency cells in frequency layer i**

|  |  |  |
| --- | --- | --- |
| **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_NC (s) (DRX cycles)** |
| 0 | <0.08 | 0.48 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note 1) |
| 0.08≤DRX-cycle≤0.16 | Note 2 (7 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 0.16<DRX-cycle≤2.56 | Note 2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| 1 | <0.16 | 0.96 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note 1) |
| DRX-cycle=0.16 | 1.12 \* Kinter\_M1 \*  KSAT (7 \* Kinter\_M1 \* Ksatellite\_inter\_i  ) |
| 0.16<DRX-cycle≤2.56 | Note 2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.2.2.2.2-3: Requirement to measure HD-FDD interfrequency cells in frequency layer I when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_NC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.10 and 9.1.21.11.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.13 and 9.1.21.14.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.2.2.2.2.1 Measurement Reporting Requirements

8.13A.2.2.2.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

8.13A.2.2.2.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.2.2.2.2.1.3.

8.13A.2.2.2.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.9, 9.1.21.10, 9.1.21.13 and 9.1.21.14.

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 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.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\_inter\_UE cat M1\_NC defined in Clause 8.13A.2.2.2.2When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_UE cat M1\_NC defined in clause 8.13A.2.2.2.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_inter\_UE cat M1\_NC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.2.3 Maximum allowed layers for multiple monitoring for UE category M1 with CE mode A

The UE UE category M1 configured with CE mode A shall be capable of monitoring at least:

- Depending on UE capability, 2 FDD E-UTRA inter-frequency carriers

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 5 carrier frequency layers, which include one serving carrier frequency and any of the above defined combination of E-UTRA FDD inter-frequency.

8.13A.2.4 Channel quality report for UE Category M1 in connected mode with CE mode A

The requirements in this clause shall apply for UE supporting DL channel quality reporting for UE Category M1 as defined in TS 36.321 [17] section 5.25.

The DL channel quality provides the serving eNB with information about

- the minimum MPDCCH repetition level to satisfy the hypothetical MPDCCH block error rate of 1% with the parameters specified in Table 8.13A.2.4-1 if the repetition level in DL quality report is larger than 1, or

- the minimum MPDCCH aggregation level to satisfy the hypothetical MPDCCH block error rate of 1% with the parameters specified in in Table 8.13A.2.4-2 if the repetition level in DL quality report is 1.

**Table 8.13A.2.4-1: MPDCCH transmission parameters for downlink quality reporting, repetition number being reported**

|  |  |
| --- | --- |
| **Attribute** | **CEModeA** |
| DCI format | 6-1A |
| Starting OFDM symbols | 4; Bandwidth = 1.4MHz |
| MPDCCH Aggregation level (ECCE) Note2 | 24 |
| M-PDCCH Transmission type | Distributed |

**Table 8.13A.2.4-2: MPDCCH transmission parameters for downlink quality reporting, aggregation level being reported**

|  |  |
| --- | --- |
| **Attribute** | **CEModeA** |
| DCI format | 6-1A |
| Starting OFDM symbols | 4; Bandwidth = 1.4MHz |
| MPDCCH repetition level Note1 | 1 |
| M-PDCCH Transmission type | Distributed |
| Note 1: Not applicable if repetition number in DL quality information is larger than 1.Note 2: Not applicable if repetition number in DL quality information equals to 1. |

The MPDCCH repetition level or aggregation level is chosen from the supported MPDCCH repetition levels and aggregation levels [3]. The report mapping is defined in section 9.1.21.22.

The UE shall satisfy the downlink channel quality measurement accuracy requirements as specified in section 9.1.21.23.

8.13A.3 Requirements for UE category M1 with CE mode B

The UE category M1 applicability of the requirements in subclause 8.13A.3 is defined in Section 3.6. The requirements defined in clause 8.13A.3 apply provided the following conditions are met:

- UE is configured with measurement gap pattern ID#0 or ID#1 defined in Table 8.1.2.1-1.

If the UE is configured with *t-ServiceStartNeigh* [2] for a neighbour cell to be identified and also configured with measurement measurement gap pattern ID#0 or ID#1 defined in Table 8.1.2.1-1 for performing the measurements defined in clause 8.13A.3, then UE shall suspend the configured measurement gap pattern until the earliest *t-ServiceStartNeigh* [2] has been reached if *t-ServiceStartNeigh* is configured for all satellites.

