**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017082***

**Electronic Meeting, 2nd – 13th November, 2020**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **36.133** | **CR** | **6999** | **rev** | **1** | **Current version:** | **16.7.0** |  |
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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:***  | Terminology updates for NR-U |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_unlic-Core |  | ***Date:*** | 2020-10-23 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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 canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | RAN4 agreed on the definition of SMTC/SSB not available at the UE and the signal/channel occasion unavailable for UE transmission, which need to be captured in the specification |
|  |  |
| ***Summary of change:*** | The terms SMTC/SSB not available at the UE and the signal/channel occasion unavailable for UE transmission are clarified |
|  |  |
| ***Consequences if not approved:*** | Incorrect requirements |
|  |  |
| ***Clauses affected:*** | 4.2.2.5.7, 5.3.4A, 6.3.2.5, 7.31A, 8.1.2.4.21A, 8.1.2.4.25.2a, 8.17.2.2.a, 8.17.4A |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 36.521-3 |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**--- start of change 1 ---**

##### 4.2.2.5.7 Measurements of NR cells subject to CCA

The UE shall be able to identify new inter-frequency cells subject to CCA and perform SS-RSRP or SS-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.

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 in this subclause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 within Kcarrier \* Tdetect,NR\_Inter + Kcarrier\_CCA \* Tdetect,NR\_Inter\_CCA 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 dB in FR1 for reselections based on ranking or 6dB in FR1 for SS-RSRP reselections based on absolute priorities or 4dB in FR1 for SS-RSRQ reselections based on absolute priorities.

The parameter Kcarrier is the number of NR inter-frequency carriers on licensed band and Kcarrier\_CCA is the number of NR inter-frequency carriers on unlicensed band indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.x.y for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,NR\_Inter\_CCA. 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 section 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 NR 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 SS-RSRP or SS-RSRQ at least every Kcarrier \* Tmeasure,NR\_Inter + Kcarrier\_CCA \* Tmeasure,NR\_Inter\_CCA (see table 4.2.2.5.7-1) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR 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.

For a cell that is already identified, after 2 unsuccessful measurement attempts due to exceeding the maximum number of SMTC occasions not available at the UE, the UE shall detect cells on any of the configured serving- and/or non-serving carriers.

In the requirements of clause 4.2.2.5.7, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding detection, measurement, or evaluation period; otherwise the SMTC occasion is considered as available at the UE.

The UE shall filter SS-RSRP or SS-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,NR\_Inter\_CCA/2.

The UE shall not consider a NR 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 38.304 within Kcarrier \* Tevaluate,NR\_Inter + Kcarrier\_CCA \* Tevaluate,NR\_Inter\_CCA when Treselection = 0as specified in table 4.2.2.5.7-1 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

when *rangeToBestCell* is not configured:

- the cell is at least 5dB better ranked in FR1 or.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.

- if there are multiple such cells, the cell has the highest rank among them

- the cell is at least 5dB better ranked in FR1 if the current serving cell is among them. or

- 6dB in FR1 for SS-RSRP reselections based on absolute priorities or

- 4dB in FR1 for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If Treselection timer has a non zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2A.2.4-1 under the following conditions:

- TSMTC\_intra = TSMTC\_inter = 160 ms; where TSMTC\_intra and TSMTC\_inter are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion [1].

Table 4.2.2.5.7-1: Tdetect,NR\_Inter\_CCA, Tmeasure,NR\_Inter\_CCA and Tevaluate,NR\_Inter\_CCA

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter\_CCA [s] (number of DRX cycles) | Tmeasure,NR\_Inter\_CCA [s] (number of DRX cycles) | Tevaluate,NR\_Inter\_CCA [s] (number of DRX cycles) |
|
| 0.32 |  0.32x([36]+Md) {([36]+ Md) } | 0.32x([4]+Mm){([4]+ Mm) } | 0.32x([16]+Me){([16]+ Me) } |
| 0.64 |  0.64x([28]+ Md) {[28]+ Md } | 0.64x([2]+ Mm) {[2]+ Mm } | 0.64x([8]+ Me) {[8]+ Me } |
| 1.28 |  1.28x([25]+ Md){[25]+ Md } | 1.28x([1]+ Mm){[1]+ Mm } | 1.28x([5]+ Me) {[5]+ Me } |
| 2.56 | 2.56x([23]+ Md){[23]+ Md } | 2.56x([1]+ Mm){[1]+ Mm } | 2.56x([3]+ Me) {[3]+ Me } |
| Note 1: Md, Mm, Me are the number of DRX cycles each with at least one SMTC occasion not available at the UE during the Tdetect,NR\_Inter\_CCA,, **Tmeasure,NR\_Inter\_CCA**and **Tevaluate,NR\_Inter\_CCA**, respectively. Mm,max, Md,max and Me,max are the maximum values of Mm, Md and Me, respectively.Note 2: Mm ≤ Mm,max, where: Mm,max = [16] for DRX cycle = 0.32 seconds, Mm,max = [8] for DRX cycle = 0.64 seconds, Mm,max = [4] for DRX cycle = 1.28 seconds, Mm,max = [4] for DRX cycle = 2.56 seconds,Note 3: Md ≤ Md,max, where: Md,max = [4] \* Mm,max,Note 4: Me ≤ Me,max, where: Me,max = [2] \* Mm,max, |

