**3GPP TSG-RAN WG4 Meeting #100-e *R4-2115444***

**Electronic meeting, August 16– 27, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.133** | **CR** | **7133** | **rev** | **-** | **Current version:** | **16.10.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Big CR to TS 36.133: LTE RRM maintenance (Rel-16) | | | | | | | | | |
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| ***Source to WG:*** | MCC, Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
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| ***Work item code:*** | LTE\_extDRX-Core, LTE\_feMTC-Core, NR\_newRAT-Core, NB\_IOTenh2, TEI\_15 | | | | |  | ***Date:*** | | | 2020-08-30 |
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| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases:* *Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CR merge the endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.  - R4-2114265, CR to eDRX RRM requirements R16   * The eDRX requirements in idle mode are defined based on PTW, where UE performs measurement during PTW based on DRX cycle. However, based on section 7.3 of 36.304, when eDRX cycle is 5.12s, there is no PTW, but UE should monitor paging based on 5.12s DRX cycle. It means the current requirements are not applicable for 5.12s eDRX cycle.   - R4-2114260, CR to eMTC RRM requirements R16   * The requirements are not scaled with number of carriers, which is different from requirements for normal UEs.   - R4-2114093, CR on clarification on SMTC determination in DC 36133 R16   * In RAN4#99e meeting, it was identified that when STMC is not provided within the corresponding command, UE is required to follow the SMTC in the MO with same SSB frequency and SCS, but MN and SN could configure different SMTC in different MOs. Then which SMTC configuration that UE should follow is not clear. It is agreed that it is up to UE implementation which SMTC to use under such case. Then necessary clarification shall be made.   - R4-2114256, CR on RSTD measurement requirements 36133   * When PRS for LTE RSTD measurement and SMTC window for NR measurement collide, the two measurements compete MG as defined in the CSSF within gap. On the requiremet side, when UE is configured with EN-DC, both the LTE-NR inter-RAT measurement (section 8.17.4) and the LTE inter-frequency RSTD measurment (section 8.17.15) are defined based on CSSF, which is correct. However, when UE is in LTE SA, the LTE inter-frequency RSTD measurment (section 8.1.2.6) are not scaled with CSSF, so the time sharing with inter-RAT NR measurement is not accounted. * In cluase 8.1.2 there is a note “When inter-frequency RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern 0 can be used. For defining the inter-frequency and inter-RAT requirements Tinter1=30ms shall be assumed.”, which means 80ms MGRP is assumed when inter-freq RSTD is measured. This is not reflected in the NR inter-RAT measurement requirements which is based on MGRP.   - R4-2114137, Correction of RMC of NB-TDD test cases R16   * The antenna configuration is 2x1 in the NB-TDD RLM test cases. However the RMC R.14, R.18 and R.22 used in the test cases are defined for 1x1. Correction is needed to align the antenna configuration and RMC. * In test case A.7.3.93, the required rate of correct events is missing. | | | | | | | | |
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| ***Summary of change:*** | | The summary of change in each each endorsed draft CR is copied below.  - R4-2114265, CR to eDRX RRM requirements R16   * Update the tables for eDRX requirements by adding a row for 5.12s eDRX cycle, and apply the 5.12s DRX cycle to define the measurement requirements, which is aligned with paging monitoring.   - R4-2114260, CR to eMTC RRM requirements R16   * Add scaling factor Kcarrier. * Correct some typo   - R4-2114093, CR on clarification on SMTC determination in DC 36133 R16   * Clarify that If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation   - R4-2114256, CR on RSTD measurement requirements 36133   * Clarify in section 8.1.2.6 that when UE is configured with inter-RAT NR measurement, the requirements is scaled. * Add a note in 8.1.2.4.21 that when inter-frequency RSTD measurements are configured, the requirements assume MGRP=80ms is used   - R4-2114137, Correction of RMC of NB-TDD test cases R16   * Use 2x1 RMCs in the test cases to align with the antenna configuration. * Adding the required rate of correct events as 90% in A.7.3.93. | | | | | | | | |
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| ***Consequences if not approved:*** | | - R4-2114265, CR to eDRX RRM requirements R16   * Requirements are not applicable for 5.12s eDRX cycle   - R4-2114260, CR to eMTC RRM requirements R16   * eMTC inter-frequency measurement requirements in idle mode are incorrect   - R4-2114093, CR on clarification on SMTC determination in DC 36133 R16   * The requirements are ambiguous   - R4-2114256, CR on RSTD measurement requirements 36133   * Time sharing between LTE inter-frequency RSTD measurement and inter-RAT NR measurement is not accounted   - R4-2114137, Correction of RMC of NB-TDD test cases R16   * Test Case configuration would be incorrect. | | | | | | | | |
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| ***Clauses affected:*** | | - R4-2114265, CR to eDRX RRM requirements R16   * 4.2.2.1, 4.2.2.2, 4.2.2.3, 4.2.2.4, 4.2.2.5, 4.7.2.1.2, 4.7.2.1.3, 4.7.2.2.1, 4.7.2.2.2, 4.7.2.2.3   - R4-2114260, CR to eMTC RRM requirements R16   * 4.7.2.1.3, 4.7.2.2.3, 4.7.2.2.4, 4.7.2.2.5   - R4-2114093, CR on clarification on SMTC determination in DC 36133 R16   * 6.3.2.4   - R4-2114256, CR on RSTD measurement requirements 36133   * 8.1.2.6.1, 8.1.2.6.2, 8.1.2.6.3, 8.1.2.6.4, 8.1.2.4.21   - R4-2114137, Correction of RMC of NB-TDD test cases R16   * A.7.3.88, A.7.3.89, A.7.3.90, A.7.3.91, A.7.3.92, A.7.3.93, A.7.3.94, A.7.3.95. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.521-3 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

#### 4.2.2.1 Measurement and evaluation of serving cell

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in [1] for the serving cell at least every DRX cycle.

The UE shall filter the RSRP and RSRQ measurements of the serving cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE is not configured with eDRX\_IDLE cycle and has evaluated according to Table 4.2.2.1-1 in Nserv consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities. If the UE is configured with eDRX\_IDLE cycle and has evaluated according to Table 4.2.2.1-2 in Nserv consecutive DRX cycles within a single PTW that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information during the time T, the UE shall initiate cell selection procedures for the selected PLMN as defined in [1], where T=10 s if the UE is not configured with eDRX\_IDLE cycle, and T=MAX(10 s, one eDRX\_IDLE cycle) if the UE is configured with eDRX\_IDLE cycle.

Table 4.2.2.1-1: Nserv

|  |  |
| --- | --- |
| DRX cycle length [s] | Nserv [number of DRX cycles] |
| 0.32 | 4 |
| 0.64 | 4 |
| 1.28 | 2 |
| 2.56 | 2 |

Table 4.2.2.1-2: Nservfor UE configured with eDRX\_IDLE cycle

|  |  |  |  |
| --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Nserv [number of DRX or eDRX cycles Note 3] |
| 5.12 | N/A | N/A | 2 |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | 2 |
| 0.64 | ≥1.28 (1) | 2 |
| 1.28 | ≥2.56 (2) | 2 |
| 2.56 | ≥5.12 (4) | 2 |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

#### 4.2.2.2 Void

#### 4.2.2.3 Measurements of intra-frequency E-UTRAN cells

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

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

- Annex B.1.3 for Cat-M1 UE

- Annex B.1.6 for category 1bis UE

- Annex B.1.1, otherwise

for a corresponding Band.

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

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_intra when Treselection = 0, provided that the cell is

- at least 4dB better ranked for Cat-M1 UE and category 1bis UE

- at least 3 dB better ranked, otherwise

When evaluating cells for reselection, the side conditions for RSRP and SCH apply to both serving and non-serving intra-frequency cells.

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

For UE neither configured with eDRX\_IDLE cycle nor configured with *highSpeedEnhancedMeasFlag*, Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra are specified in Table 4.2.2.3-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra are specified in Table 4.2.2.3-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra when multiple PTWs are used. For UE configured with *highSpeedEnhancedMeasFlag*, Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra are specified in Table 4.2.2.3-3. For UE configured with *highSpeedEnhMeasFlag2-r16*, Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra are specified in Table 4.2.2.3-4.

Table 4.2.2.3-1 : Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra  [s] (number of DRX cycles) |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Table 4.2.2.3-2: Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate,E-UTRAN\_intra for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Intra [s] (number of DRX or eDRX cycles Note 3) | Tmeasure,EUTRAN\_Intra [s] (number of DRX or eDRX cycles Note 3) | Tevaluate,E-UTRAN\_intra  [s] (number of DRX or eDRX cycles Note 3) |
| 5.12 | N/A | N/A | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | (23) | 0.32 (1) | 0.64 (2) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | 1.28 (2) |
| 1.28 | ≥2.56 (2) | 1.28 (1) | 2.56 (2) |
| 2.56 | ≥5.12 (4) | 2.56 (1) | 5.12 (2) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

Table 4.2.2.3-3 : Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra for UE configured with *highSpeedEnhancedMeasFlag*

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra  [s] (number of DRX cycles) |
| 0.32 | 3.2 (10) | 0.32(1) | 0.96(3) |
| 0.64 | 6.4 (10) | 0.64 (1) | 1.92 (3) |
| 1.28 | 12.8(10) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Table 4.2.2.3-4 : Tdetect,EUTRAN\_Intra, Tmeasure,EUTRAN\_Intra and Tevaluate, E-UTRAN\_intra for UE configured with *highSpeedEnhMeasFlag2-r16*

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra  [s] (number of DRX cycles) |
| 0.32 | 2.56 (8) | 0.32(1) | 0.96(3) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

#### 4.2.2.4 Measurements of inter-frequency E-UTRAN cells

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

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

If the UE is not configured with eDRX\_IDLE cycle or configured with an eDRX\_IDLE cycle not longer than 20.48 s, the UE shall be able to evaluate whether a newly detectable inter-frequency cell in normal performance group meets the reselection criteria defined in TS36.304 within Kcarrier,normal \* Tdetect,EUTRAN\_Inter, and able to evaluate whether a newly detectable inter-frequency cell in reduced performance group meets the reselection criteria defined in TS36.304 within 6 \* Kcarrier,reduced \* Tdetect,EUTRAN\_Inter if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, the UE shall be able to evaluate whether a newly detectable inter-frequency cell in normal performance group meets the reselection criteria defined in TS36.304 within Kcarrier,normal \* Tdetect,EUTRAN\_Inter, and when Srxlev < 3 dB or Squal < 3 dB and able to evaluate whether a newly detectable inter-frequency cell in reduced performance group meets the reselection criteria defined in TS36.304 within 6 \* Kcarrier,reduced \* Tdetect,EUTRAN\_Inter if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. An inter-frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.2 for a corresponding Band.

For UE category 1bis, if the UE is not configured with eDRX\_IDLE cycle or configured with an eDRX\_IDLE cycle not longer than 20.48 s, the UE shall be able to evaluate whether a newly detectable inter-frequency cell in normal performance group meets the reselection criteria defined in TS36.304 within Kcarrier,normal \* Tdetect,EUTRAN\_Inter, and able to evaluate whether a newly detectable inter-frequency cell in reduced performance group meets the reselection criteria defined in TS36.304 within 6 \* Kcarrier,reduced \* Tdetect,EUTRAN\_Inter if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5.5dB for reselections based on ranking or 6.5dB for RSRP reselections based on absolute priorities or 5dB for RSRQ reselections based on absolute priorities. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, the UE shall be able to evaluate whether a newly detectable inter-frequency cell in normal performance group meets the reselection criteria defined in TS36.304 within Kcarrier,normal \* Tdetect,EUTRAN\_Inter, and when Srxlev < 3 dB or Squal < 3 dB and able to evaluate whether a newly detectable inter-frequency cell in reduced performance group meets the reselection criteria defined in TS36.304 within 6 \* Kcarrier,reduced \* Tdetect,EUTRAN\_Inter if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5.5dB for reselections based on ranking or 6.5dB for RSRP reselections based on absolute priorities or 5dB for RSRQ reselections based on absolute priorities. An inter-frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.2 for a corresponding Band.