Alternatively, the UE shall meet the requirements in subclause 8.13A.3 defined for gap pattern ID#0 without using any measurement gaps provided:

- UE indicates it does not need gaps with the capability intraFreq-CE-NeedForGaps-r13 [2, TS36.331] for the frequency band of the serving cell and the UE is measuring a GSO intra-frequency cell or a NGSO intra-frequency cell provided by the same satellite as the serving cell, or

- UE is not configured with any reporting configuration that requires measurement on any intra-frequency neighbour cell.

For the requirements in this clause, Ksatellite\_intra  is a scaling factor to consider the UE measurements across multiple satellites with different doppler shifts in the intra-frequency layer and and Ksatellite\_inter\_i  is a scaling factor to consider the UE measurements across multiple satellites with different doppler shifts in the i-th inter frequency layer. And the value of Ksatellite\_intra  and Ksatellite\_inter\_i  are 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;

For a given frequency layer, the UE is not required to measure cells associated to a satellite if *t-serviceStartNeigh* is configured for cells in that satellite and t-serviceStartNeigh has not been reached yet.

8.13A.3.1 E-UTRAN intra frequency measurements by UE category M1 with CE mode B

The UE shall be able to identify new intra-frequency cells and perform RSRP and RSRQ measurements of identified intra-frequency cells without an explicit intra-frequency neighbour cell list containing physical layer cell identities. During the RRC\_CONNECTED state the UE shall continuously measure identified intra frequency cells and additionally search for and identify new intra frequency cells.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

- If measurement gaps are configured, the measured subframes containing RSS are available before or after the measurement gaps and UE shall measure RSS outside the gaps, and

- RSS frequency location of the cell being measured occurs in the NB(s) that UE monitors for MPDDCH if UE supports measuring neighbour cell RSS in the same MPDCCH bandwidth, or within the same RSS RB location of the serving cell if UE does not support measuring neighbour cell RSS in the same MPDCCH bandwidth, for 5 successive DRX cycles or MPDCCH monitoring cycles and the last subframe of the RSS occasion of the measured cell is in the window of [n-5, n-1] where n is the first subframe of DRX ON duration or MPDCCH monitoring occasion, and

- RSS-based measurement period (Tmeasure\_intra\_UE cat M1) is not longer than CRS-based measurement period, and

- RSS power offset (PRSS) with respect to CRS as defined in *RSS-Config* or *rss-MeasPowerBias* [2], where PRSS ≥ 0 dB.

- RSRQ is not configured as trigger quantity or report quantity for intra-frequency measurement

If UE performs RSRP measurement based on RSS for serving or neighbour cell, it is not expected to perform RSRP measurement based on CRS on that cell. UE shall compensate the RSS power offset (PRSS) with respect to CRS when derving the RSRP measurement based on RSS.

For performing RSRP measurement based on RSS on detected intra-frequency cells, UE assumes BL/CE DL subframe configuration of each neighbor cell is same as serving cell. The requirements for RSRP measurement based on RSS for a neighbour cell apply provided that BL/CE DL subframe configuration of the neighbor cell is same as serving cell.

Additionally, for performing RSS-based RSRP measurements on detected intra-frequency cells, the UE assumes that the RSS transmission of each neighbor cell starts in the radio frame that is closest in time, i.e. within a window of +/- 5ms, around the corresponding radio frame offset calculated from RRC signalling in the serving cell, as described in TS 36.331 subclause 6.3. The requirements for RSS-based RSRP measurements for neighbor cells apply provided that the RSS transmission of each neighbor cell starts in the radio frame within a window of +/- 5ms around the calculated radio frame offset of the serving cell.

8.13A.3.1.1 E-UTRAN FDD intra frequency measurements

8.13A.3.1.1.1 E-UTRAN intra frequency measurements when no DRX is used

When no DRX is in use the UE shall be able to identify and measure a new detectable FDD intra frequency cell according to requirements in Table 8.13A.3.1.1.1-1 provided that additional conditions table 8.13A.3.1.1.1-1 is met, and

- G=1, or

- rmax\*G < 800ms, or

- UE is receiving PDSCH.

Otherwise, requirements in Table 8.13A.3.1.1.1-4 apply, where rmax and G are given by higher layer parameter *mPDCCH-NumRepetition* and *mPDCCH-startSF-UESS* respectively as defined in TS 36.213 [3].