The UE shall restart the measurements upon exceeding Mm,max, Md.max, or Me,max.

**--- end of change 1 ---**

**--- start of change 2 ---**

### 5.3.4A E-UTRAN - NR FR1 Handover to target cell using CCA

#### 5.3.4A.1 Introduction

The purpose of inter-RAT handover from E-UTRAN to NR in FR1 in carrier frequencies with CCA is to transfer a connection between the UE and E-UTRAN to NR in FR1 carrier frequencies with CCA. The handover procedure is initiated from E-UTRAN with an RRC message (MOBILITY FROM E-UTRA). The procedure is described in TS 36.331 [2].

In the requirements of clause 5.3.4A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding detection or time tracking period; otherwise the SMTC occasion is considered as available at the UE.

In the requirements of clause 5.3.4A, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB at the UE but not transmitted by the UE during the corresponding period due to UL CCA failures at the UE; otherwise the PRACH occasion is considered as available for transmission.

#### 5.3.4A.2 Handover delay

When the UE receives an RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within Dhandover seconds from the end of the last TTI containing the RRC command. Dhandover is defined as

 Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

 TRRC\_procedure\_delay: it is the RRC procedure delay which is [50] ms.

 Tinterruption: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding TRRC\_procedure\_delay. Tinterrupt is defined in clause 5.3.4A.3.

#### 5.3.4A.3 Interruption time

When inter-RAT handover to NR is commanded, the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TIU + Trs + Tprocessing + Tmargin ms

Where:

 Tsearch is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is an unknown cell and target cell Es/Iot ≥ [-2] dB, then Tsearch = (3+L1´) \*Trs ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

L1´ is the number of SMTC occasions not available at the UE during the inter-RAT detection period. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

Tprocessing is time for UE processing. Tprocessing can be up to 20 ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2 ms.

 TIU is the interruption uncertainty due to the random access procedure when sending PRACH to the new cell. TIU can be up to: (1+ L3)\*TSSB,RO + 10 ms; where TSSB,RO is the SSB to PRACH occasion association period as defined in Table 8.1-1 of TS 38.213 [39] and L3 is the number of consecutive SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures. L3 = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [57].When the UE is configured with both the UL BWP with PRACH occasion on the target cell and UL LBT failure detection/recovery, the interruption can be longer.

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

NOTE 2: The interruption time extended by L1´and L3 parameters, and by the UL LBT failure detection/recovery mechanism is limited by the T304 timer. The UE behaviour at the T304 timer expiry is specified in TS 38.331 [38].

 Trs is the SMTC period of the taget NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise Trs is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in clause 8.1.2.4.21A, and 8.1.2.4.22A.

**--- end of change 2 ---**

**--- start of change 3 ---**

#### 6.3.2.5 RRC connection release with redirection to NR carrier subject to CCA

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

The time delay (Tconnection\_release\_redirect\_NR\_CCA) 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\_CCA) shall be less than:

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

The target NR cell shall be considered detetable when for each relevant SSB, the side conditions should be met that,

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

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].

Tidentify-NR\_CCA: It is the time to identify the target NR cell and is defined as:

- Tidentify-NR\_CCA = TPSS/SSS-sync + Tmeas; TPSS/SSS-sync is the cell search time and Tmeas is the measurement time due to cell selection criteria evaluation.

- Tidentify-NR\_CCA = MAX (680 ms, (L1+11) × Trs); where L1 is the number of SMTC occasions not available at the UE due to DL CCA failures. If L1 > L1,max then the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 36.304 [1]; where L1,max is defined in Table 6.3.2.5-1.

In the requirements of clause 6.3.2.5, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SMTC occasion is considered as available at the UE.