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

If the UE is configured with eDRX\_IDLE cycle not longer than 20.48 s, the UE shall measure RSRP or RSRQ at least every Kcarrier,normal \* Tmeasure,EUTRAN\_Inter for identified lower or equal priority inter-frequency cells in normal performance group, and at least every 6 \* Kcarrier,reduced \* Tmeasure,EUTRAN\_Inter for identified lower or equal priority inter-frequency cells in reduced performance group. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, the UE shall measure RSRP or RSRQ at least every Kcarrier,normal \* Tmeasure,EUTRAN\_Inter for identified lower or equal priority inter-frequency cells in normal performance group, and when Srxlev < 3 dB or Squal < 3 dB at least every 6 \* Kcarrier,reduced \* Tmeasure,EUTRAN\_Inter for identified lower or equal priority inter-frequency cells in reduced performance group. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

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

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

If the UE is configured with eDRX\_IDLE cycle not longer than 20.48 s, for an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell in normal performance group has met reselection criterion defined TS 36.304 within Kcarrier,normal \* Tevaluate,E-UTRAN\_Inter, and capable of evaluating that the inter-frequency cell in reduced performance group has met reselection criterion defined TS 36.304 within 6 \* Kcarrier,reduced \* Tevaluate,E-UTRAN\_Inter, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, for an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell in normal performance group has met reselection criterion defined TS 36.304 within Kcarrier,normal \* Tevaluate,E-UTRAN\_Inter, and when Srxlev < 3 dB or Squal < 3 dB capable of evaluating that the inter-frequency cell in reduced performance group has met reselection criterion defined TS 36.304 within 6 \* Kcarrier,reduced \* Tevaluate,E-UTRAN\_Inter, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 5dB for reselections based on ranking or 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities. When evaluating cells for reselection, the side conditions for RSRP and SCH apply to both serving and inter-frequency cells.

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

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter, Tmeasure,EUTRAN\_Inter and Tevaluate, E-UTRAN\_inter are specified in Table 4.2.2.4-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter, Tmeasure,EUTRAN\_Inter and Tevaluate, E-UTRAN\_inter are specified in Table 4.2.2.4-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter, Tmeasure,EUTRAN\_Inter and Tevaluate, E-UTRAN\_inter when multiple PTWs are used.

Table 4.2.2.4-1 : Tdetect,EUTRAN\_Inter, Tmeasure,EUTRAN\_Inter and Tevaluate,E-UTRAN\_Inter

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Inter [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Inter [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_Inter  [s] (number of DRX cycles) |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Table 4.2.2.4-2: Tdetect,EUTRAN\_Inter, Tmeasure,EUTRAN\_Inter and Tevaluate, E-UTRAN\_inter for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Inter [s] (number of DRX or eDRX cycles Note 3) | Tmeasure,EUTRAN\_Inter [s] (number of DRX or eDRX cycles Note 3) | Tevaluate,E-UTRAN\_inter  [s] (number of DRX or eDRX cycles Note 3) |
| 5.12 | N/A | N/A | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | (23) | 0.32 (1) | 0.64 (2) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | 1.28 (2) |
| 1.28 | ≥2.56 (2) | 1.28 (1) | 2.56 (2) |
| 2.56 | ≥5.12 (4) | 2.56 (1) | 5.12 (2) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

For higher priority cells, a UE may optionally use a shorter value for **TmeasureE-UTRA\_Inter** ,which shall not be less than Max(0.64 s, one DRX cycle).

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

#### 4.2.2.5 Measurements of inter-RAT cells

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-RAT layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-RAT layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT layers shall be the same as that defined below for lower priority RATs.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

##### 4.2.2.5.1 Measurements of UTRAN FDD cells

When the measurement rules indicate that UTRA FDD cells are to be measured, the UE shall measure CPICH Ec/Io and CPICH RSCP of detected UTRA FDD cells in the neighbour frequency list at the minimum measurement rate specified in this section. The UE shall filter CPICH Ec/Io and CPICH RSCP measurements of each measured UTRA FDD cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, the UE shall evaluate whether newly detectable UTRA FDD cells in normal performance group have met the reselection criteria in TS 36.304 within time NUTRA\_carrier,normal \* TdetectUTRA\_FDD ,and evaluate whether newly detectable UTRA FDD cells in reduced performance group have met the reselection criteria in TS 36.304 within time 6 \* NUTRA\_carrier,reduced \* TdetectUTRA\_FDD when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when TreselectionRAT = 0 provided that the reselection criteria is met by a margin of at least 6dB for reselections based on RSCP, or a margin of at least 3dB for reselections based on Ec/Io. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, the UE shall evaluate whether newly detectable UTRA FDD cells in normal performance group have met the reselection criteria in TS 36.304 within time (NUTRA\_carrier,normal) \* TdetectUTRA\_FDD ,and when Srxlev < 3 dB or Squal < 3 dB evaluate whether newly detectable UTRA FDD cells in reduced performance group have met the reselection criteria in TS 36.304 within time 6 \* NUTRA\_carrier,reduced \* TdetectUTRA\_FDD when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when TreselectionRAT = 0 provided that the reselection criteria is met by a margin of at least 6dB for reselections based on RSCP, or a margin of at least 3dB for reselections based on Ec/Io.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, cells which have been detected shall be measured at least every NUTRA\_carrier,normal \* TmeasureUTRA\_FDD for the cells in normal performance group, and at least every 6 \* NUTRA\_carrier,reduced \* TmeasureUTRA\_FDD for the cells in reduced performance group when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, cells which have been detected shall be measured at least every (NUTRA\_carrier,normal) \* TmeasureUTRA\_FDD for the cells in normal performance group, and when Srxlev < 3 dB or Squal < 3 dB at least every 6 \* NUTRA\_carrier,reduced \* TmeasureUTRA\_FDD for the cells in reduced performance group when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.

When higher priority UTRA FDD cells are found by the higher priority search, they shall be measured at least every Tmeasure,UTRA\_FDD. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, for a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified UTRA FDD cell has met reselection criterion defined in TS 36.304 [1] within NUTRA\_carrier,normal \* TevaluateUTRA\_FDD if the cell is in normal performance group and within 6 \* NUTRA\_carrier,reduced \* TevaluateUTRA\_FDD if the cell is in reduced performance group when Treselection = 0provided that the reselection criteria is met by a margin of at least 6dB for reselections based on RSCP, or a margin of at least 3dB for reselections based on Ec/Io. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, for a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified UTRA FDD cell has met reselection criterion defined in TS 36.304 [1] within (NUTRA\_carrier,normal) \* TevaluateUTRA\_FDD if the cell is in normal performance group and when Srxlev < 3 dB or Squal < 3 dB within 6 \* NUTRA\_carrier,reduced \* TevaluateUTRA\_FDD if the cell is in reduced performance group when Treselection = 0provided that the reselection criteria is met by a margin of at least 6dB for reselections based on RSCP, or a margin of at least 3dB for reselections based on Ec/Io.

If Treselection timer has a non zero value and the UTRA FDD cell is satisfied with the reselection criteria which are defined in [1], the UE shall evaluate this UTRA FDD cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, TdetectUTRA\_FDD, TmeasureUTRA\_FDD and TevaluateUTRA\_FDD are specified in Table 4.2.2.5.1-1. For UE configured with eDRX\_IDLE cycle, TdetectUTRA\_FDD, TmeasureUTRA\_FDD and TevaluateUTRA\_FDD are specified in Table 4.2.2.5.1-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of TdetectUTRA\_FDD, TmeasureUTRA\_FDD and TevaluateUTRA\_FDD when multiple PTWs are used.

Table 4.2.2.5.1-1: TdetectUTRA\_FDD, TmeasureUTRA\_FDD, and TevaluateUTRA\_FDD

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | TdetectUTRA\_FDD [s] | TmeasureUTRA\_FDD [s] (number of DRX cycles) | TevaluateUTRA\_FDD  [s] (number of DRX cycles) |
| 0.32 | 30 | 5.12 (16) | 15.36 (48) |
| 0.64 | 5.12 (8) | 15.36 (24) |
| 1.28 | 6.4(5) | 19.2 (15) |
| 2.56 | 60 | 7.68 (3) | 23.04 (9) |

Table 4.2.2.5.1-2: TdetectUTRA\_FDD, TmeasureUTRA\_FDD and TevaluateUTRA\_FDD for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | TdetectUTRA\_FDD [s] (number of DRX or eDRX cycles Note 4) | TmeasureUTRA\_FDD [s] (number of DRX or eDRX cycles Note 4) | TevaluateUTRA\_FDD  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 117.76 (23) | 15.36 (3) | 46.08 (9) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (23) | 0.96 (3) | Note 3 (9) |
| 0.64 | ≥2.56 (2) | 1.92 (3) | Note 3 (9) |
| 1.28 | ≥3.84 (3) | 3.84 (3) | Note 3 (9) |
| 2.56 | ≥7.68 (6) | 7.68 (3) | Note 3 (9) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The time is calculated depending on the number N of DRX cycles as follows:  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

For higher priority cells, a UE may optionally use a shorter value for **TmeasureUTRA\_FDD**, which shall not be less than Max(0.64 s, one DRX cycle).

##### 4.2.2.5.2 Measurements of UTRAN TDD cells

When the measurement rules indicate that UTRA TDD cells are to be measured, the UE shall measure P-CCPCH RSCP of detected UTRA TDD cells in the neighbour frequency list at the minimum measurement rate specified in this section. The UE shall filter P-CCPCH RSCP measurements of each measured UTRA TDD cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period. If the UE is not configured with eDRX\_IDLE cycle, P-CCPCH RSCP of UTRAN TDD cells shall not be filtered over a longer period than that specified in table 4.2.2.5.2-1. If the UE is configured with eDRX\_IDLE cycle, P-CCPCH RSCP of UTRAN TDD cells shall not be filtered over a longer period than that specified in table 4.2.2.5.2-2.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, the UE shall evaluate whether newly detectable UTRA TDD cells in normal performance group have met the reselection criteria in TS 36.304 within time NUTRA\_carrier\_TDD,normal \* TdetectUTRA\_TDD, and evaluate whether newly detectable UTRA TDD cells in reduced performance group have met the reselection criteria in TS 36.304 within time 6 \* NUTRA\_carrier\_TDD,reduced \* TdetectUTRA\_TDD when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6dB. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, the UE shall evaluate whether newly detectable UTRA TDD cells in normal performance group have met the reselection criteria in TS 36.304 within time (NUTRA\_carrier\_TDD,normal) \* TdetectUTRA\_TDD, and when Srxlev < 3 dB or Squal < 3 dB evaluate whether newly detectable UTRA TDD cells in reduced performance group have met the reselection criteria in TS 36.304 within time 6 \* NUTRA\_carrier\_TDD,reduced \* TdetectUTRA\_TDD when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6dB.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, cells which have been detected shall be measured at least every NUTRA\_carrier\_TDD,normal \* TmeasureUTRA\_TDD for the cells in normal performance group, and at least every 6 \* NUTRA\_carrier\_TDD,reduced \* TmeasureUTRA\_TDD for the cells in reduced performance group, when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, cells which have been detected shall be measured at least every (NUTRA\_carrier\_TDD,normal) \* TmeasureUTRA\_TDD for the cells in normal performance group, and when Srxlev < 3 dB or Squal < 3 dB at least every 6 \* NUTRA\_carrier\_TDD,reduced \* TmeasureUTRA\_TDD for the cells in reduced performance group, when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.

When higher priority UTRA TDD cells are found by the higher priority search, they shall be measured at least every Tmeasure,UTRA\_TDD. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE is not configured with eDRX\_IDLE cycle or configured with eDRX\_IDLE cycle not longer than 20.48 s, for a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified UTRA TDD cell has met reselection criterion defined in [1] within NUTRA\_carrier\_TDD,normal \*TevaluateUTRA\_TDD if the cell is in normal performance group and within 6 \* NUTRA\_carrier\_TDD,reduced \* TevaluateUTRA\_TDD if the cell is in reduced performance group when Treselection = 0provided that the reselection criteria is met by a margin of at least 6dB. If the UE is configured with eDRX\_IDLE cycle longer than 20.48 s, for a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified UTRA TDD cell has met reselection criterion defined in [1] within NUTRA\_carrier\_TDD,normal \*TevaluateUTRA\_TDD if the cell is in normal performance group and when Srxlev < 3 dB or Squal < 3 dB within 6 \* NUTRA\_carrier\_TDD,reduced \* TevaluateUTRA\_TDD if the cell is in reduced performance group when Treselection = 0provided that the reselection criteria is met by a margin of at least 6dB.