**Table 8.13A.3.1.1.1-1: Requirement on cell identification delay and measurement delay for FDD intrafrequency cell**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **Cell identification delay (Tidentify\_intra\_UE cat M1)**  | **Measurement delay (Tmeasure\_intra\_UE cat M1)** |
| -15≤ Q2 < -6 | 0 | 320.8 \* Kintra\_M1\_EC \*  KSatellite\_intra s | 800 \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| 1 | 321.6 \* Kintra\_M1\_EC \*  KSatellite\_intra s | 1600 \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| Q2≥-6 | 0 | 21.8\* Kintra\_M1\_EC \*  KSatellite\_intra s | 800 \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| 1 | 22.6\* Kintra\_M1\_EC\*  KSatellite\_intra s | 1600 \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| N/A | N/A | N/A | 5 x TRSS (Note 1) |
| Note 1: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

**Table 8.13A.3.1.1.1-2: Void**

Kintra\_M1\_EC = 100 / X where X is signalled by the RRC parameter *measGapSharingScheme* [2] and is defined as in Table 8.13A.3.1.1.1-3.  is total number of inter-frequency layers to be monitored as defined in 8.1.2.1.1. When inter frequency measurement is not configured, Kintra\_M1\_EC=1 regardless whether or how parameter measGapSharingScheme [2] is configured.

**Table 8.13A.3.1.1.1-3: Value of parameter X for CEModeB**

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 50 |
| ‘10’ | 75 |
| ‘11’ | 87.5 |

**Table 8.13A.3.1.1.1-4: Requirement on cell identification delay and measurement delay for FDD intrafrequency cell**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **Cell identification delay (Tidentify\_intra\_UE cat M1)**  | **Measurement delay (Tmeasure\_intra\_UE cat M1)** |
| -15≤ Q2 < -6 | 0 | Max(400 \* rmax\* G / 1000, 320.8) \* Kintra\_M1\_EC \*  KSatellite\_intra s | Max(5 \* rmax\* G, 800) \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| 1 | Max(400 \* rmax\* G / 1000, 321.6) \* Kintra\_M1\_EC \*  KSatellite\_intra s | Max(5 \* rmax\* G, 1600) \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| Q2≥-6 | 0 | Max(20 \* rmax\* G / 1000, 21.8)\* Kintra\_M1\_EC \*  KSatellite\_intra s | Max(5 \* rmax\* G, 800) \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| 1 | Max(20 \* rmax\* G / 1000, 22.6)\* Kintra\_M1\_EC \*  KSatellite\_intra s | Max(5 \* rmax\* G, 1600) \* Kintra\_M1\_EC \*  KSatellite\_intra ms |
| N/A | N/A | N/A | Max(rmax\*G, TRSS) x 5(Note 1) |
| Note 1: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.3 and 9.1.21.4 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.7 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-3 for a corresponding Band.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of Tmeasure\_intra\_UE cat M1\_EC. If higher layer filtering is used, an additional cell identification delay can be expected.

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is according to Table 8.13A.3.1.1.1-1. When measurement gaps are activated the UE shall be capable of performing measurements for at least 6cells. If the UE has identified more than 6 cells, the UE shall perform measurements but the reporting rate of RSRP and RSRQ measurements of cells from UE physical layer to higher layers may be decreased.

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.3, 9.1.21.4 and 9.1.21.7.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.7.

8.13A.3.1.1.1.1 Measurement Reporting Requirements

8.13A.3.1.1.1.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

8.13A.3.1.1.1.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.3,9.1.21.4 and 9.1.21.7.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.3.1.1.1.1.3.

8.13A.3.1.1.1.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

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: *pusch-maxNumRepetitionCEmodeB* x TTIDCCH, where *pusch-maxNumRepetitionCEmodeB* [2] is the maximum number of PUSCH repetitions configured for the UE in CE Mode B provided that *pusch-maxNumRepetitionCEmodeB >1*, othwerwise uncertainty is defined as 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify intra\_UE cat M1\_EC defined in Clause 8.13A.3.1.1.1.When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_EC defined in clause 8.13A.3.1.1.1 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period\_UE cat M1\_EC, Intra provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.3.1.1.2 E-UTRAN intra frequency measurements when DRX is used

When DRX is in use the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_EC as shown in table 8.13A.3.1.1.2-1 provided that additional conditions Table 8.13A.3.1.1.2-1 is met.

When eDRX\_CONN is in use the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_EC as shown in table 8.13A.3.1.1.2-1B.

