**3GPP TSG-RAN WG4 Meeting #109 R4-2320743**

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

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | DraftCR on eMTC Connected Mode Measurements (36.133) |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | IoT\_NTN\_enh |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Implementing the enhancements for connected mode measurements for eMTC in NTN |
|  |  |
| ***Summary of change:*** | Introducing new feature |
|  |  |
| ***Consequences if not approved:*** | This feature will not be captured in specifications  |
|  |  |
| ***Clauses affected:*** | 8.13A |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Change #1>

## 8.13A Measurements for UE Category M1 for Satellite Access

### 8.13A.1 Introduction

The UE category M1 applicability of the requirements in subclause 8.13 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.

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.

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.

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 |

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.3.2.2.2.1 Measurement Reporting Requirements

8.13A.3.2.2.2.1.1 Periodic Reporting

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

8.13A.3.2.2.2.1.2 Event-triggered Periodic Reporting

Reported RSRP and RSRQ measurement contained in event triggered periodic measurement reports shall meet the requirements in sections 9.1.21.11, 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.3.2.2.2.1.3.

8.13A.3.2.2.2.1.3 Event Triggered Reporting

Reported RSRP and RSRQ measurement contained in event triggered measurement reports shall meet the requirements in sections 9.1.21.11, 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.3.2.2.2When 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\_EC defined in clause 8.13A.3.2.2.2 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\_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.3.3 Maximum allowed layers for multiple monitoring for UE category M1 with CE mode B

The UE UE category M1 configured with CE mode B 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.3.4 Channel quality report for UE Category M1 in connected mode with CE mode B

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.3.4-1.

Table 8.13A.3.4-1: MPDCCH transmission parameters for downlink quality reporting, repetition number being reported

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

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 9.1.21.24.