If Treselection timer has a non zero value and the UTRA TDD cell is satisfied with the reselection criteria which are defined in [1], the UE shall evaluate this UTRA TDD cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, TdetectUTRA\_TDD, TmeasureUTRA\_TDD and TevaluateUTRA\_TDD are specified in Table 4.2.2.5.2-1. For UE configured with eDRX\_IDLE cycle, TdetectUTRA\_TDD, TmeasureUTRA\_TDD and TevaluateUTRA\_TDD are specified in Table 4.2.2.5.2-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of TdetectUTRA\_TDD, TmeasureUTRA\_TDD and TevaluateUTRA\_TDD when multiple PTWs are used.

Table 4.2.2.5.2-1: TdetectUTRA\_TDD, TmeasureUTRA\_TDD and TevaluateUTRA\_TDD

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | TdetectUTRA\_TDD [s] | TmeasureUTRA\_TDD [s] (number of DRX cycles) | TevaluateUTRA\_TDD  [s] (number of DRX cycles) |
| 0.32 | 30 | 5.12 (16) | 15.36 (48) |
| 0.64 | 5.12 (8) | 15.36 (24) |
| 1.28 | 6.4(5) | 19.2 (15) |
| 2.56 | 60 | 7.68 (3) | 23.04 (9) |

Table 4.2.2.5.2-2: TdetectUTRA\_TDD, TmeasureUTRA\_TDD and TevaluateUTRA\_TDD for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | TdetectUTRA\_TDD [s] (number of DRX or eDRX cycles Note 4) | TmeasureUTRA\_TDD [s] (number of DRX or eDRX cycles Note 4) | TevaluateUTRA\_TDD  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 117.76 (23) | 15.36 (3) | 46.08 (9) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (23) | 0.96 (3) | Note 3 (9) |
| 0.64 | ≥2.56 (2) | 1.92 (3) | Note 3 (9) |
| 1.28 | ≥3.84 (3) | 3.84 (3) | Note 3 (9) |
| 2.56 | ≥7.68 (6) | 7.68 (3) | Note 3 (9) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The time is calculated depending on the number N of DRX cycles as follows:  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

For higher priority cells, a UE may optionally use a shorter value for **TmeasureUTRA\_TDD**, which shall not be less than Max(0.64 s, one DRX cycle).

##### 4.2.2.5.3 Measurements of GSM cells

When the measurement rules defined in [1] indicate that E-UTRAN inter-frequencies or inter-RAT frequency cells are to be measured, the UE shall measure the signal level of the GSM BCCH carriers if the GSM BCCH carriers are indicated in the measurement control system information of the serving cell. GSM BCCH carriers of lower priority than the serving cell shall be measured at least every Tmeasure,GSM.

When higher priority GSM BCCH carriers are found by the higher priority search, they shall be measured at least every Tmeasure,GSM, and the UE shall decode the BSIC of the GSM BCCH carrier. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection, or to continuously verify the BSIC of the GSM BCCH carrier every 30s. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

The UE shall maintain a running average of 4 measurements for each GSM BCCH carrier. The measurement samples for each cell shall be as far as possible uniformly distributed over the averaging period.

If continuous GSM measurements are required by the measurement rules in [1], the UE shall attempt to verify the BSIC at least every 30 seconds for each of the 4 strongest GSM BCCH carriers. If a change of BSIC is detected for one GSM cell then that GSM BCCH carrier shall be treated as a new GSM neighbour cell. If the UE detects on a BCCH carrier a BSIC which is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform BSIC re-confirmation for that cell.

The UE shall not consider the GSM BCCH carrier in cell reselection, if the UE cannot demodulate the BSIC of that GSM BCCH carrier. Additionally, the UE shall not consider a GSM neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

If Treselection timer has a non zero value and the GSM cell is satisfied with the reselection criteria which are defined in [1], the UE shall evaluate this GSM cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tmeasure,GSM is specified in Table 4.2.2.5.3-1. For UE configured with eDRX\_IDLE cycle, Tmeasure,GSM is specified in Table 4.2.2.5.3-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during Tmeasure,GSM when multiple PTWs are used.

Table 4.2.2.5.3-1: Tmeasure,GSM,

|  |  |
| --- | --- |
| DRX cycle length [s] | Tmeasure,GSM [s] (number of DRX cycles) |
| 0.32 | 5.12 (16) |
| 0.64 | 5.12 (8) |
| 1.28 | 6.4(5) |
| 2.56 | 7.68 (3) |

Table 4.2.2.5.3-2: Tmeasure,GSM for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | | PTW length [s] (number of 1.28s periods) | Tmeasure,GSM [s] (number of DRX or eDRX cycles Note 3) | |
| 5.12 | | N/A | N/A | | 15.36 (3) | |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | | 0.32 | ≥1.28 (1) | | 0.96 (3) | |
| 0.64 | ≥2.56 (2) | | 1.92 (3) | |
| 1.28 | ≥3.84 (3) | | 3.84 (3) | |
| 2.56 | ≥7.68 (6) | | 7.68 (3) | |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

##### 4.2.2.5.4 Measurements of HRPD cells

In order to perform measurement and cell reselection to HRPD cell, the UE shall acquire the timing of HRPD cells.

When the measurement rules indicate that HRPD cells are to be measured, the UE shall measure CDMA2000 HRPD Pilot Strength of HRPD cells in the neighbour cell list at the minimum measurement rate specified in this section.

The parameter ‘Number of HRPD Neighbor Frequency’, which is transmitted on E-UTRAN BCCH, is the number of carriers used for all HRPD cells in the neighbour cell list.

When the E-UTRA serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for CDMA2000 HRPD layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is defined in clause 4.2.2.

For CDMA2000 HRPD cells which have been detected, the UE shall measure CDMA2000 HRPD Pilot Strength at least every (Number of HRPD Neighbor Frequency)\*TmeasureHRPD, when the E-UTRA serving cell Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.

The UE shall be capable of evaluating that the CDMA2000 HRPD cell has met cell reselection criterion defined in [1] within TevaluateHRPD.

For UE not configured with eDRX\_IDLE cycle, Table 4.2.2.5.4-1 gives values of TmeasureHRPD and TevaluateHRPD. For UE configured with eDRX\_IDLE cycle, TmeasureHRPD and TevaluateHRPD are specified in Table 4.2.2.5.4-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of TmeasureHRPD and TevaluateHRPD when multiple PTWs are used.

Table 4.2.2.5.4-1: TmeasureHRPD and TevaluateHRPD

|  |  |  |
| --- | --- | --- |
| DRX cycle length [s] | TmeasureHRPD [s] (number of DRX cycles) | TevaluateHRPD [s] (number of DRX cycles) |
| 0.32 | 5.12 (16) | 15.36 (48) |
| 0.64 | 5.12 (8) | 15.36 (24) |
| 1.28 | 6.4 (5) | 19.2 (15) |
| 2.56 | 7.68 (3) | 23.04 (9) |

Table 4.2.2.5.4-2: TmeasureHRPD and TevaluateHRPD for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | TmeasureHRPD [s] (number of DRX or eDRX cycles Note 4) | TevaluateHRPD  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 15.36 (3) | 46.08 (9) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | 0.96 (3) | Note 3 (9) |
| 0.64 | ≥2.56 (2) | 1.92 (3) | Note 3 (9) |
| 1.28 | ≥3.84 (3) | 3.84 (3) | Note 3 (9) |
| 2.56 | ≥7.68 (6) | 7.68 (3) | Note 3 (9) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The time is calculated depending on the number N of DRX cycles as follows:  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | |

If Treselection timer has a non zero value and the CDMA2000 HRPD cell is satisfied with the reselection criteria which are defined in [1], the UE shall evaluate this CDMA2000 HRPD cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

##### 4.2.2.5.5 Measurements of cdma2000 1X

In order to perform measurement and cell reselection to cdma2000 1X cell, the UE shall acquire the timing of cdma2000 1X cells.

When the measurement rules indicate that cdma2000 1X cells are to be measured, the UE shall measure cdma2000 1x RTT Pilot Strength of cdma2000 1X cells in the neighbour cell list at the minimum measurement rate specified in this section.

The parameter ‘Number of CDMA2000 1X Neighbor Frequency’, which is transmitted on E-UTRAN BCCH, is the number of carriers used for all cdma2000 1X cells in the neighbour cell list.

When the E-UTRA serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE shall search for cdma2000 1X layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is defined in clause 4.2.2.

For CDMA2000 1X cells which have been detected, the UE shall measure CDMA2000 1xRTT Pilot Strength at least every (Number of CDMA2000 1X Neighbor Frequency)\*TmeasureCDMA2000\_1X, when the E-UTRA serving cell Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ. The UE shall be capable of evaluating that the cdma2000 1X cell has met cell reselection criterion defined in [1] within TevaluateCDMA2000\_1X.

For UE not configured with eDRX\_IDLE cycle, Table 4.2.2.5.5-1 gives values of TmeasureCDMA2000\_1X and TevaluateCDMA2000\_1X. For UE configured with eDRX\_IDLE cycle, TmeasureCDMA2000\_1X and TevaluateCDMA2000\_1X are specified in Table 4.2.2.5.5-2 where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of TmeasureCDMA2000\_1X and TevaluateCDMA2000\_1X when multiple PTWs are used.

Table 4.2.2.5.5-1: TmeasureCDMA2000 1X and TevaluateCDMA2000 1X

|  |  |  |
| --- | --- | --- |
| DRX cycle length [s] | TmeasureCDMA2000\_1X [s] (number of DRX cycles) | TevaluateCDMA2000\_1X [s] (number of DRX cycles) |
| 0.32 | 5.12 (16) | 15.36 (48) |
| 0.64 | 5.12 (8) | 15.36 (24) |
| 1.28 | 6.4 (5) | 19.2 (15) |
| 2.56 | 7.68 (3) | 23.04 (9) |

Table 4.2.2.5.5-2: TmeasureCDMA2000\_1X and TevaluateCDMA2000\_1X for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | TmeasureCDMA2000\_1X [s] (number of DRX or eDRX cycles Note 4) | TevaluateCDMA2000\_1X  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 15.36 (3) | 46.08 (9) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | 0.96 (3) | Note 3 (9) |
| 0.64 | ≥2.56 (2) | 1.92 (3) | Note 3 (9) |
| 1.28 | ≥3.84 (3) | 3.84 (3) | Note 3 (9) |
| 2.56 | ≥7.68 (6) | 7.68 (3) | Note 3 (9) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The time is calculated depending on the number N of DRX cycles as follows:  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | |

If Treselection timer has a non zero value and the CDMA2000 1X cell is satisfied with the reselection criteria which are defined in [1], the UE shall evaluate this CDMA2000 1X cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

<End of Change 1>

<Start of Change 2>

##### 4.7.2.1.2 Measurements of intra-frequency cells for UE category M1 in normal coverage

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

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

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

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

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

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

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

If UE performs RSRP measurement based on RSS on detected intra-frequency cell, it is not expected to perform RSRP measurement based on CRS on that measured cell.

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

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

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

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

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_Intra\_NC when Treselection = 0, provided that the cell is at least 4dB better ranked for Cat-M1 UE. For neigbor cell measured with RSS, the Tevaluate,E-UTRAN\_Intra\_NC\_RSS as defined in Table 4.7.2.1.2-1 applies.

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

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC are specified in Table 4.7.2.1.2-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC are specified in Table 4.7.2.1.2-2, where the requirements apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC when multiple PTWs are used.

Table 4.7.2.1.2-1 : Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate, E-UTRAN\_Intra\_NC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra\_NC [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra\_NC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra\_NC  [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra\_NC\_RSS  [s] (number of DRX cycles) |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) | 3.84 (12) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) | 3.84 (6) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) | 7.68 (3) |
| NOTE 1: Void | | | | |

Table 4.7.2.1.2-2: Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate,E-UTRAN\_Intra\_NC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Intra\_NC [s] (number of DRX or eDRX cycles Note 4) | Tmeasure,EUTRAN\_Intra\_NC [s] (number of DRX or eDRX cycles Note 4) | Tevaluate,E-UTRAN\_intra\_NC  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | (23) | 0.32 (1) | 0.64 (2) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | 1.28 (2) |
| 1.28 | ≥2.56 (2) | 1.28 (1) | 2.56 (2) |
| 2.56 | ≥5.12 (4) | 2.56 (1) | 5.12 (2 ) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Void  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE's intra-frequency measurement is not required to meet Tdetect,EUTRAN\_Intra\_NC, Tmeasure,EUTRAN\_Intra\_NC and Tevaluate,E-UTRAN\_intra\_NC as defined in Table 4.7.2.1.2-1 and Table 4.7.2.1.2-2.