TSI-NR\_CCA: 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\_CCA: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell:

- TRACH\_CCA = (1+L2)×TSSB,RO + 10 ms; where:

- L2 is the consecutive number of SSB to PRACH occasion association periods during which no PRACH occasion is available for PRACH transmission due to UL CCA failures. L2 = 0 for Type 2C UL channel access procedure as defined in TS 37.213 [57].

- TSSB,RO is the SSB to PRACH occasion association period as defined in the table 8.1-1 of TS 38.213 [39].

- The value of L2 is limited by *PREAMBLE\_TRANSMISSION\_COUNTER*, which is increased when PRACH occasion is unavailable for PRACH transmission due to UL CCA failure as specified in TS 38.321 [43]. The UE behaviour when *PREAMBLE\_TRANSMISSION\_COUNTER* reaches the *preambleTransMax* is specified in TS 38.321 [43].

In the requirements of clause 6.3.2.5, the term PRACH occasion unavailable for transmission refers to when the PRACH occasion is configured by gNB at the UE but not transmitted by the UE during the corresponding period due to UL CCA failure at the UE.

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 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 clause is applied with Trs = 20 ms if the SSB transmission periodicity is not larger than 20 ms; otherwise,

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

Table 6.3.2.5-1: Maximum allowed number of missed SMTC occasions during cell identification

|  |  |
| --- | --- |
| SMTC periodicity (Trs) [ms] | Maximum allowed number of missed SMTC occasions (L1,max) |
| Trs ≤ 40 | 8 |
| Trs > 40 | 4 |

**--- end of change 3 ---**

**--- start of change 4 ---**

## 7.31A Addition and Release Delay of NR PSCell Operating with CCA for E-UTRA - NR Dual Connectivity

### 7.31A.1 Introduction

This section defines requirements for the delay within which the UE shall be able to configure an NR PSCell operating with CCA in EN-DC. The requirements are applicable to an E-UTRA-FDD – NR and E-UTRA-TDD – NR dual connectivity capable UE.

In the requirements of clause 7.31A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SMTC occasion is considered as available at the UE.

### 7.31A.2 NR PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving NR PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards NR PSCell no later than in subframe *n* + Tconfig PSCell\_withCCA:

Where:

Tconfig\_PSCell\_withCCA = TRRC\_delay + Tprocessing + Tsearch\_withCCA + T∆\_withCCA + TPSCell\_ DU\_withCCA + 2 ms

TRRC\_delay is the RRC procedure delay as specified in [2].

Tprocessing is the software processing time needed by UE, including RF warm up period. Tprocessing = 20 ms.

Tsearch\_withCCA is the time for AGC settling and PSS/SSS detection.

- If the target cell is known, then Tsearch\_withCCA = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot ≥ -2 dB, then Tsearch\_withCCA = (3 + L1)\* Trs ms where L1 is the number of SMTC occasions not available at the UE for AGC settling and PSS/SSS detection.

T∆\_withCCA is time for fine time tracking and acquiring full timing information of the target cell. T∆\_withCCA = (1+ L2)\*Trs ms for a known or for an unknown PSCell where L2 is the number of SMTC occasions not available at the UE for fine time tracking and acquiring full timing information.

TPSCell\_ DU\_withCCA = TPSCell\_ DU  + ΔPRACH  where TPSCell\_ DU  is as specified in clause 7.31.2,

ΔPRACH is the total additional delay extended to also include the time to all next PRACH transmissions and retransmission opportunities due to UL CCA failure until the time of its successful transmission, as specified in TS 38.213 [3], with ΔPRACH=0 for Type 2C UL channel access procedure defined in TS 37.213 [57]; the delay can be longer when the UE is configured with both UL BWP with PRACH occasion on the target cell and UL LBT failure detection/recovery.

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 PSCell addition message, otherwise Trs is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing. If UE is not provided SMTC configuration or measurement object on this frequency: the requirement in this clause is applied with Trs =5 ms assuming the SSB transmission periodicity is 5ms, and there is no requirement if the SSB transmission periodicity is not 5 ms.

NOTE 1: The PSCell addition delay including the potential extensions caused by L1 and L2 is limited by the T304 timer [2].

The NR PSCell operating with CCA is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the NR PSCell configuration command:

- the UE has sent a valid measurement report for the NR PSCell being configured and

- One of the SSBs measured from the NR PSCell being configured remains detectable according to the cell identification conditions in the SMTC occasions available at the UE, as specified in section 9.3A of TS 38.133 [50],

- One of the SSBs measured from NR PSCell being configured also remains detectable during the NR PSCell configuration delay according to the cell identification conditions in the SMTC occasions available at the UE, as specified in section 9.3A of TS 38.133 [50].

otherwise it is unknown. The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure [2].