**Table 8.13A.3.1.1.2-1: Requirement to identify a newly detectable FDD intrafrequency cell**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighbouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | ≤0.64 | 320.8 \* Kintra\_M1\_EC\*  KSatellite\_intra (Note1) |
| -15≤ Q2 < -6 |  | 0.64< DRX-cycle≤2.56 | Note2 (400 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
|  | 1 | DRX-cycle ≤ 0.640 | 321.6 \* Kintra\_M1\_EC \*  KSatellite\_intra (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
|  | 0 | ≤0.64 | 21.8 \* Kintra\_M1\_EC \*  KSatellite\_intra (Note1) |
| Q2≥-6 |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
|  | 1 | DRX-cycle ≤ 0.640 | 22.6 \* Kintra\_M1\_EC \*  KSatellite\_intra (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
| Note1: Number of DRX cycle depends upon the DRX cycle in useNote2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.1.1.2-1A: Void**

**Table 8.13A.3.1.1.2-1B: Requirement to identify a newly detectable FDD intrafrequency cell when eDRX\_CONN is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_intra\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (400 \* Kintra\_M1\_EC\*  KSatellite\_intra ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.3 and 9.1.21.4 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.7 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-3 for a corresponding Band

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is Tmeasure\_intra\_UE cat M1\_EC. When DRX is used, Tmeasure\_intra\_UE cat M1\_EC is as specified in table 8.13A.3.1.1.2-2 provided that additional conditions table 8.13A.3.1.1.2-2 is met. When eDRX\_CONN is used, Tmeasure\_intra\_UE cat M1\_EC is as specified in table 8.13A.3.1.1.2-4. The UE shall be capable of performing RSRP and RSRQ measurements for 6 identified-intra-frequency cells, and the UE physical layer shall be capable of reporting measurements to higher layers with the measurement period of Tmeasure\_intra\_UE cat M1\_EC.

**Table 8.13A.3.1.1.2-2: Requirement to measure FDD intrafrequency cells**

|  |  |  |  |
| --- | --- | --- | --- |
| **Target cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | ≤0.16 | 0.8 \* Kintra\_M1\_EC \*  KSatellite\_intra (Note1) |
| Q2≥-15 |  | 0.16<DRX-cycle≤2.56 | Note2(5 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
|  | 1 | ≤0.32 | 1.6 \* Kintra\_M1\_EC \*  KSatellite\_intra (Note1) |
|  |  | 0.32<DRX-cycle≤2.56 | Note2(5 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
| N/A | N/A | N/A | Max(DRX cycle length, TRSS ) x 5 (Note 3) |
| Note1: Number of DRX cycle depends upon the DRX cycle in useNote2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.1.1.2-3: Void**

**Table 8.13A.3.1.1.2-4: Requirement to measure FDD intrafrequency cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kintra\_M1\_EC\*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.3 and 9.1.21.4.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.7.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.3.1.1.2.1 Measurement Reporting Requirements

8.13A.3.1.1.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

8.13A.3.1.1.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.3.1.1.2.1.3.

8.13A.3.1.1.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

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 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: *pusch-maxNumRepetitionCEmodeB* x TTIDCCH, where *pusch-maxNumRepetitionCEmodeB* [2] is the maximum number of PUSCH repetitions configured for the UE in CE Mode B provided that *pusch-maxNumRepetitionCEmodeB >1*, othwerwise uncertainty is defined as 2 x TTIDCCH. 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\_intra, UE cat M1\_EC defined in Clause 8.13A.3.1.1.2 When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_EC defined in clause 8.13A.3.1.1.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_intra\_UE cat M1\_EC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.3.1.2 E-UTRAN intra frequency measurements for HD-FDD

8.13A.3.1.2.1 E-UTRAN intra frequency measurements when no DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

The requirements defined in clause 8.13A.3.1.1.1 also apply for this section provided the following conditions are met:

- at least downlink subframe # 0 and downlink subframe # 5 per radio frame of an intra-frequency cell to be identified by the UE is available at the UE over Tidentify\_intra\_UE cat M1\_EC;

- at least two consecutive downlink subframe per radio frame of measured cell is available at the UE for RSRP measurements assuming measured cell is identified cell over Tmeasure\_intra\_UE cat M1\_EC.

- RSRP related side conditions given in Sections 9.1.21.3 and 9.1.21.4 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.7 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-4

8.13A.3.1.2.2 E-UTRAN intra frequency measurements when DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

When DRX is in use the UE shall be able to identify a new detectable HD-FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_EC as shown in table 8.13A.3.1.2.2-1 provided that additional conditions table 8.13A.3.1.2.2-1 is met.