##### 4.7.2.1.3 Measurements of inter-frequency cells for UE category M1 in normal coverage

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

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

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

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

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

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

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

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

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

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

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC are specified in Table 4.7.2.1.3-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC are specified in Table 4.7.2.1.3-2. Additionally, the requirements in Table 4.7.2.1.3-2 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_Inter\_NC when multiple PTWs are used.

Table 4.7.2.1.3-1 : Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate,E-UTRAN\_Inter\_NC

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Inter\_NC [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Inter\_NC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_Inter\_NC  [s] (number of DRX cycles) |
| 0.32 | 11.52 (36) | 1.28 (4) | 5.12 (16) |
| 0.64 | 17.92 (28) | 1.28 (2) | 5.12 (8) |
| 1.28 | 32(25) | 1.28 (1) | 6.4 (5) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Table 4.7.2.1.3-2: Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate, E-UTRAN\_inter\_NC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Inter\_NC [s] (number of DRX or eDRX cycles Note 3) | Tmeasure,EUTRAN\_Inter\_NC [s] (number of DRX or eDRX cycles Note 3) | Tevaluate,E-UTRAN\_inter\_NC  [s] (number of DRX or eDRX cycles Note 3) |
| 5.12 | N/A | N/A | 117.76 (23) | 5.12 (1) | 10.24 (2) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | (23) | 0.32 (1) | (2) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | (2) |
| 1.28 | ≥1.28 (1) | 1.28 (1) | (2) |
| 2.56 | ≥2.56 (2) | 2.56 (1) | (2) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | |

For higher priority cells, a UE may optionally use a shorter value forTmeasure,EUTRAN\_Inter\_NC,which shall not be less than Max(0.64 s, one DRX cycle).

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE's inter-frequency measurement is not required to meet Tdetect,EUTRAN\_Inter\_NC, Tmeasure,EUTRAN\_Inter\_NC and Tevaluate,E-UTRAN\_inter\_NC as defined in Table 4.7.2.1.3-1 and Table 4.7.2.1.3-2.

<End of Change 2>

<Start of Change 3>

##### 4.7.2.2.1 Measurement and evaluation of serving cell for UE category M1 in enhanced coverage

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

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in [1] for the serving cell at least every DRX cycle.

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:

- Serving cell RSS are available within the paging MPDCCH narrowband for Nserv successive DRX cycles and the last subframe of the RSS occasion is in the window [n-5, n-1] where n is the first subframe of paging MPDCCH narrowband, and

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

- UE is not configured with eDRX\_IDLE cycle, and DRX cycle length is 0.32s or 0.64s.

If UE performs RSRP measurement based on RSS for serving cell, it is not expected to perform RSRP measurement based on CRS on that serving cell.

The UE shall filter the RSRP and RSRQ measurements of the serving cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE is not configured with eDRX\_IDLE cycle and has evaluated according to Table 4.7.2.2.1-1 in Nserv\_EC consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE is configured with eDRX\_IDLE cycle and has evaluated according to Table 4.7.2.2.1-2 in Nserv\_EC consecutive DRX cycles within a single PTW that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information during the time T, the UE shall initiate cell selection procedures for the selected PLMN as defined in [1], where T=20 s if the UE is not configured with eDRX\_IDLE cycle, and T=MAX(20 s, one eDRX\_IDLE cycle) if the UE is configured with eDRX\_IDLE cycle.

Table 4.7.2.2.1-1: Nserv\_EC

|  |  |
| --- | --- |
| DRX cycle length [s] | Nserv\_EC [number of DRX cycles] |
| 0.32 | 8 |
| 0.64 | 8 |
| 1.28 | 4 |
| 2.56 | 4 |

Table 4.7.2.2.1-2: Nserv\_ECfor UE configured with eDRX\_IDLE cycle

|  |  |  |  |
| --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Nserv [number of DRX or eDRX cycles Note 3] |
| 5.12 | N/A | N/A | 4 |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | 4 |
| 0.64 | ≥2.56 (2) | 4 |
| 1.28 | ≥5.12 (4) | 4 |
| 2.56 | ≥10.24(8) | 4 |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | |

Nserv\_EC defined in Table 4.7.2.2.1-3 applies if serving cell is measured based on RSS.

Table 4.7.2.2.1-3: Nserv\_EC

|  |  |
| --- | --- |
| DRX cycle length [s] | Nserv [number of DRX cycles] |
| 0.32 | 5 |
| 0.64 | 5 |
| 1.28 | N/A |
| 2.56 | N/A |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

##### 4.7.2.2.1A Relaxed measurement and evaluation of serving cell for UE category M1 in enhaned coverage

The UE which supports *wakeUpSignal-r15* or *wakeUpSignal-TDD-r15* shall meet the requirement defined for the DRX cycle length of N\*DRX\_cycle in Section 4.7.2.2.1, provided the following conditions are met:

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

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

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

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

Otherwise the requirements defined for the configured DRX cycle length in Section 4.7.2.2.1 shall apply.

The UE shall further meet the requirements in section 4.7.2.2.1 during time period T0 after following occasions:

- after the end of reception of latest paging message, or

- from the moment UE has switched from RRC\_CONNECTED state to RRC\_IDLE state.

T0 = N\*DRX cycle if the UE is not configured with eDRX\_IDLE cycle and T0 = one eDRX IDLE cycle if the UE is configured with eDRX\_IDLE cycle.

The relaxation factor N is given by Table 4.7.2.2.1A-1 if the UE is not configured with eDRX\_IDLE cycle and by Table 4.7.2.2.1A-2 if the UE is configured with eDRX\_IDLE cycle.

Table 4.7.2.2.1A-1: The relaxation factor N for a UE not configured with eDRX IDLE cycle

|  |  |
| --- | --- |
| **DRX cycle length [s]** | **Value** |
| 0.32 | Min(***n*** , 32) |
| 0.64 | Min(***n*** , 16) |
| 1.28 | Min(***n*** , 8) |
| 2.56 | Min(***n*** , 4) |
| NOTE: ***n*** is signalled by the network by using *num-DRX-CyclesRelaxed* defined in TS 36.331 [2]. | |

**Table 4.7.2.2.1A-2: The relaxation factor N for a UE configured with eDRX IDLE cycle**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Value** | | | |
| **1.28 ≤ PTW length [s] < 2.56** | **2.56 ≤ PTW length [s] < 5.12** | **5.12 ≤ PTW length [s] < 10.24** | **10.24 ≤ PTW length [s]** |
| 0.32 | 1 | Min(***n*** , 2) | Min(***n*** , 4) | Min(***n*** , 8) |
| 0.64 | N/A | 1 | Min(***n*** , 2) | Min(***n*** , 4) |
| 1.28 | N/A | N/A | 1 | Min(***n*** , 2) |
| 2.56 | N/A | N/A | N/A | 1 |
| NOTE: ***n*** is signalled by the network by using *num-DRX-CyclesRelaxed* defined in TS 36.331 [2]. | | | | |

##### 4.7.2.2.2 Measurements of intra-frequency cells for UE category M1 in enhanced coverage

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

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

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

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

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

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

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

If UE performs RSRP measurement based on RSS on detected intra-frequency cell, it is not expected to perform RSRP measurement based on CRS on that measured cell.

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

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

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

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

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_intra\_EC when Treselection = 0, provided that the cell is at least 5dB better ranked. For neigbor cell measured with RSS, the Tevaluate,E-UTRAN\_Intra\_EC\_RSS as defined in Table 4.7.2.2.2-1 and Table 4.7.2.2.2-2 applies.

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

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7.2.2.2-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7.2.2.2-2. Additionally, the requirements in Table 4.7.2.2.2-2 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC when multiple PTWs are used.

Table 4.7.2.2.2-1 : Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SCH Ês/Iot of neighboring cell: Q2 [dB] | DRX cycle length [s] | Tdetect,EUTRAN\_Intra\_EC [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra\_EC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra\_EC  [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra\_EC\_RSS  [s] (number of DRX cycles) |
| -15≤ Q2 < -6 | 0.32 | 330.24 (1032) | 1.28 (4) | 10.24 (32) | 6.4 (20) |
| 0.64 | 330.24 (516) | 1.28 (2) | 10.24 (16) | 6.4 (10) |
| 1.28 | 524.8 (410) | 1.28 (1) | 12.8 (10) | 6.4 (5) |
| 2.56 | 1039.36 (406) | 2.56 (1) | 15.36 (6) | 12.8 (5) |
| Q2≥-6 | 0.32 | 16.64 (52) | 1.28 (4) | 10.24 (32) | 6.4 (20) |
| 0.64 | 23.04 (36) | 1.28 (2) | 10.24 (16) | 6.4 (10) |
| 1.28 | 38.4 (30) | 1.28 (1) | 12.8 (10) | 6.4 (5) |
| 2.56 | 66.56 (26) | 2.56 (1) | 15.36 (6) | 12.8 (5) |
| NOTE 1: Void | | | | | |

Table 4.7.2.2.2-2: Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Intra\_EC [s] (number *N* of DRX or eDRX cycles Note 5) for neighboring cell with SCH Es/IoT:  -15≤ Q2 < -6 [dB] | Tdetect,EUTRAN\_Intra\_EC [s] (number *N* of DRX or eDRX cycles Note 5) for neighboring cell with SCH Es/IoT:  Q2≥-6 [dB] | Tmeasure,EUTRAN\_Intra\_EC [s] (number *N* of DRX or eDRX cycles Note 5) | Tevaluate,E-UTRAN\_intra\_EC  [s] (number *N* of DRX or eDRX cycles Note 5) | Tevaluate,E-UTRAN\_intra\_EC\_RSS  [s] (number *N* of DRX or eDRX cycles Note 5) |
| 5.12 | N/A | N/A | 2078.72 (406) | 133.12 (26) | 5.12 (1) | 30.72 (6) | 25.6 (5) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (406) | Note 3 (26) | 0.32 (1) | Note 3 (6) | Note 3 (5) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | Note 3 (6) | Note 3 (5) |
| 1.28 | ≥2.28 (1) | 1.28 (1) | Note 3 (6) | Note 3 (5) |
| 2.56 | ≥2.56 (2) | 2.56 (1) | Note 3 (6) | Note 3 (5) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The detection period and the evaluation period depend on the number *N* of DRX cycles and are calculated according to the formula below:  .  NOTE 4: Void  NOTE 5: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | | | |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE’s intra-frequency measurement is not required to meet Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate,E-UTRAN\_intra\_EC as defined in Table 4.7.2.2.2-1 and Table 4.7.2.2.2-2.

##### 4.7.2.2.3 Measurements of inter-frequency cells for UE category M1 in enhanced coverage

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

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

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

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

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

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

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

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

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 36.304 within Kcarrier\*Tevaluate,E-UTRAN\_Inter\_EC, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6 dB for reselections based on ranking.

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

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7.2.2.3-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7.2.2.3-3. Additionally, the requirements in Table 4.7.2.2.3-3 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC when multiple PTWs are used.

Table 4.7.2.2.3-1: Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate,E-UTRAN\_Inter\_EC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SCH Ês/Iot of neighboring cell: Q2 [dB] | DRX cycle length [s] | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Inter\_EC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_inter\_EC  [s] (number of DRX cycles) |
| **-15≤ Q2 < -6** | 0.32 | 330.24 (1032) | 1.28 (4) | 10.24 (32) |
| 0.64 | 330.24 (516) | 1.28 (2) | 10.24 (16) |
| 1.28 | 524.8 (410) | 1.28 (1) | 12.8 (10) |
| 2.56 | 1039.36 (406) | 2.56 (1) | 15.36 (6) |
| **Q2≥-6** | 0.32 | 16.64 (52) | 1.28 (4) | 10.24 (32) |
| 0.64 | 23.04 (36) | 1.28 (2) | 10.24 (16) |
| 1.28 | 38.4 (30) | 1.28 (1) | 12.8 (10) |
| 2.56 | 66.56 (26) | 2.56 (1) | 15.36 (6) |

Table 4.7.2.2.3-2: Void

Table 4.7.2.2.3-3: Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX or eDRX cycles Note 4) for neighboring cell with SCH Es/IoT:  -15≤ Q2 < -6 [dB] | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX or eDRX cycles Note 4) for neighboring cell with SCH Es/IoT:  Q2≥-6 [dB] | Tmeasure,EUTRAN\_Inter\_EC [s] (number of DRX or eDRX cycles Note 4) | Tevaluate,E-UTRAN\_inter\_EC  [s] (number of DRX or eDRX cycles Note 4) |
| 5.12 | N/A | N/A | 2078.72 (406) | 133.12 (26) | 5.12 (1) | 30.72 (6) |
| 10.24 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (406) | Note 3 (26) | 0.32 (1) | Note 3 (6) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | Note 3 (6) |
| 1.28 | ≥1.28 (1) | 1.28 (1) | Note 3 (6) |
| 2.56 | ≥2.56 (2) | 2.56 (1) | Note 3 (6) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.  NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].  NOTE 3: The detection period and the evaluation period depend on the number *N* of DRX cycles and are calculated according to the formula below:  .  NOTE 4: Number of eDRX cycles when eDRX\_IDLE cycle length equals 5.12s, number of DRX cycles otherwise. | | | | | | |

For higher priority cells, a UE may optionally use a shorter value forTmeasure,EUTRAN\_Inter\_EC,which shall not be less than Max(0.64 s, one DRX cycle).