### 7.31A.3 NR PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is:

- configured with PCell, and

- configured with NR PSCell operating with CCA, and

- may also be configured with one or more SCells, and

- may also be configured with one or more NR SCells operating with CCA.

Upon receiving NR PSCell release in subframe *n*, the UE shall accomplish the release actions specified in [2] no later than in subframe *n+* TRRC\_delay:

Where

 TRRC\_delay is the RRC procedure delay as specified in [2].

The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure [2].

**--- end of change 4 ---**

**--- start of change 5 ---**

##### 8.1.2.4.21A E-UTRAN FDD – NR measurements when CCA is used

Requirements in this clause shall apply for NR capable UE, when NR is in carrier frequencies with CCA and not configured with EN-DC.

The UE shall be able to identify new 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.

In the requirements of clause 8.1.2.4.21A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SMTC occasion is considered as available at the UE.

8.1.2.4.21A.1 E-UTRAN FDD – NR measurements

8.1.2.4.21A.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\_cca\_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 frequency cell within Tidentify\_irat\_cca\_with\_index. The UE shall be able to identify a new detectable inter-RAT frequency SSB of an already detected cell within Tidentify\_irat\_cca\_without\_index.

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

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

Where:

 TPSS/SSS\_sync\_irat\_cca: it is the time period used in PSS/SSS detection given in table 8.1.2.4.21A.1.1-1.

 TSSB\_time\_index\_irat\_cca: it is the time period used to acquire the index of the SSB being measured given in table 8.1.2.4.21A.1.1-2.

 T SSB\_measurement\_period\_irat\_cca: equal to a measurement period of SSB based measurement given in table 8.1.2.4.21A.1.1-3.

Nfreq is defined in clause 8.1.2.1.1.

Table 8.1.2.4.21A.1.1-1: Time period for PSS/SSS detection, in NR carrier frequencies with CCA

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | TPSS/SSS\_sync\_irat\_cca |
| No DRX |  Max(600ms, (8 +LPSS/SSS,gaps)× Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(600ms, Ceil((8+LPSS/SSS,gaps) ×1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | (8+LPSS/SSS,gaps) × 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: LPSS/SSS,gaps is the number of SMTC occasions not available at the UE during TPSS/SSS\_sync\_irat\_cca, where LPSS/SSS,gaps ≤ LPSS/SSS,gaps,max.NOTE 4: LPSS/SSS,gaps = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms LPSS/SSS,gaps = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and LPSS/SSS,gaps = 5 for DRX cycle > 320 ms. |

Upon exceeding LPSS/SSS,gaps,max, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

Table 8.1.2.4.21A.1.1-2: Time period for time index detection, in NR carrier frequencies with CCA

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | TSSB\_time\_index\_irat\_cca |
| No DRX | Max(120ms, ([3] + Lind,gaps) × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(120ms, ceil((3+ Lind,gaps) x 1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | (3+ Lind,gaps) × 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: Lind,gaps is the number of SMTC occasions not available at the UE during TSSB\_time\_index\_irat\_cca, where Lind,gaps ≤ Lind,gaps,maxNOTE 4: Lind,gaps,max = 5 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, Lind,gaps,max = 3 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and Lind,gaps,max = 2 for DRX cycle > 320 ms. |

The UE shall restart the time index detection upon exceeding Lind,gaps,max. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

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

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

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

- NR SS-SINR related conditions in the accuracy requirements in Section TBD are fulfilled for a corresponding Band, together with the corresponding side conditions in TBD 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 TBD, with measurement period as shown in table 8.1.2.4.21A.1.1-3:

Table 8.1.2.4.21A.1.1-3: Measurement period for inter-RAT measurements

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | T SSB\_measurement\_period\_irat\_cca |
| No DRX | Max(200ms, (8+ Lmeas) × Max(MGRP, SMTC period)) × Nfreq |
| DRX cycle ≤ 320ms | Max(200ms, ceil((8+ Lmeas) x 1.5) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq |
| DRX cycle > 320ms | (8+ Lmeas) × 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: Lmeas is the number of SMTC occasions not available at the UE during T SSB\_measurement\_period\_irat\_cca, where Lmeas ≤ Lmeas,maxNOTE 4:   Lmeas,max = 12 for Max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, Lmeas,max = 8 for Max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and Lmeas,max = 5 for DRX cycle > 320 ms. |

The UE shall restart the measurement upon exceeding Lmeas,max. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

When the time period of unsuccessful measurement attemps due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause 9.3A.6.3, the UE shall stop the measurement attempts on this SSB and perform the detection procedure again, like for any other SSB.