When eDRX\_CONN is in use, the UE shall be able to identify a new detectable FDD intra frequency cell within Tidentify\_intra\_UE cat M1\_EC as shown in table 8.13A.3.1.2.2-1B.

**Table 8.13A.3.1.2.2-1: Requirement to identify a newly detectable HD-FDD intrafrequency cell**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighbouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | ≤0.64 | 320.8 \* Kintra\_M1 \*  K KSatellite\_intra (Note1) |
| -15≤ Q2 < -6 |  | 0.64< DRX-cycle≤2.56 | Note2 (400 \* Kintra\_M1 \*  KSatellite\_intra) |
|  | 1 | DRX-cycle ≤ 0.640 | 321.6 \* Kintra\_M1 \*  KSatellite\_intra (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kintra\_M1 \*  KSatellite\_intra) |
|  | 0 | ≤0.64 | 21.8 \* Kintra\_M1 \*  KSatellite\_intra (Note1) |
| Q2≥-6 |  | 0.64< DRX-cycle≤2.56 | Note2 (24 \* Kintra\_M1 \*  KSatellite\_intra) |
|  | 1 | DRX-cycle ≤ 0.640 | 22.6 \* Kintra\_M1 \*  KSatellite\_intra (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kintra\_M1 \*  KSatellite\_intra) |
| Note1: Number of DRX cycle depends upon the DRX cycle in useNote2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.1.2.2-1A: Void**

**Table 8.13A.3.1.2.2-1B: Requirement to identify a newly detectable HD-FDD intrafrequency cell when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_intra\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (400 \* Kintra\_M1\_EC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.3 and 9.1.21.4 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.7 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.14-4 for a corresponding Band

In the RRC\_CONNECTED state the measurement period for intra frequency measurements is Tmeasure\_intra\_UE cat M1\_EC. When DRX is used, Tmeasure\_intra\_UE cat M1\_EC is as specified in table 8.13A.3.1.2.2-2 provided that additional conditions Table 8.13A.3.1.2.2-2 is met. When eDRX\_CONN cycle is used, Tmeasure\_intra\_UE cat M1\_EC is as specified in table 8.13A.3.1.2.2-4. The UE shall be capable of performing RSRP and RSRQ measurements for 6 identified-intra-frequency cells, and the UE physical layer shall be capable of reporting measurements to higher layers with the measurement period of Tmeasure\_intra\_UE cat M1\_EC.

**Table 8.13A.3.1.2.2-2: Requirement to measure HD-FDD intrafrequency cells**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighbouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | <0.128 | 0.8 \* Kintra \_EC \*  KSatellite\_intra (Note1) |
|  |  | 0.128≤DRX-cycle≤0.16 | Note2 (7 \* Kintra\_EC \*  KSatellite\_intra) |
| Q2≥-15 |  | 0.16<DRX-cycle≤2.56 | Note2(5 \* Kintra\_EC \*  KSatellite\_intra) |
|  | 1 | ≤0.32 | 1.6 \* Kintra\_EC \*  KSatellite\_intra (Note1) |
|  |  | 0.32<DRX-cycle≤2.56 | Note2(5 \* Kintra\_EC \*  KSatellite\_intra) |
| N/A | N/A | N/A | Max (DRX cycle length, TRSS ) x 5 (Note 3) |
| Note1: Number of DRX cycle depends upon the DRX cycle in useNote2: Time depends upon the DRX cycle in use Note3: It is the measurement period for RSRP measured on RSS signals defined in *RSS-Config* [2]. |

**Table 8.13A.3.1.2.2-3: Void**

**Table 8.13A.3.1.2.2-4: Requirement to measure HD-FDD intrafrequency cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_intra\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kintra\_M1\_EC \*  KSatellite\_intra) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.3 and 9.1.21.4.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.7.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.3.1.2.2.1 Measurement Reporting Requirements

8.13A.3.1.2.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

8.13A.3.1.2.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.3.1.2.2.1.3.

8.13A.3.1.2.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurements contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.3, 9.1.21.4 and 9.1.21.7.