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE’s inter-frequency measurement is not required to meet Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC as defined in Table 4.7.2.2.3-1 and Table 4.7.2.2.3-3.

##### 4.7.2.2.4 Maximum allowed layers for multiple monitoring for UE category M1 in enhanced coverage

The UE category M1 in enhanced coverage shall be capable of monitoring at least:

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

- Depending on UE capability, 2 TDD 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 and E-UTRA TDD inter-frequency layers.

##### 4.7.2.2.5 Maximum interruption in paging reception for Category M1 UEs in enhanced coverage

UE shall perform the cell re-selection with minimum interruption in monitoring downlink channels for paging reception. When the UE is configured with eDRX\_IDLE cycle, the UE shall not miss any paging in a PTW provided the paging is sent in at least 2 DRX cycles before the end of that PTW.

At intra-frequency cell re-selection, the UE shall monitor the downlink of serving cell for paging reception until the UE is capable to start monitoring downlink channels of the target intra-frequency cell for paging reception. The interruption time shall not exceed TSI-EUTRA-M1-EC + 50 ms.

TSI-EUTRA-M1-EC is the time required for receiving all the relevant system information data, which include MIB and relavant SIB, according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [2] for an E-UTRAN cell.

These requirements assume extended coverage radio conditions and do not take into account cell re-selection failure.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

<End of Change 3>

<Start of Change 4>

#### 6.3.2.4 RRC connection release with redirection to NR

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within Tconnection\_release\_redirect\_NR.

The time delay (Tconnection\_release\_redirect\_NR) is the time between the end of the last TTI containing the RRC command, “*RRCConnectionRelease*” (TS 36.331 [2]) on the E-UTRAN PDSCH and the time the UE starts to send random access to the target NR cell. The time delay (Tconnection\_release\_redirect\_NR) shall be less than:

Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH

The target NR cell shall be considered detectable when for each relevant SSB:

- SSB\_RP and SSB Ês/Iot according to Annex B.2.5 of TS 38.133 [50] for a corresponding NR Band.

TRRC\_procedure\_delay: It is the RRC procedure delay for processing the received message “*RRCConnectionRelease*” as defined in clause 6.2.2 of TS 36.331 [2]. It shall be less than 110 ms.

Tidentify-NR: It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in table 6.3.2.4-1. Tidentify-NR = TPSS/SSS-sync + Tmeas, whereTPSS/SSS-sync is the cell search time and Tmeas is the measurement time due to cell selection criteria evaluation.

TSI-NR: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

TRACH: It is the delay caused due to the random access procedure when sending random access to the target NR cell. TRACH can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [39].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise Trs is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with Trs = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20 ms.

Table 6.3.2.4-1: Time to identify target NR cell for RRC connection release with redirection to NR

|  |  |
| --- | --- |
| Frequency range (FR) of target NR cell | Tidentify-NR |
| FR1 | MAX (680 ms, 11 x Trs) |
| FR2 | MAX (880 ms, 88 x Trs) |

<End of Change 4>

<Start of Change 5>

##### 8.1.2.6.1 E-UTRAN FDD-FDD Inter-Frequency OTDOA Measurements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in TS 36.214 [4], for at least *n*=16 cells, including the reference cell, within *k* \*  ms as given below:

 ,

where

*k* = [2] if the UE is configured with inter-RAT measurement on one or more NR carriers, *k* = 1 otherwise,

is the total time for detecting and measuring at least *n* cells,

 is the the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [16], among the measured *n* cells including the reference cell,

 is the number of PRS positioning occasions as defined in Table 8.1.2.6.1-1, where a PRS positioning occasion is as defined in clause 8.1.2.5.1,

 =  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the *n* cells are distributed on up to two carrier frequencies including a serving carrier frequency and one inter-frequency carrier.

Table 8.1.2.6.1-1: Number of PRS positioning occasions within 

|  |  |  |
| --- | --- | --- |
| Positioning subframe configuration period | Number of PRS positioning occasions | |
| f2 Note1 | f1 and f2 Note2 |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| Note 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the FDD inter-frequency carrier frequency f2.  Note 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving FDD carrier frequency f1 and the FDD inter-frequency carrier frequency f2 respectively. | | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells *i* out of at least (*n*-1) neighbor cells within  provided:

≥-6 dB for all Frequency Bands for the reference cell,

≥-13 dB for all Frequency Bands for neighbour cell *i*,

 and  conditions apply for all subframes of at least  PRS positioning occasions,

PRP 1,2|dBm according to Annex B.2.6 for a corresponding Band

 is as defined in Clause 8.1.2.5.1.

The time  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in TS 36.355 [24], are delivered to the physical layer of the UE.

If the inter-frequency handover occurs while inter-frequency RSTD measurements are being performed, and the inter-frequency carrier on which RSTD is measured becomes the new serving carrier frequency after the inter-frequency handover, the UE shall complete the ongoing OTDOA measurement session. The UE shall also meet the inter-frequency OTDOA measurement and accuracy requirements. However in this case the RSTD measurement period () shall be according to the following expression:

,

where:

 is the number of times the inter-frequency handover occurs during,

 is the time during which the inter-frequency RSTD measurement may not be possible due to inter-frequency handover; it can be up to 45 ms.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in the sub-clause 9.1.10.2.

Furthermore, due to the inter-frequency handover the UE shall meet the RSTD measurement accuracy for a PRS bandwidth which is not larger than the minimum channel bandwidth of those PCells on whose carriers RSTD measurement is performed during the RSTD measurement period.

8.1.2.6.1.1 RSTD Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP 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 where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

##### 8.1.2.6.2 E-UTRAN TDD-FDD Inter-Frequency OTDOA Measurements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in TS 36.214 [4], for at least *n*=16 cells, including the reference cell, within *k* \*  ms as given below:

 ,

where

*k* = [2] if the UE is configured with inter-RAT measurement on one or more NR carriers, *k* = 1 otherwise,

 is the total time for detecting and measuring at least *n* cells,

 is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [16], among the measured *n* cells including the reference cell,

 is the number of PRS positioning occasions as defined in Table 8.1.2.6.2-1, where a PRS positioning occasion is as defined in clause 8.1.2.5.1,

 =  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the *n* cells are distributed on up to two carrier frequencies including a serving carrier frequency and one inter-frequency carrier.

Table 8.1.2.6.2-1: Number of PRS positioning occasions within 

|  |  |  |
| --- | --- | --- |
| Positioning subframe configuration period | Number of PRS positioning occasions | |
| f2 Note1 | f1 and f2 Note2 |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| NOTE 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the FDD inter-frequency carrier frequency f2.  NOTE 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving TDD carrier frequency f1 and the FDD inter-frequency carrier frequency f2 respectively. | | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells *i* out of at least (*n*-1) neighbor cells within , provided:

≥-6 dB for all Frequency Bands for the reference cell,

≥-13 dB for all Frequency Bands for neighbour cell *i*,

 and  conditions apply for all subframes of at least  PRS positioning occasions,

PRP 1,2|dBm according to Annex B.2.6 for a corresponding Band,

 is as defined in Clause 8.1.2.5.1.

The time  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in TS 36.355 [24], are delivered to the physical layer of the UE.

If the inter-frequency handover occurs while inter-frequency RSTD measurements are being performed, and the inter-frequency carrier on which RSTD is measured becomes the new serving carrier frequency after the inter-frequency handover, the UE shall complete the ongoing OTDOA measurement session. The UE shall also meet the inter-frequency OTDOA measurement and accuracy requirements. However in this case the RSTD measurement period () shall be according to the following expression:

,

where:

 is the number of times the inter-frequency handover occurs during,

 is the time during which the inter-frequency RSTD measurement may not be possible due to inter-frequency handover; it can be up to 45 ms.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in the sub-clause 9.1.10.2.

Furthermore, due to the inter-frequency handover the UE shall meet the RSTD measurement accuracy for a PRS bandwidth which is not larger than the minimum channel bandwidth of those PCells on whose carriers RSTD measurement is performed during the RSTD measurement period.

The inter-frequency requirements in this clause (8.1.2.6.2) shall apply for all TDD special subframe configurations specified in TS 36.211 [16] and for the TDD uplink-downlink configurations as specified in Table 8.1.2.6.2-2.

Table 8.1.2.6.2-2: TDD uplink-downlink subframe configurations applicable for TDD-FDD inter-frequency requirements

|  |  |
| --- | --- |
| PRS Transmission Bandwidth [RB] | Applicable TDD uplink-downlink configurations |
| 6, 15 | 1, 2, 3, 4 and 5 |
| 25, 50, 75, 100 | 0, 1, 2, 3, 4, 5 and 6 |
| NOTE: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [16]. | |

8.1.2.6.2.1 RSTD Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP 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 where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

##### 8.1.2.6.3 E-UTRAN TDD-TDD Inter-Frequency OTDOA Measurements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in TS 36.214 [4], for at least *n*=16 cells, including the reference cell, within *k* \*  ms as given below:

 ,

where

*k* = [2] if the UE is configured with inter-RAT measurement on one or more NR carriers, *k* = 1 otherwise,

is the total time for detecting and measuring at least *n* cells,

 is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [16], among the measured *n* cells including the reference cell,

 is the number of PRS positioning occasions as defined in Table 8.1.2.6.1-1, where a PRS positioning occasion is as defined in clause 8.1.2.5.1,

 =  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the *n* cells are distributed on up to two carrier frequencies including a serving carrier frequency and one inter-frequency carrier.

Table 8.1.2.6.3-1: Number of PRS positioning occasions within 

|  |  |  |
| --- | --- | --- |
| Positioning subframe configuration period | Number of PRS positioning occasions | |
| f2 Note1 | f1 and f2 Note2 |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| Note 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the TDD inter-frequency carrier frequency f2.  Note 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving TDD carrier frequency f1 and the TDD inter-frequency carrier frequency f2 respectively. | | |

The inter-frequency requirements in this clause (8.1.2.6.3) shall apply for all TDD special subframe configurations specified in TS 36.211 [16] and for the TDD uplink-downlink configurations as specified in Table 8.1.2.6.3-2.

Table 8.1.2.6.3-2: TDD uplink-downlink subframe configurations applicable for inter-frequency requirements

|  |  |
| --- | --- |
| PRS Transmission Bandwidth [RB] | Applicable TDD uplink-downlink configurations |
| 6, 15 | 3, 4 and 5 |
| 25 | 1, 2, 3, 4, 5 and 6 |
| 50, 75, 100 | 0, 1, 2, 3, 4, 5 and 6 |
| Note 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [16].  Note2: For UEs capable of performing inter-frequency measurements without measurement gaps, TDD uplink-downlink subframe configurations as specified in Table 8.1.2.5.2-2 shall apply. | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells *i* out of at least (*n*-1) neighbor cells within  provided:

≥-6 dB for all Frequency Bands for the reference cell,

≥-13 dB for all Frequency Bands for neighbour cell *i*,

 and  conditions apply for all subframes of at least  PRS positioning occasions,

PRP 1,2|dBm according to Annex B.2.6 for a corresponding Band

 is as defined in Clause 8.1.2.5.1.

The time  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in TS 36.355 [24], are delivered to the physical layer of the UE.

If the inter-frequency handover occurs while inter-frequency RSTD measurements are being performed, and the inter-frequency carrier on which RSTD is measured becomes the new serving carrier frequency after the inter-frequency handover, the UE shall complete the ongoing OTDOA measurement session. The UE shall also meet the inter-frequency OTDOA measurement and accuracy requirements. However in this case the RSTD measurement period () shall be according to the following expression:

,

where:

 is the number of times the inter-frequency handover occurs during,

 is the time during which the inter-frequency RSTD measurement may not be possible due to inter-frequency handover; it can be up to 45 ms.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in the sub-clause 9.1.10.2.