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

For each RAT E-UTRAN FDD-NR layer on, in carrier frequencies with CCA, the UE shall be capable of monitoring at least 4 cells.

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

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

8.1.2.4.21A.1.2 Periodic Reporting

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

8.1.2.4.21A.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 is 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 and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than Tidentify\_irat\_cca\_without\_index or Tidentify\_irat\_cca\_with\_index defined in Clause 8.1.2.4.21A.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 a cell which has been detectable at least for the time period Tidentify\_irat\_cca\_without\_index or Tidentify\_irat\_cca\_with\_index defined in clause 8.1.2.4.21A.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 Tmeasurement\_NR\_cca\_FDD defined in clause 8.1.2.4.21A.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.

8.1.2.4.21A.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 8.1.2.4.21A.1.3.

8.1.2.4.21A.1.5 NR inter-RAT RSSI measurements

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [58], on one or more inter-RAT carriers operating with CCA, TS 37.213 [57], if the carrier(s) are indicated by higher layers [38], and reporting the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [38] occurring with a configured RSSI measurement timing configuration periodicity, *rmtc-Periodicity,* according to [38].

Table 8.1.2.4.21A.1.5-1: Measurement period for inter-RAT RSSI measurements with gaps

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | T RSSI\_measurement\_period\_NR\_cca |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this section shall meet the RSSI measurement accuracy requirement in Section TBD in TS 38.133 [50].

8.1.2.4.21A.1.6 NR inter-RAT channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer.

**Table 8.1.2.4.21A.1.6-1: Measurement period for inter-RAT Channel Occupancy measurements with gaps**

|  |  |
| --- | --- |
| **Condition NOTE1,2,3,4** | **T CO\_measurement\_period\_NR\_cca** |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency channel occupancy measurements.

The channel occupancy measurement performed and reported according to this section shall meet the channel occupancy measurement accuracy requirements in Section TBD of TS 38.133 [50].

**--- end of change 5 ---**

**--- start of change 6 ---**

8.1.2.4.25.2a SFTD Measurement delay with CCA on target frequency

The requirements on SFTD measurement delay defined in this section are applicable to a UE configured with a target NR carrier for which CCA is used and under the side condition SCH Ês/Iot ≥ -3 dB for the NR cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest NR cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more NR cells. The UE may or may not be configured with *cellsForWhichToReportSFTD*. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the NR cell regardless of its SSB position in the SMTC period. The SFTD measurement shall be conducted with sustained connection to the E-UTRA PCell and activated SCell(s), however, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in clause 7.35.

When measurement gaps are provided, the UE shall be capable of finding the NR cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no MCG DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of Tmeasure\_SFTD\_LBT\_max = 4 × Tmeasure\_SFTD1, where Tmeasure\_SFTD1 is defined in clause 8.1.2.4.25.2. If the UE is unable to meet the requirement, it shall shall terminate the inter-RAT SFTD measurement.

When MCG DRX is used, the same Tmeasure\_SFTD\_LBT\_max as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case an NR PSCell is added, the UE shall terminate the inter-RAT SFTD measurement.

In case PCell is changed due to handover, the UE shall terminate the inter-RAT SFTD measurement.

The measurement accuracy for the SFTD measurement shall fulfill the requirement in clause 9.1.27. The measurement accuracy for additionally reported NR SS-RSRP shall fulfil the requirement in clause 9.11.1.

8.1.2.4.25.3 SFTD Measurement reporting delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 × TTIDCCH. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report and all delays due to UL CCA failures until the successful transmission of the report. When the UE is configured to perform SRS carrier-based switching, an additional delay can be expected.

The SFTD measurement reporting delay shall be less than Tmeasure\_SFTD1 defined in clause 8.1.2.4.25.2 and Tmeasure\_SFTD\_LBT\_max defined in clause 8.1.2.4.25.2a for target carrier without and with CCA, respectively.

**--- end of change 6 ---**

**--- start of change 7 ---**

#### 8.17.2.2.a SFTD Measurement requirements with CCA on target frequency

When no DRX is used in either of PCell and PSCell, the physical layer measurement period of the SFTD measurement shall be Tmeasure\_SFTD1 = max(200 ms, (5 + L) x SMTC period), where L is the number of SSBs (or DRSs) blocked by unsuccessful CCA. Lmax is the maximum value of L (i.e., L≤Lmax) and is defined in Table 8.17.2.2.a-2.