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 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: *pusch-maxNumRepetitionCEmodeB* x TTIDCCH, where *pusch-maxNumRepetitionCEmodeB* [2] is the maximum number of PUSCH repetitions configured for the UE in CE Mode B provided that *pusch-maxNumRepetitionCEmodeB >1*, othwerwise uncertainty is defined as 2 x TTIDCCH. 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\_intra\_UE cat M1\_EC defined in Clause 8.13A.3.1.2.2When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_intra\_UE cat M1\_EC defined in clause 8.13A.3.1.2.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_intra\_UE cat M1\_EC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.3.2 E-UTRAN inter frequency measurements by UE category M1 with CE Mode B

The UE shall be able to identify new inter-frequency cells and perform RSRP and RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided. During the RRC\_CONNECTED state the UE shall continuously measure identified inter frequency cells and additionally search for and identify new inter frequency cells.

8.13A.3.2.1 E-UTRAN FDD - FDD inter frequency measurements

8.13A.3.2.1.1 E-UTRAN FDD - FDD inter frequency measurements when no DRX is used

When no DRX is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify and measure a new detectable FDD inter-frequency cell according to requirements in Table 8.13A.3.2.1.1-1 when additional condition in Table 8.13A.3.2.1.1-1 is met, and

- G=1, or

- rmax\*G < 800ms, or

- UE is receiving PDSCH.

Otherwise, requirements in Table 8.13A.3.2.1.1-3 apply, where rmax and G are given by higher layer parameter *mPDCCH-NumRepetition* and *mPDCCH-startSF-UESS* respectively as defined in TS 36.213 [3].

**Table 8.13A.3.2.1.1-1: Requirement on cell identification delay and measurement delay for FDD interfrequency cell in frequency layer i**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **Cell identification delay (Tidentify\_intra\_UE cat M1)**  | **Measurement delay (Tmeasure\_intra\_UE cat M1)** |
| -15≤ Q2 < -6 | 0 | 320.8 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i  s | 800 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i  ms |
| 1 | 321.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  s | 1600 \* Kinter\_M1 \* Ksatellite\_inter\_i  ms |
| Q2≥-6 | 0 | 21.8 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i  s | 800 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i   ms |
| 1 | 22.6 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i  s | 1600 \* Kinter\_M1\_EC \*  Ksatellite\_inter\_i  ms |

 

where X is signalled by the RRC parameter *measGapSharingScheme* [2] and is defined as in Table 8.13A.3.2.1.1-2.  is total number of inter-frequency layers to be monitored as defined in 8.1.2.1.1.

KSAT is the number of satellites to be monitored on the E-UTRA FDD carrier frequency; KSAT equals to the number NGSO satellites to be measured if NGSO satellites are monitored. KSAT =1 if GSO satellites are monitored.

**Table 8.13A.3.2.1.1-2: Value of parameter X for CEModeB**

|  |  |
| --- | --- |
| **measGapSharingScheme** | **Value of X (%)** |
| ‘00’ |  |
| ‘01’ | 50 |
| ‘10’ | 75 |
| ‘11’ | 87.5 |

**Table 8.13A.3.2.1.1-3: Requirement on cell identification delay and measurement delay for FDD interfrequency cell in frequency layer i**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **Cell identification delay (Tidentify\_inter\_UE cat M1)**  | **Measurement delay (Tmeasure\_inter\_UE cat M1)** |
| -15≤ Q2 < -6 | 0 | Max(400 \* rmax\* G / 1000, 320.8) \* Kinter\_M1\_EC\*  KSAT s | Max(5 \* rmax\* G, 800) \* Kinter\_M1\_EC\*  Ksatellite\_inter\_i   ms |
|  | 1 | Max(400 \* rmax\* G / 1000, 321.6) \* Kinter\_M1\_EC\*  KSAT s | Max(5 \* rmax\* G, 1600) \* Kinter\_M1\_EC\*  Ksatellite\_inter\_i   ms |
| Q2≥-6 | 0 | Max(20 \* rmax\* G / 1000, 21.8)\* Kinter\_M1\_EC\*  KSAT s | Max(5 \* rmax\* G, 800) \* Kinter\_M1\_EC\*  Ksatellite\_inter\_i   ms |
|  | 1 | Max(20 \* rmax\* G / 1000, 22.6)\* Kinter\_M1\_EC\*  KSAT s | Max(5 \* rmax\* G, 1600) \* Kinter\_M1\_EC\*  Ksatellite\_inter\_i   ms |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.11 and 9.1.21.12 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.15 and 9.1.21.16 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.18-1 for a corresponding Band.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of Tmeasure\_inter\_UE cat M1\_EC. If higher layer filtering is used, an additional cell identification delay can be expected.