Furthermore, due to the inter-frequency handover the UE shall meet the RSTD measurement accuracy for a PRS bandwidth which is not larger than the minimum channel bandwidth of those PCells on whose carriers RSTD measurement is performed during the RSTD measurement period.

8.1.2.6.3.1 RSTD Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP 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 where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

##### 8.1.2.6.4 E-UTRAN FDD-TDD Inter-Frequency OTDOA Measurements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in TS 36.214 [4], for at least *n*=16 cells, including the reference cell, within *k* \*  ms as given below:

 ,

where

*k* = [2] if the UE is configured with inter-RAT measurement on one or more NR carriers, *k* = 1 otherwise,

 is the total time for detecting and measuring at least *n* cells,

 is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [16], among the measured *n* cells including the reference cell,

 is the number of PRS positioning occasions as defined in Table 8.1.2.6.4-1, where a PRS positioning occasion is as defined in clause 8.1.2.5.1,

 =  ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time, and

the *n* cells are distributed on up to two carrier frequencies including a serving carrier frequency and one inter-frequency carrier.

Table 8.1.2.6.4-1: Number of PRS positioning occasions within 

|  |  |  |
| --- | --- | --- |
| Positioning subframe configuration period | Number of PRS positioning occasions | |
| f2 Note1 | f1 and f2 Note2 |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| Note 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the TDD inter-frequency carrier frequency f2.  Note 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving FDD carrier frequency f1 and the TDD inter-frequency carrier frequency f2 respectively. | | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells *i* out of at least (*n*-1) neighbor cells within , provided:

≥-6 dB for all Frequency Bands for the reference cell,

≥-13 dB for all Frequency Bands for neighbour cell *i*,

 and  conditions apply for all subframes of at least  PRS positioning occasions,

PRP 1,2|dBm according to Annex B.2.6 for a corresponding Band

 is as defined in Clause 8.1.2.5.1.

The time  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in TS 36.355 [24], are delivered to the physical layer of the UE.

If the inter-frequency handover occurs while inter-frequency RSTD measurements are being performed, and the inter-frequency carrier on which RSTD is measured becomes the new serving carrier frequency after the inter-frequency handover, the UE shall complete the ongoing OTDOA measurement session. The UE shall also meet the inter-frequency OTDOA measurement and accuracy requirements. However in this case the RSTD measurement period () shall be according to the following expression:

,

where:

 is the number of times the inter-frequency handover occurs during,

 is the time during which the inter-frequency RSTD measurement may not be possible due to inter-frequency handover; it can be up to 45 ms.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in the sub-clause 9.1.10.2.

Furthermore, due to the inter-frequency handover the UE shall meet the RSTD measurement accuracy for a PRS bandwidth which is not larger than the minimum channel bandwidth of those PCells on whose carriers RSTD measurement is performed during the RSTD measurement period.

The inter-frequency requirements in this clause (8.1.2.6.4) shall apply for all TDD special subframe configurations specified in TS 36.211 [16] and for the TDD uplink-downlink configurations as specified in Table 8.1.2.6.4-2.

Table 8.1.2.6.4-2: TDD uplink-downlink subframe configurations applicable for inter-frequency requirements

|  |  |
| --- | --- |
| PRS Transmission Bandwidth [RB] | Applicable TDD uplink-downlink configurations |
| 6, 15 | 3, 4 and 5 |
| 25 | 1, 2, 3, 4, 5 and 6 |
| 50, 75, 100 | 0, 1, 2, 3, 4, 5 and 6 |
| Note 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [16].  Note2: For UEs capable of performing inter-frequency measurements without measurement gaps, TDD uplink-downlink subframe configurations as specified in Table 8.1.2.5.2-2 shall apply. | |

8.1.2.6.4.1 RSTD Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP 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 where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

<End of Change 5>

<Start of Change 6>

##### 8.1.2.4.21 E-UTRAN FDD – NR measurements

Requirements in this clause shall apply for NR capable UE when not configured with EN-DC.

The UE shall be able to identify new inter-RAT E-UTRAN FDD - NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

8.1.2.4.21.1 E-UTRAN FDD – NR measurements

8.1.2.4.21.1.1 Identification of a new NR cell

When measurement gaps are scheduled, the UE shall be able to identify a new detectable cell within Tidentify\_irat\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT cell within Tidentify\_irat\_with\_index. The UE shall be able to identify a new detectable inter-RAT SS block of an already detected cell within Tidentify\_irat\_without\_index.

Tidentify\_irat\_without\_index = (TPSS/SSS\_sync\_irat + T SSB\_measurement\_period\_irat) ms

Tidentify\_irat\_with\_index = (TPSS/SSS\_sync\_irat + T SSB\_measurement\_period\_irat + TSSB\_time\_index\_irat) ms

Where:

TPSS/SSS\_sync\_irat: it is the time period used in PSS/SSS detection given in table 8.1.2.4.21.1.1-1, 8.1.2.4.21.1.1-1A and table 8.1.2.4.21.1.1-2.

TSSB\_time\_index\_irat: it is the time period used to acquire the index of the SSB being measured given in table 8.1.2.4.21.1.1-3, 8.1.2.4.21.1.1-3A and table 8.1.2.4.21.1.1-4.

TSSB\_measurement\_period\_irat: equal to a measurement period of SSB based measurement given in table 8.1.2.4.21.1.1-5, 8.1.2.4.21.1.1-5A and table 8.1.2.4.21.1.1-6.

Mpss/sss\_sync\_irat: For a UE supporting FR2 power class 1, Mpss/sss\_sync\_irat = 64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), Mpss/sss\_sync\_irat = 40 samples. For a UE supporting FR2 power class 3 (handheld), Mpss/sss\_sync\_irat = 40 samples. For a UE supporting FR2 power class 4, Mpss/sss\_sync\_irat = 40 samples.

MSSB\_index\_irat: For a UE supporting FR2 power class 1, MSSB\_index\_irat = 40 samples. For a UE supporting FR2 power class 2 (vehicle mounted), MSSB\_index\_irat = 24 samples. For a UE supporting FR2 power class 3 (handheld), MSSB\_index\_irat = 24 samples. For a UE supporting FR2 power class 4, MSSB\_index\_irat = 24 samples.

Mmeas\_period\_irat: For a UE supporting FR2 power class 1, Mmeas\_period\_irat = 64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), Mmeas\_period\_irat = 40 samples. For a UE supporting FR2 power class 3 (handheld), Mmeas\_period\_irat = 40 samples. For a UE supporting FR2 power class 4, Mmeas\_period\_irat = 40 samples.

Nfreq is defined in clause 8.1.2.1.1

For per-FR measurement gap capable UE, when serving cells are in E-UTRA and measurement objects are only in FR2,

- UE can perform such measurements without gap, and

- UE fulfils the requirements for FR2 measurement objects based on effective MGRP = 20 ms.

Table 8.1.2.4.21.1.1-1: Time period for PSS/SSS detection (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_irat |
| No DRX | Max(600ms, 8 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8×1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | 8 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 8.1.2.4.21.1.1-1A: Time period for PSS/SSS detection for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_irat |
| No DRX | Max(600ms, 8 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle ≥ 320ms | 8× DRX cycle ×Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms | |

Table 8.1.2.4.21.1.1-2: Time period for PSS/SSS detection (Frequency range FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_irat** |
| No DRX | Max(600ms, Mpss/sss\_sync\_irat × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(600ms, (1.5 × Mpss/sss\_sync\_irat) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | Mpss/sss\_sync\_irat × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 8.1.2.4.21.1.1-3: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_irat |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | 3 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 8.1.2.4.21.1.1-3A: Time period for time index detection for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_irat |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle < 320ms | Max(120ms, Ceil(3 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle ≥ 320ms | 3 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms | |

Table 8.1.2.4.21.1.1-4: Time period for time index detection (Frequency range FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_irat |
| No DRX | Max(200ms, MSSB\_index\_irat × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(200ms, (1.5 × MSSB\_index\_irat) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | MSSB\_index\_irat × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

In the requirements, an NR cell is considered detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in Section 9.11.1 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],

- NR SS-RSRQ related conditions in the accuracy requirements in Section 9.11.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],

- NR SS-SINR related conditions in the accuracy requirements in Section 9.11.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50].

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clause 9.11, with measurement period as shown in table 8.1.2.4.21.1.1-5, 8.1.2.4.21.1.1-5A and 8.1.2.4.21.1.1-6:

Table 8.1.2.4.21.1.1-5: Measurement period for inter-RAT measurements (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_measurement\_period\_irat |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | 8 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

Table 8.1.2.4.21.1.1-5A: Measurement period for inter-RAT measurements for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_measurement\_period\_irat |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle < 320ms | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq |
| DRX cycle ≥ 320ms | 4× M × DRX cycle ×Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.  NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms | |

Table 8.1.2.4.21.1.1-6: Measurement period for inter-RAT measurements (Frequency range FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_measurement\_period\_irat |
| No DRX | Max(400ms, Mmeas\_period\_irat × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(400ms, (1.5 × Mmeas\_period\_irat) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | Mmeas\_period\_irat × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].  NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in section 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. | |

The UE shall be capable of performing NR SS-RSRP, SS-RSRQ and SS-SINR for up to 7 NR carrier frequencies.

For each RAT E-UTRAN FDD-NR layer on FR1 or FR2, the UE shall be capable of monitoring at least 4 cells.

For each RAT E-UTRAN FDD-NR layer on FR1, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB index and/or PCI on the RAT E-UTRAN FDD-NR layer.

For each RAT E-UTRAN FDD-NR layer on FR2, during each layer 1 measurement period, the UE shall be capable of monitoring at least 10 SSBs with different SSB index and/or PCI on the RAT E-UTRAN FDD-NR layer. The UE shall be capable of monitoring at least one SSB per cell.

The NR SS-RSRP measurement accuracy for all measured NR cells shall be as specified in clause 9.11.1. The NR SS-RSRQ measurement accuracy for all measured NR cells shall be as specified in clause 9.11.2. The NR SS-SINR measurement accuracy for all measured NR cells shall be as specified in clause 9.11.3.

NOTE: When inter-frequency RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, gap pattern 0 is assumed and requirements in this clause are derived assuming MGRP=80ms is used.

8.1.2.4.21.1.2 Periodic Reporting

Reported measurements in periodically triggered measurement reports shall meet the requirements in clause 9.

8.1.2.4.21.1.3 Event Triggered Reporting

Reported measurements in event triggered measurement reports shall meet the requirements in clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu 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 twice the TTI of the uplink DCCH. 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 Tidentify\_irat\_without\_index or Tidentify\_irat\_with\_index defined in Clause 8.1.2.4.21.1.1 for the minimum requirements.When L3 filtering is used or IDC autonomous denial or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

If an NR cell which has been detectable at least for the time period Tidentify\_irat\_without\_index. or Tidentify\_irat\_with\_index defined in clause 8.1.2.4.21.1.1 for the minimum requirements and then triggers the measurement report as per TS 36.331 [2], the event triggered measurement reporting delay shall be less than TSSB\_measurement\_period\_irat defined in clause 8.1.2.4.21.1.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

8.1.2.4.21.1.4 Event-triggered Periodic Reporting

Reported measurements contained in event triggered periodic measurement reports shall meet the requirements in clause 9.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.1.2.4.21.1.3.