When DRX is used in either of the E-UTRA PCell or the NR PSCell, or in both PCell and PSCell, the physical layer measurement period (Tmeasure\_SFTD1) of the SFTD measurement shall be as specified in table 8.17.2.2.a-1.

In the requirements of clause 8.17.2.2.a, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SS/PBCH block index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period; otherwise the SMTC occasion is considered as available at the UE.

Table 8.17.2.2.a-1: SFTD measurement requirement when DRX is used

|  |  |
| --- | --- |
| DRX cycle length (s) Note 3 | Tmeasure\_SFTD1 (s) |
| ≤0.04 | max(0.2,(5 + L) x SMTC period) (Note1) |
| 0.04<DRX cycle≤0.32 | (8 + L) x max(DRX cycle, SMTC period) |
| 0.32<DRX cycle≤10.24 | (5 + L) x DRX cycle |
| Note 1: Number of DRX cycles depends upon the DRX cycle in use.Note 2: DRX cycle length in this table refers to the DRX cycle length configured for PCell or PSCell. When DRX is used in both PCell and PSCell, DRX cycle length in this table refers to the longer of the DRX cycle lengths for PCell and PSCell.Note 3: L is the total number of SMTC occasions not available at the UE. The maximum value of L, Lmax, is defined in Table 8.17.2.2.a-2. |

**Table 8.17.2.2.a-2: Maximum number of missed DRS occasions**

|  |  |
| --- | --- |
| **Condition** | **Lmax** |
| max(DRX cycle, SMTC period) ≤ 40 ms | 7 |
| 40 ms < max(DRX cycle, SMTC period) ≤ 320 ms | 5 |
| DRX cycle > 320 ms | 3 |
| Note 1: DRX cycle length in this table refers to the DRX cycle length configured for PCell or PSCell. When DRX is used in both PCell and PSCell, DRX cycle length in this table refers to the longer of the DRX cycle lengths for PCell and PSCell. When no DRX is used in both PCell and PSCell, DRX cycle = 0.Note 2: The SMTC period is the one used by PSCell. |

If PSCell is changed without changing carrier frequency of PSCell, while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed Tmeasure\_SFTD2 as defined by the following expression:

Tmeasure\_SFTD2 = (M+1)\*(Tmeasure\_SFTD1) + M\*TPSCell\_change\_ENDC

where:

M is the number of times the NR PSCell is changed over the measurement period (Tmeasure\_SFTD2), and

TPSCell\_change\_ENDC is the time necessary to change the PSCell; it can be up to 25 ms.

If PCell is changed, or if PSCell is changed with different carrier frequency from PSCell, the UE shall terminate SFTD measurements.

When Lexceeds Lmax, the UE shall terminate the SFTD measurement.

The time difference between frame timing acquisition for PCell and PSCell, t1 and t2 respectively, shall fulfill |t1-t2| < max(200 ms, 5\*TSMTC), where TSMTC is the SMTC period of PSCell. Otherwise the UE shall invalidate the SFTD measurement.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in the sub-clause 9.1.27.

**--- end of change 7 ---**

**--- start of change 8 ---**

### 8.17.4A E-UTRA Inter-RAT NR Measurements when CCA is used when Configured with E-UTRA-NR Dual Connectivity Operation

#### 8.17.4A.1 E-UTRAN FDD – NR measurements when configured with E-UTRA-NR Dual connectivity

Requirements in this clause apply for the NR capable UE configured with inter-RAT measurement on NR, when NR is in carrier frequencies with CCA. For UE supporting EN-DC operation, the requirements in this clause shall apply when NR PSCell is configured. When the UE is not configured with E-UTRA-NR dual connectivity mode then the E-UTRAN FDD-NR measurement requirements defined in section 8.1.2.4.21A shall apply.

In the requirements of clause 8.17.4A, the term SMTC occasion not available at the UE refers to when the SMTC contains SSBs configured by gNB in a cell on a carrier frequency subject to CCA, but *N* candidate SSB positions for the same SSB index within the discovery burst transmission window are not available at the UE due to DL CCA failures at gNB during the corresponding period, where:

* For the cell detection procedure: *N* is at least one candidate SSB position (NOTE: the one candidate SSB position for the cell detection shall not be impacted by the set of candidate SSB positions which are already being measured by the UE within the current measurement period of the on-going measurements), and
* For other procedures in clause 8.17.4A: *N* are the first two successive candidate SSB positions when two or more candidate SSB positions are configured for this SSB index in one discovery burst transmission window, otherwise N is one candidate SSB position;

otherwise the SMTC occasion is considered as available at the UE.