In the RRC\_CONNECTED state the measurement period for inter frequency measurements is according to Table 8.13A.3.2.1.1-1. When measurement gaps are scheduled for FDD inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP and RSRQ measurements to higher layers with measurement accuracy as specified in sub-clauses 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

The UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency for up to 3 FDD inter-frequencies and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements to higher layers with the measurement period defined in Table 8.13A.3.2.1.1-1.

8.13A.3.2.1.1.1 Measurement Reporting Requirements

8.13A.3.2.1.1.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

8.13A.3.2.1.1.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.3.2.1.1.1.3.

8.13A.3.2.1.1.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

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: *pusch-maxNumRepetitionCEmodeB* x TTIDCCH, where *pusch-maxNumRepetitionCEmodeB* [2] is the maximum number of PUSCH repetitions configured for the UE in CE Mode B provided that *pusch-maxNumRepetitionCEmodeB >1*, othwerwise uncertainty is defined as 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resoureces for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T identify inter\_UE cat M1\_EC defined in Clause 8.13A.3.2.1.1.When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_UE cat M1\_EC defined in clause 8.13A.3.2.1.1 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than TMeasurement\_Period\_UE cat M1\_EC, Inter provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.3.2.1.2 E-UTRAN inter frequency measurements when DRX is used

When DRX is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_EC as shown in table 8.13A.3.2.1.2-1.

When eDRX\_CONN is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_EC as shown in table 8.13A.3.2.1.2-1.

**Table 8.13A.3.2.1.2-1: Requirement to identify a newly detectable FDD interfrequency cell in frequency layer i**

|  |  |  |  |
| --- | --- | --- | --- |
| Neighbouring cell SCH Ês/Iot: Q2 [dB] | Gap pattern ID | DRX cycle length (s) | Tidentify\_intra\_UE cat M1 (s) (DRX cycles) |
|  | 0 | ≤0.64 | 320.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| -15≤ Q2 < -6 |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | DRX-cycle ≤ 0.640 | 321.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 0 | ≤0.64 | 21.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| Q2≥-6 |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | DRX-cycle ≤ 0.640 | 22.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note1: Number of DRX cycle depends upon the DRX cycle in useNote2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.2.1.2-1B: Requirement to identify a newly detectable FDD interfrequency cell in frequency layer i when eDRX\_CONN is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_inter\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.11 and 9.1.21.12 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.15 and 9.1.21.16 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex B.2.18-1 for a corresponding Band

When DRX or eDRX\_CONN is in use, the UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency and the UE physical layer shall be capable of reporting RSRP and RSRQ to higher layers with the measurement period Tmeasure\_inter\_UE cat M1\_EC, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps. When DRX is used, Tmeasure\_inter\_UE cat M1\_EC is as defined in Table 8.13A.3.2.1.2-2, and when eDRX\_CONN is in use, Tmeasure\_inter\_UE cat M1\_EC is as defined in Table 8.13A.3.2.1.2-2.

**Table 8.13A.3.2.1.2-2: Requirement to measure FDD interfrequency cells**

|  |  |  |  |
| --- | --- | --- | --- |
| **Target cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | ≤0.16 | 0.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| Q2≥-15 |  | 0.16<DRX-cycle≤2.56 | Note2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | ≤0.32 | 1.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.32<DRX-cycle≤2.56 | Note2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.2.1.2-3: Requirement to measure FDD interfrequency cells in frequency layer i when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5\* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

The RSRP measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.11 and 9.1.21.12.

The RSRQ measurement accuracy for all measured cells shall be as specified in the sub-clauses 9.1.21.15 and 9.1.21.16.

The requriements in this subcluse apply regardless of MPDCCH monitoring configuration.

8.13A.3.2.1.2.1 Measurement Reporting Requirements

8.13A.3.2.1.2.1.1 Periodic Reporting

Reported RSRP and RSRQ measurement contained in periodically triggered measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

8.13A.3.2.1.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.13A.3.2.1.2.1.3.

8.13A.3.2.1.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.11, 9.1.21.12, 9.1.21.15 and 9.1.21.16.

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 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: *pusch-maxNumRepetitionCEmodeB* x TTIDCCH, where *pusch-maxNumRepetitionCEmodeB* [2] is the maximum number of PUSCH repetitions configured for the UE in CE Mode B provided that *pusch-maxNumRepetitionCEmodeB >1*, othwerwise uncertainty is defined as 2 x TTIDCCH. 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\_inter, UE cat M1\_EC defined in Clause 8.13A.3.2.1.2 When L3 filtering is used or IDC autonomous denial is configured an additional delay can be expected.