8.1.2.4.21.2 Void

<End of Change 6>

<Start of Change 7>

### A.7.3.88 TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in normal coverage

#### A.7.3.88.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell. This test will partly verify the NB-IoT TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.88.1-1, A.7.3.88.1-2, A.7.3.88.1-2A, A.7.3.88.1-3 and A.7.3.88.1-4. nCell 1 is the active NB-IoT cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.88.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.7.3.88.1-1: General test parameters for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in normal coverage

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | nCell 1 |  |
| Neighbour cell |  | eCell 1 |  |
| CP length |  | Normal |  |
| Deployment Mode |  | In-band |  |
| NPDCCH transmission parameters Rmax |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23.2-1 |
| Special subframe configuration |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration |  | 1 | As specified in table 4.2-2 in TS 36.211 [16] |
| DRX cycle | ms | 256 | See Table A.7.3.88.1-3 |
| Layer 3 filtering Note 2,3 |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | ms | 1000 | T311 is enabled |
| T1 | s | 5.12 |  |
| dT | S | 0.8 |  |
| T2 | s | 10.24 |  |
| dT | S | 0.7 |  |
| T3 | s | 5.12 |  |
| dT | S | 1.4 |  |
| T4 | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [2].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | |

Table A.7.3.88.1-2: nCell specific test parameters for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in normal coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | | |
| T1 | dT | T2 | dT | T3 | dT | T4 |
| BWchannel | kHz | 180 | | | | | | |
| PRB location within eCell |  | eCell 1 BWchannel 10MHz: 30 | | | | | | |
| NPDCCH parameters as defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | | | |
| NPBCH\_RA | dB | -3 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.88.1-2A | | | | | | |
| SNR Note 4, 5 | dB | -3.1 | Note 6 | -9.1 | Note 6 | -14.1 | Note 6 | -3.1 |
| Propagation condition |  | AWGN | | | | | | |
| Configuration |  | 2x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.7.3.88.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

Table A.7.3.88.1-2A: eCell 1 specific test parameters for TDD Out-of-sync radio link monitoring test in DRX for UE category NB1 In-band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | eCell 1 |
| T1-T4 |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | -12 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.88.1-3: DRX-Configuration for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [2] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table A.7.3.88.1-4: *TimeAlignmentTimer* -Configuration for NB-IoT TDD out-of-sync testing for UE category NB1 In-band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.88.1-1: SNR variation for out-of-sync testing in DRX for NB-IoT TDD out-of-sync testing for UE category NB1 In-band mode in normal coverage

#### A.7.3.88.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

### A.7.3.89 TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

#### A.7.3.89.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell. This test will partly verify the NB-IoT TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.89.1-1, A.7.3.89.1-2, A.7.3.89.1-2A, A.7.3.89.1-3 and A.7.3.89.1-4. nCell 1 is the active NB-IoT cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.89.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode the NPDCCH and complete the UL transmission when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.7.3.89.1-1: General test parameters for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | nCell 1 |  |
| Neighbour cell |  | eCell 1 |  |
| CP length |  | Normal |  |
| Deployment Mode |  | In-band |  |
| NPDCCH transmission parameters Rmax |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23.2-1 |
| Special subframe configuration |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration |  | 1 | As specified in table 4.2-2 in TS 36.211 [16] |
| DRX cycle | ms | 256 | See Table A.7.3.61.1-3 |
| Layer 3 filtering Note 2,3 |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | ms | 1000 | T311 is enabled |
| T1 | s | 5.12 |  |
| dT | s | 0.7 |  |
| T2 | s | 10.24 |  |
| dT | s | 0.8 |  |
| T3 | s | 5.12 |  |
| dT | s | 1.4 |  |
| T4 | s | 5.12 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [2].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | |

Table A.7.3.89.1-2: nCell specific test parameters for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | | |
| T1 | dT | T2 | dT | T3 | dT | T4 |
| BWchannel | kHz | 180 | | | | | | |
| PRB location within eCell |  | eCell 1 BWchannel 10MHz: 30 | | | | | | |
| NPDCCH parameters as defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | | | |
| NPBCH\_RA | dB | -3 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.89.1-2A | | | | | | |
| SNR Note 4, 5 | dB | -6.3 | Note 6 | -11.4 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | | | |
| Antenna Configuration |  | 2x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.7.3.89.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

Table A.7.3.89.1-2A: eCell 1 specific test parameters for TDD Out-of-sync radio link monitoring test in DRX for UE category NB1 In-band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | eCell 1 |
| T1-T4 |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | -12 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.89.1-3: DRX-Configuration for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.7.3 in TS 36.331 [2] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| drx-StartOffset | 0 |

Table A.7.3.89.1-4: *TimeAlignmentTimer* -Configuration for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.89.1-1: SNR variation for TDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage

#### A.7.3.89.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4.

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

### A.7.3.90 TDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 In-Band mode in Normal Coverage

#### A.7.3.90.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE configured in normal coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell when DRX is used. This test will partly verify the TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.90.1-1, A.7.3.90.1-2, A.7.3.90.1-3, A.7.3.90.1-4 and A.7.3.90.1-5. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.90.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 are as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR3.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. NPDCCH repetition level is determined by RRC parameter *npdcch-NumRepetitions* [2]. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.90.1-1: General test parameters for TDD in-sync test with DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IoT operational mode | |  | In-band |  |
| Active cell | |  | nCell 1 | NB-IOT cell nCell1 is within E-UTRA cell eCell1 |
| CP length | |  | Normal |  |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-1 in TS 36.211 [16] |
| DRX cycle | | ms | 256 | See Table A.7.3.63.1-4 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

Table A.7.3.90.1-2: nCell 1 specific test parameters for TDD in-sync radio link monitoring test with DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | |
| T1 | dT | T2 | dT | T3 |
| BWchannel | kHz | 180 | | | | |
| PRB location within eCell | - | eCell 1 BWchannel 10MHz: 30 | | | | |
| NPDCCH parameters defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | |
| Ratio of NPDSCH to NRS EPRE |  | -3 | | | | |
| NPDCCH\_RA | dB | -3 | | | | |
| NPDCCH\_RB | dB | -3 | | | | |
| NPBCH\_RA | dB | -3 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.90.1-3 | | | | |
| SNR Note 5, Note 6 | dB | -3.1 | Note 7 | -14.1 | Note 8 | -3.1 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 2x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.7.3.90.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table A.7.3.90.1-3: eCell 1 specific test parameters for TDD in-sync radio link monitoring test with DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | eCell 1 |
| T1-T3 |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | 4 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.90.1-4: DRX-Configuration for E-UTRAN TDD in-sync tests with DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.3.2 in TS 36.331 [2] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| longDRX-CycleStartOffset | Sf256 |
| shortDRX | disable |

Table A.7.3.90.1-5: *TimeAlignmentTimer* -Configuration for E-UTRAN TDD in-sync tests with DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.90.1-1: SNR variation for in-sync testing with DRX

#### A.7.3.90.2 Test Requirements

The UE behaviour in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.3.91 TDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 In-Band mode in Enhanced Coverage

#### A.7.3.91.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE configured in enhanced coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell when DRX is used. This test will partly verify the TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.91.1-1, A.7.3.91.1-2, A.7.3.91.1-3, A.7.3.91.1-4 and A.7.3.91.1-5. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.91.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR3.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. NPDCCH repetition level is determined by RRC parameter *npdcch-NumRepetitions* [3]. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.91.1-1: General test parameters for TDD in-sync test with DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IoT operational mode | |  | In-band |  |
| Active cell | |  | nCell 1 | NB-IOT cell nCell1 is within E-UTRA cell eCell1 |
| CP length | |  | Normal |  |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-1 in TS 36.211 [16] |
| DRX cycle | | ms | 256 | See Table A.7.3.62.1-4 |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

Table A.7.3.91.1-2: nCell 1 specific test parameters for TDD in-sync radio link monitoring test with DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | |
| T1 | dT | T2 | dT | T3 |
| BWchannel | kHz | 180 | | | | |
| PRB location within eCell | - | eCell 1 BWchannel 10MHz: 30 | | | | |
| NPDCCH parameters defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | |
| Ratio of NPDSCH to NRS EPRE |  | -3 | | | | |
| NPDCCH\_RA | dB | -3 | | | | |
| NPDCCH\_RB | dB | -3 | | | | |
| NPBCH\_RA | dB | -3 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.91.1-3 | | | | |
| SNR Note 5, Note 6 | dB | -6.3 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 2x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.7.3.91.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table A.7.3.91.1-3: eCell 1 specific test parameters for TDD in-sync radio link monitoring test with DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | **eCell 1** |
| **T1-T3** |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | -12 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.91.1-4: DRX-Configuration for E-UTRAN TDD in-sync tests with DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| onDurationTimer | pp1 | As specified in clause 6.3.2 in TS 36.331 [2] |
| drx-InactivityTimer | pp0 |
| drx-RetransmissionTimer | pp0 |
| longDRX-CycleStartOffset | Sf256 |
| shortDRX | disable |

Table A.7.3.91.1-5: *TimeAlignmentTimer* -Configuration for E-UTRAN TDD in-sync tests with DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.91.1-1: SNR variation for in-sync testing with DRX

#### A.7.3.91.2 Test Requirements

The UE behaviour in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.3.92 TDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 In-Band mode in Normal Coverage

#### A.7.3.92.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE configured in normal coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.92.1-1, A.7.3.92.1-2, A.7.3.92.1-3 and A.7.3.92.1-4. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.92.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is disabled, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, dT and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR3.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.92.1-1: General test parameters for TDD in-sync test without DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IoT operational mode | |  | In-band |  |
| Active cell | |  | nCell 1 | NB-IOT cell nCell1 is within E-UTRA cell eCell1 |
| CP length | |  | Normal |  |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 2 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 8 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-1 in TS 36.211 [16] |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

Table A.7.3.92.1-2: nCell 1 specific test parameters for TDD in-sync radio link monitoring test without DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | |
| T1 | dT | T2 | dT | T3 |
| BWchannel | kHz | 200 | | | | |
| PRB location within eCell | - | eCell 1 BWchannel 10MHz: 30 | | | | |
| NPDCCH parameters defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | |
| NPDSCH\_RA |  | -3 | | | | |
| NPDSCH\_RB |  | -3 | | | | |
| NPDCCH\_RA | dB | -3 | | | | |
| NPDCCH\_RB | dB | -3 | | | | |
| NPBCH\_RA | dB | -3 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.92.1-3 | | | | |
| SNR Note 5, Note 6 | dB | -3.1 | Note 7 | -14.1 | Note 8 | -3.1 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 2x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.7.3.92.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table A.7.3.92.1-3: eCell 1 specific test parameters for TDD in-sync radio link monitoring test without DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | eCell 1 |
| T1-T3 |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | 6 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.92.1-4: *TimeAlignmentTimer* -Configuration for E-UTRAN TDD in-sync tests without DRX for UE category NB1 In-Band mode in normal coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.92.1-1: SNR variation for in-sync testing without DRX

#### A.7.3.92.2 Test Requirements

The UE behavior in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.3.93 TDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 In-Band mode in Enhanced Coverage

#### A.7.3.93.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE configured in enhanced coverage properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.93.1-1, A.7.3.93.1-2, A.7.3.93.1-3 and A.7.3.93.1-4. nCell 1 is the active cell in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.93.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.

Prior to the start of the time duration T1, the UE shall be fully be synchronized to nCell 1. The UE is scheduled in every uplink subframe to transmit NPUSCH, which is received by the test equipment. By measuring the reception of the NPUSCH, detection of out of sync and in sync requirements can be measured. In the test, DRX configuration is disabled, i.e. UE tries to decode NPDCCH and to send NPUSCH during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

The test setup in each test during time durations T1, T2, dT and T3 shall be as follows:

- During the period from time point A to time point B, the SNR is decreasing linearly from SNR1 to SNR2.

- During the period from time point C to time point D, the SNR is increasing linearly from SNR2 to SNR3.

- During the period T3, the test system shall send the UE a grant to transmit in uplink. UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission.

- Thereafter UE switches back to downlink.