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

An NR cell is considered detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in clause TBD are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex TBD of TS 38.133 [50],

- NR SS-RSRQ related conditions in the accuracy requirements in clause TBD are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex TBD of TS 38.133 [50],

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

The NR SS-RSRP measurement accuracy for all measured NR cells shall be as specified in clause TBD, the NR SS-RSRQ measurement accuracy for all measured cells shall be as specified in clause TBD, and NR SS-SINR measurement accuracy for all measured cells shall be as specified in clause TBD.

##### 8.17.4A.1.1 NR Inter-RAT cell identification

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter-RAT NR cell within Tidentify\_NR\_cca\_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 NR cell within Tidentify\_NR\_cca\_with\_index. The UE shall be able to identify a new detectable inter-RAT NR SSB of an already detected cell within Tidentify\_NR\_cca\_without\_index.

 Tidentify\_NR\_cca\_without\_index = (TPSS/SSS\_sync\_NR\_cca + TSSB\_measurement\_period\_NR\_cca) ms

 Tidentify\_NR\_cca\_with\_index = (TPSS/SSS\_sync\_NR\_cca + TSSB\_measurement\_period\_NR\_cca + TSSB\_time\_index\_NR\_cca) ms

Where:

 TPSS/SSS\_sync\_NR\_cca: it is the time period used in PSS/SSS detection given in table 8.17.4A.1.1 -1

 TSSB\_time\_index\_NR\_cca: it is the time period used to acquire the index of the SSB being measured given in table 8.17.4A.1.1-2

 TSSB\_measurement\_period\_NR\_cca: equal to a measurement period of SSB based measurement given in table 8.17.4A.1.2-1

 CSSFNR,EN-DC: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i defined in clause 9.1.5.2.1 of TS 38.133 [50] for measurement conducted within measurement gaps in EN-DC mode.

Table 8.17.4A.1.1-1: Time period for PSS/SSS detection

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | TPSS/SSS\_sync\_NR\_cca |
| No DRX | Max(600ms, (8 +LPSS/SSS,gaps) × Max(MGRP, SMTC period)) × CSSFNR,EN-DC |
| DRX cycle ≤ 320ms | Max(600ms, ceil((8+LPSS/SSS,gaps) × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSFNR,EN-DC |
| DRX cycle > 320ms | (8 +LPSS/SSS,gaps) × DRX cycle × CSSFNR,EN-DC |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 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: LPSS/SSS,gaps is the number of SMTC occasions not available at the UE during TPSS/SSS\_sync\_NR\_cca, where LPSS/SSS,gaps ≤ LPSS/SSS,gaps,max.NOTE 4:   LPSS/SSS,gaps = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms LPSS/SSS,gaps = 8 for 40 ms < max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and LPSS/SSS,gaps = 5 for DRX cycle > 320 ms. |

Upon exceeding LPSS/SSS,gaps,max, the UE is not required to meet the corresponding PSS/SSS detection requirement. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

Table 8.17.4A.1.1-2: Time period for time index detection

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | TSSB\_time\_index\_NR\_cca |
| No DRX | Max(120ms, (3 + Lind,gaps)× max(MGRP, SMTC period)) × CSSFNR,EN-DC |
| DRX cycle ≤ 320ms | Max(120ms, ceil((3 + Lind,gaps) × 1.5) × max(MGRP, SMTC period, DRX cycle)) × CSSFNR,EN-DC |
| DRX cycle > 320ms | (3 + Lind,gaps) × DRX cycle × CSSFNR,EN-DC |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 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: Lind,gaps is the number of SMTC occasions not available at the UE during TSSB\_time\_index\_NR\_cca, where Lind,gaps ≤ Lind,gaps,maxNOTE 4: Lind,gaps,max = 5 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, Lind,gaps,max = 3 for max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and Lind,gaps,max = 2 for DRX cycle > 320 ms. |

The UE shall restart the time index detection upon exceeding Lind,gaps,max. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

When the time period of unsuccessful measurement attemps due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause 9.3A.6.3, the UE shall stop the measurement attempts on this SSB and perform the detection procedure again, like for any other SSB.

When SCG DRX is in use the applicable DRX cycle is the SCG DRX cycle.