If a cell which has been detectable at least for the time period Tidentify\_inter\_UE cat M1\_EC defined in clause 8.13A.3.2.1.2 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than Tmeasure\_inter\_UE cat M1\_EC provided the timing to that cell has not changed more than ± 50 Ts and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured, an additional delay can be expected.

8.13A.3.2.2 E-UTRAN inter-frequency measurements for HD-FDD

8.13A.3.2.2.1 E-UTRAN inter-frequency measurements when no DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

The requirements defined in clause 8.13A.3.2.1.1 also apply for this section provided the following conditions are met:

- RSRP related side conditions given in Sections 9.1.21.11 and 9.1.21.12 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.15 and 9.1.21.16 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.18-2 for a corresponding Band

8.13A.3.2.2.2 E-UTRAN inter frequency measurements when DRX is used

The requirements in this section are applicable for the UE which supports half duplex operation on one or more supported frequency bands [2].

When DRX is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_EC as shown in table 8.13A.3.2.2.2-1.

When eDRX\_CONN is in use and when measurement gaps are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD inter-frequency cell within Tidentify\_inter\_UE cat M1\_EC as shown in table 8.13A.3.2.2.2-1.

**Table 8.13A.3.2.2.2-1: Requirement to identify a newly detectable HD-FDD interfrequency cell in frequency layer i**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighbouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tidentify\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | ≤0.64 | 320.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| -15≤ Q2 < -6 |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | DRX-cycle ≤ 0.640 | 321.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 0 | ≤0.64 | 21.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
| Q2≥-6 |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | DRX-cycle ≤ 0.640 | 22.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.64< DRX-cycle≤2.56 | Note2(24 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.2.2.2-1B: Requirement to identify a newly detectable HD-FDD interfrequency cell in frequency layer i when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tidentify\_inter\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (400 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

A cell shall be considered detectable when

- RSRP related side conditions given in Sections 9.1.21.11 and 9.1.21.12 are fulfilled for a corresponding Band,

- RSRQ related side conditions given in Clause 9.1.21.15 and 9.1.21.16 are fulfilled for a corresponding Band,

- SCH\_RP and SCH Ês/Iot according to Annex Table B.2.18-2 for a corresponding Band

When DRX or eDRX\_CONN is in use, the UE shall be capable of performing RSRP and RSRQ measurements of at least 4 inter-frequency cells per FDD inter-frequency and the UE physical layer shall be capable of reporting RSRP and RSRQ to higher layers with the measurement period Tmeasure\_inter\_UE cat M1\_EC, either measurement gaps are scheduled or the UE supports capability of conducting such measurements without gaps. When DRX is used, Tmeasure\_inter\_UE cat M1\_EC is as defined in Table 8.13A.3.2.2.2-2, and when eDRX\_CONN is in use, Tmeasure\_inter\_UE cat M1\_EC is as defined in Table 8.13A.3.2.2.2-2.

**Table 8.13A.3.2.2.2-2: Requirement to measure HD-FDD interfrequency cells in frequency layer i**

|  |  |  |  |
| --- | --- | --- | --- |
| **Neighbouring cell SCH Ês/Iot: Q2 [dB]** | **Gap pattern ID** | **DRX cycle length (s)** | **Tmeasure\_intra\_UE cat M1 (s) (DRX cycles)** |
|  | 0 | <0.128 | 0.8 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.128≤DRX-cycle≤0.16 | Note2 (7 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Q2≥-15 |  | 0.16<DRX-cycle≤2.56 | Note2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
|  | 1 | ≤0.32 | 1.6 \* Kinter\_M1 \*  Ksatellite\_inter\_i  (Note1) |
|  |  | 0.32<DRX-cycle≤2.56 | Note2(5 \* Kinter\_M1 \*  Ksatellite\_inter\_i  ) |
| Note 1: Number of DRX cycle depends upon the DRX cycle in useNote 2: Time depends upon the DRX cycle in use |

**Table 8.13A.3.2.2.2-3: Requirement to measure HD-FDD interfrequency cells when eDRX\_CONN cycle is used**

|  |  |
| --- | --- |
| **eDRX\_CONN cycle length (s)** | **Tmeasure\_inter\_UE cat M1\_EC (s) (eDRX\_CONN cycles)** |
| 2.56<eDRX\_CONN cycle≤10.24 | Note (5 \* Kinter\_M1 \*  KSAT) |
| Note: Time depends upon the eDRX\_CONN cycle in use |

### <End of Change>