In each run of the test, the test equipment selects NPDCCH repetition level, and sends the RRC configuration to the UE. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.93.1-1: General test parameters for TDD in-sync test without DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NB-IoT operational mode | |  | In-band |  |
| Active cell | |  | nCell 1 | NB-IOT cell nCell1 is within E-UTRA cell eCell1 |
| CP length | |  | Normal |  |
| In sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | In sync threshold Qin\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 4 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to NRS EPRE |  | 0 |
| Out of sync transmission parameters  (Note 1) | DCI format |  | Format N1 | As defined in TS 36.212 [21] |
| Number of OFDM symbols for legacy control channels |  | 3 | Out of sync threshold Qout\_NB-IoT and the corresponding hypothetical NPDCCH transmission parameters are as specified in clause 7.23.2 and Table 7.23.2-1 respectively. |
| NPDCCH aggregation level | eCCE | 2 |
| NPDCCH repetition level |  | 16 |
| Ratio of NPDSCH to NRS EPRE |  | 0 |
| Ratio of NPDCCH to RS EPRE | dB | 0 |
| Special subframe configuration | |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration | |  | 1 | As specified in table 4.2-1 in TS 36.211 [16] |
| Layer 3 filtering | |  | Enabled | Counters:  N310 = 1; N311 = 1 |
| T310 timer | | ms | 4000 | T310 is enabled |
| T311 timer | | ms | 1000 | T311 is enabled |
| T1 | | s | 4 |  |
| dT | | s | 1.4 |  |
| T2 | | s | 2.12 |  |
| dT | | s | 1.4 |  |
| T3 | | s | 4 |  |
| Note 1: NPDCCH corresponding to the in-sync and out of sync transmission parameters need not be included in the Reference Measurement Channel. | | | | |

Table A.7.3.93.1-2: nCell 1 specific test parameters for TDD in-sync radio link monitoring test without DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | |
| T1 | dT | T2 | dT | T3 |
| BWchannel | kHz | 200 | | | | |
| PRB location within eCell | - | eCell 1 BWchannel 10MHz: 30 | | | | |
| NPDCCH parameters defined in A.3.1.5.7 |  | R.15 NB-TDD | | | | |
| NPDSCH\_RA |  | -3 | | | | |
| NPDSCH\_RB |  | -3 | | | | |
| NPDCCH\_RA | dB | -3 | | | | |
| NPDCCH\_RB | dB | -3 | | | | |
| NPBCH\_RA | dB | -3 | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NOCNG\_RANote1 | dB |
| NOCNG\_RBNote1 | dB |
|  | dBm/15 kHz | Specified in Table A.7.3.93.1-3 | | | | |
| SNR Note 5, Note 6 | dB | -6.3 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation condition |  | AWGN | | | | |
| Antenna Configuration |  | 2x1 | | | | |
| Note 1: OCNG shall be used such that the resources in ncell1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CQI reporting are assigned to the UE prior to the start of time period T1.  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 4: The signal contains NPDCCH for UEs other than the device under test as part of OCNG.  Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2, and SNR1 respectively in figure A.7.3.93.1-1.  Note 7: The Test system shall reduce its transmit power in steps of (((SNR2-SNR1) / (10\*dT)) dB every 100ms till SNR2 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of (((SNR1-SNR2) / (10\*dT)) dB every 100ms till SNR1 is achieved at the end of dT. | | | | | | |

Table A.7.3.93.1-3: eCell 1 specific test parameters for TDD in-sync radio link monitoring test without DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | eCell 1 |
| T1-T3 |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.1 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | 0 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

Table A.7.3.93.1-4: *TimeAlignmentTimer* -Configuration for E-UTRAN TDD in-sync tests without DRX for UE category NB1 In-Band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| TimeAlignmentTimer | infinity | As specified in clause 6.3.2 in TS 36.331 [2] |



Figure A.7.3.93.1-1: SNR variation for in-sync testing without DRX

#### A.7.3.93.2 Test Requirements

The UE behavior in each test shall be as follows:

During the period T3, the UE under test is expected to decode the uplink grant and switch to uplink and complete the uplink transmission. This is considered a correct event.

The rate of correct events observed during repeated tests shall be at least 90%.

### A.7.3.94 TDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage

#### A.7.3.94.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell. This test will partly verify the NB-IoT TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.94.1-1 and A.7.3.94.1-2. nCell1 is the active NB-IoT cell in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.94.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure:

- Prior to the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 within dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH

Note: The UE is expected to decode the NPDCCH and complete the UL transmission during T2 according to the UL grant.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 within dT

- During T3, the SNR is kept as SNR3

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct any UL transmission during T4, since the UE is expected to declare RLF during T3.

Table A.7.3.94.1-1: General test parameters for TDD Radio Link Monitoring Test for out-of-sync tests without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NB-IoT operational mode |  | **Standalone** |  |
| Active cell |  | nCell 1 |  |
| CP length |  | Normal |  |
| NPDCCH repetition level Rmax |  | 8 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23.2-1 |
| Special subframe configuration |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration |  | 1 | As specified in table 4.2-1 in TS 36.211 [16] |
| DRX |  | OFF |  |
| Layer 3 filtering Note 2,3 |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2,3 | ms | 0 | T310 is disabled |
| T311 timer Note 2,3 | ms | 3000 | T311 is enabled |
| T1 | s | 2 |  |
| dT | s | 0.8 |  |
| T2 | s | 0.4 |  |
| dT | s | 0.7 |  |
| T3 | s | 0.5 |  |
| dT | s | 1.4 |  |
| T4 | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [2].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | |

Table A.7.3.94.1-2: nCell1 specific test parameters for TDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Standalone mode in normal coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | | |
| T1 | dT | T2 | dT | T3 | dT | T4 |
| NB-IoT Channel Bandwidth (BWchannel) | kHz | 180 | | | | | | |
| OCNG Pattern as defined in A.3.2.3.8 Note 1 |  | NOP.3 TDD | | | | | | |
| NPDCCH parameters as defined in A.3.1.5.8 |  | R.19 NB-TDD | | | | | | |
| NPBCH\_RA | dB | -3 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | -98 | | | | | | |
| SNR Note 4,5 | - | -3.1 | Note 6 | -9.1 | Note 7 | -14.1 | Note 6 | -3.1 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 2x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNRs in time periods T1, T2, T3 and T4 are denoted as SNR2, SNR3 and SNR1 respectively in figure A.7.3.94.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

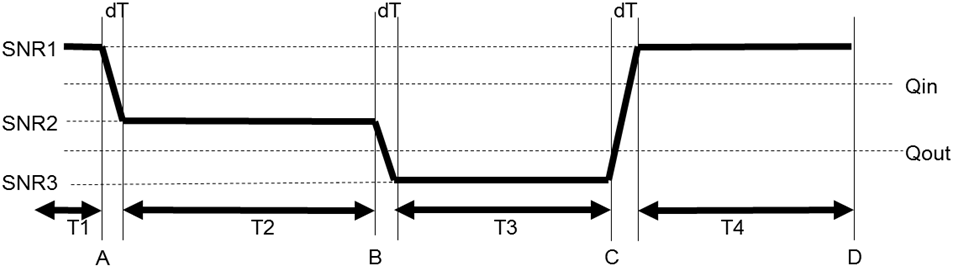


Figure A.7.3.94.1-1: SNR variation for out-of-sync testing

#### A.7.3.94.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behaves correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

### A.7.3.95 TDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 guard band mode in Enhanced Coverage

#### A.7.3.95.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD category NB1 UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the NB-IoT Cell. This test will partly verify the NB-IoT TDD radio link monitoring requirements in clause 7.23.

The test parameters are given in Tables A.7.3.95.1-1 and A.7.3.95.1-2 below. nCell1 is the active NB-IoT cell, in the test. The test consists of four successive time periods with time duration of T1, T2, T3 and T4 respectively, excluding the transition time duration dT, where the SNR increases or decreases gradually in small steps. Figure A.7.3.95.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync state with the following testing procedure.

- Before the start of the time duration T1, the UE shall be fully synchronized to nCell1

- Starting at point A, the SNR is decreased in small steps from SNR1 to SNR2 with duration dT

- At the start of the time duration T2, the UE is provided with a UL grant with NPDCCH.

Note: The UE is expected to decode NPDCCH and complete the UL transmission during T2 according to the UL grant.

- Starting at point B, the SNR is decreased in small steps from SNR2 to SNR3 with duration dT

- During T3, the SNR is kept at SNR3.

Note: The UE is expected to detect OOS and declare RLF during T3.

- Starting at point C, the SNR is increased in small steps from SNR3 to SNR1 with duration dT

- At the start of the time period T4, the UE will be provided with another UL grant with NPDCCH

Note: The UE is not expected to decode the UL grant and conduct the UL transmission during T4 since the UE is expected to declare RLF during T3.

Table A.7.3.95.1-1: General test parameters for TDD Radio Link Monitoring Test for out-of-sync tests without DRX for UE Category NB1 Guard band mode in enhanced coverage

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NB-IoT operational mode |  | Guardband |  |
| Active cell |  | nCell 1 |  |
| CP length |  | Normal |  |
| NB-IoT RF Channel Number |  | 1 | One NB-IoT carrier frequency |
| NPDCCH repetition level Rmax |  | 16 | Other NPDCCH parameters are defined in “ out-of-sync” column in Table 7.23.2-1 |
| Special subframe configuration |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| Uplink-downlink configuration |  | 6 | As specified in table 4.2-1 in TS 36.211 [16] |
| DRX |  | OFF |  |
| Layer 3 filtering Note 2 |  | Enabled | Counters:  N310 = 1  N311 = 1 |
| T310 timer Note 2 | ms | 0 | T310 is disabled |
| T311 timer Note 2 | ms | 3000 | T311 is enabled |
| T1 | s | 2 |  |
| dT | s | 0.7 |  |
| T2 | s | 0.4 |  |
| dT | s | 0.8 |  |
| T3 | s | 0.5 |  |
| dT | s | 1.4 |  |
| T4 | s | 0.4 |  |
| Note 1: NPDCCH corresponding to the out of sync transmission parameters need not be included in the Reference Measurement Channel.  Note 2: N310, N311, T310 and T311 are defined in TS 36.331 [2].  Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. | | | |

Table A.7.3.95.1-2: nCell1 specific test parameters for TDD Radio Link Monitoring Test for out-of-sync without DRX for UE Category NB1 Guard band mode in enhanced coverage

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | nCell 1 | | | | | | |
| T1 | dT | T2 | dT | T3 | dT | T4 |
| BWchannel | kHz | 180 | | | | | | |
| PRB location within eCell | **-** | eCell 1 BWchannel 10MHz: 50 | | | | | | |
| NPDCCH parameters as defined in A.3.1.5.9 |  | R.23 NB-TDD | | | | | | |
| NPBCH\_RA | dB | -3 | | | | | | |
| NPBCH\_RB | dB |
| NPSS\_RA | dB |
| NSSS\_RA | dB |
| NPDCCH\_RA | dB |
| NPDCCH\_RB | dB |
| NPDSCH\_RA | dB |
| NPDSCH\_RB | dB |
| OCNG\_RA Note 1 | dB |
| OCNG\_RB Note 1 | dB |
|  | dBm/15 KHz | Specified in Table A.7.3.95.1-3 | | | | | | |
| SNR Note 4,5 | - | -6.3 | Note 6 | -11.4 | Note 7 | -17.4 | Note 8 | -6.3 |
| Propagation Condition | - | AWGN | | | | | | |
| Antenna Configuration | - | 2x1 | | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: Void  Note 3: Void  Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.  Note 5: The SNR in time periods T1, T2, T3 and T4 is denoted as SNR1, SNR2, SNR3 and SNR1 respectively in figure A.7.3.95.1-1.  Note 6: The Test system shall reduce its transmit power in steps of ((SNR2-SNR1) / (10\*dT)) dB every 100ms until SNR2 is achieved at the end of dT.  Note 7: The Test system shall reduce its transmit power in steps of ((SNR3-SNR2) / (10\*dT)) dB every 100ms until SNR3 is achieved at the end of dT.  Note 8: The Test system shall increase its transmit power in steps of ((SNR1-SNR3) / (10\*dT)) dB every 100ms until SNR1 is achieved at the end of dT. | | | | | | | | |

Table A.7.3.95.1-3: eCell 1 specific test parameters for TDD out-of-sync radio link monitoring test without DRX for UE category NB1 Guard band mode in enhanced coverage

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | **eCell 1** |
| **T1-T4** |
| BWchannel | MHz | 10 |
| NOCNG Pattern | **-** | BWchannel 10MHz: NOP.2 TDD |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1 | dB |
| Note2 | dBm/15 kHz | -98 |
|  | dB | -12 |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 2x1 |
| Note 1: OCNG shall be used such that the eCell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power . | | |

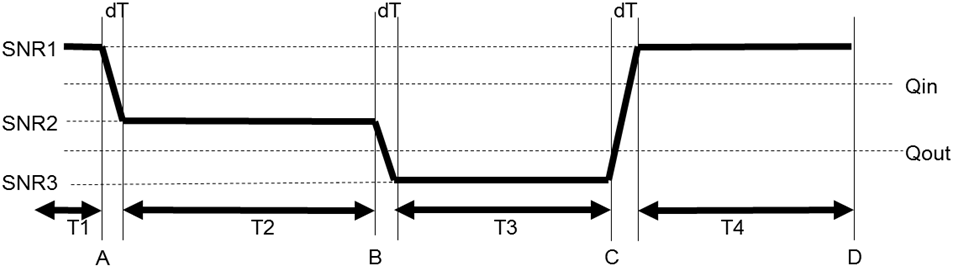


Figure A.7.3.95.1-1: SNR variation for out-of-sync testing

#### A.7.3.95.2 Test Requirements

The UE behaviors in each test shall be as follows:

- The UE shall complete the NPUSCH transmission during T2 according to the received UL grant;

- The UE shall not conduct any NPUSCH transmission during T4

A correct event is defined as UE behave correctly in all above steps. The correct events observed during repeated tests shall be at least 90%.

<End of Change 7>

v