##### 8.17.4A.1.2 NR Inter-RAT measurement

When measurement gaps are provided for inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses TBD, TBD, and TBD, respectively, with a measurement period given by:

Table 8.17.4A.1.2-1: Measurement period for NR inter-RAT measurements with gaps

|  |  |
| --- | --- |
| Condition NOTE1,2,3,4 | T SSB\_measurement\_period\_NR\_cca |
| No DRX | Max(200ms, (8+ Lmeas) × max(MGRP, SMTC period)) × CSSFNR,EN-DC |
| DRX cycle ≤ 320ms | Max(200ms, ceil((8+ Lmeas) x 1.5) × max(MGRP, SMTC period, DRX cycle)) × CSSFNR,EN-DC |
| DRX cycle > 320ms | (8+ Lmeas) × DRX cycle × CSSFNR,EN-DC |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 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: Lmeas is the number of SMTC occasions not available at the UE during T SSB\_measurement\_period\_NR\_cca, where Lmeas ≤ Lmeas,maxNOTE 4:   Lmeas,max = 12 for max(DRX cycle, SMTC period, MGRP) ≤ 40 ms, Lmeas,max = 8 for max(DRX cycle, SMTC period, MGRP) ≤ 320 ms, and Lmeas,max = 5 for DRX cycle > 320 ms. |

The UE shall restart the measurement upon exceeding Lmeas,max. The requirements apply provided that any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known.

When the time period of unsuccessful measurement attemps due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in clause 9.3A.6.3, the UE shall stop the measurement attempts on this SSB and perform the detection procedure again, like for any other SSB.

When SCG DRX is in use the applicable DRX cycle is the SCG DRX cycle.

##### 8.17.4A.1.3 NR Inter-RAT measurement reporting

8.17.4.1.3.1 Periodic Reporting

Reported NR SS-RSRP, NR SS-RSRQ, and NR SS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses TBD, TBD and TBD, respectively.

8.17.4A.1.3.2 Event-triggered Periodic Reporting

Reported NR SS-RSRP, NR SS-RSRQ, and NR SS-SINR measurements contained in event triggered periodic measurement reports shall meet the requirements in clauses TBD, TBD and TBD, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 8.17.4A.1.3.3.

8.17.4A.1.3.3 Event-triggered Reporting

Reported NR SS-RSRP, NR SS-RSRQ, and NR SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses TBD, TBD and TBD, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report and all delays due to UL CCA failures until the successful transmission of the report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within Tidentify\_NR\_cca\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable NR cell within Tidentify\_NR\_cca\_with\_index. Both Tidentify\_NR\_cca\_without\_index and Tidentify\_NR\_cca\_with\_index are defined in clause 8.17.4A.1.1.When L3 filtering is used an additional delay can be expected.

If an NR cell which has been detectable at least for the time period Tidentify\_NR\_cca\_without\_index or Tidentify\_NR\_cca\_with\_index defined in clause 8.17.4A.1.1 and then triggers the measurement report as per TS 38.331 [38], the event triggered measurement reporting delay shall be less than TSSB\_measurement\_period\_NR\_cca defined in clause 8.17.4A.1.2 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 an additional delay can be expected.

##### 8.17.4A.1.4 NR inter-RAT RSSI measurements

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [58], on one or more inter-RAT carriers operating with CCA, TS 37.213 [57], if the carrier(s) are indicated by higher layers [38], and reporting the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [38] occurring with a configured RSSI measurement timing configuration periodicity, *rmtc-Periodicity,* according to [38].

**Table 8.17.4A.1.4-1: Measurement period for inter-RAT RSSI measurements with gaps**

|  |  |
| --- | --- |
| **Condition NOTE1,2,3,4** | **T RSSI\_measurement\_period\_NR\_cca** |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this section shall meet the RSSI measurement accuracy requirement in Section TBD.

##### 8.17.4A.1.5 NR inter-RAT channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer.

**8.17.4A.1.5-1: Measurement period for inter-RAT Channel Occupancy measurements with gaps**

|  |  |
| --- | --- |
| **Condition NOTE1,2,3,4** | **T CO\_measurement\_period\_NR\_cca** |
| No DRX | max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x CSSFNR,EN-DC) |
| DRX | max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x CSSFNR,EN-DC) |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50]. |

If the UE requires measurement gaps to perform inter-frequency measurements, a single measurement gap pattern is used for all concurrent inter-frequency measurements, including inter-frequency channel occupancy measurements. The RSSI measurement duration used for channel occupancy measurement and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The channel occupancy measurement performed and reported according to this section shall meet the channel occupancy measurement accuracy requirements in Section TBD of TS 38.133 [50].

#### 8.17.4A.2 E-UTRAN TDD – NR measurements when configured with E-UTRA-NR Dual connectivity

The requirements in clause 8.17.4A.1 also apply for this section.

**--- end of change 8 ---**