**3GPP TSG-RAN WG4 Meeting #95-e *R4-2009133***

**Electronic Meeting, 25 May– 05 June 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **0854** | **rev** | **2** | **Current version:** | **16.3.0** |  |
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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:*** | Measurement requirements for UEs under power saving mode | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_UE\_pow\_sav-Core | | | | |  | ***Date:*** | | | 2020-05-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Support for relaxed measurement requirements for UEs under power saving mdoe is introduced in release 16 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Note: This CR needs to be revised based on the agreements reached during the meeting.  Change #1: Intra-frequency requirements for UEs configured with measurement relaxation criterion  Change #2: Inter-frequency requirements for UEs configured with measurement relaxation criterion | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | UEs under power saving mode won’t be able to fulfill the requirements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | New clause introduced: 4.2.2.8, 4.2.2.9, and 4.2.2.10 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

----------------------------------------------------- Beginning of Change 1 ------------------------------------------------------------

#### 4.2.2.8 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion

##### 4.2.2.8.1 Introduction

This section contains the requirements for measurements on intra-frequency NR cells when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and when the UE is configured any of the following relaxed measurement critera:

* Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.X.1 in [1],
* Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.X.2 in [1],
* Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.X.1 and 5.2.4.X.2 in [1] respectively.

##### 4.2.2.8.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on intra-frequency NR carrier and
* UE is configured with low mobility criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criteria but has fulfilled only the low mobility criterion.

The requirements defined in clause 4.2.2.3 apply for this section except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.8.1-1.

- Tmeasure,NR\_Intra as specified in Table 4.2.2.8.1-1.

- Tevaluate,NR\_Intra as specified in Table 4.2.2.8.1-1.

**Table 4.2.2.8.1-1: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of DRX cycles)** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.  Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | | | |

##### 4.2.2.8.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on intra-frequency NR carrier and
* UE is configured with not-at-cell edge criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criteria but has fulfilled only the not-at-cell edge criterion.

The requirements defined in clause 4.2.2.3 apply for this section except that:

- Tdetect,NR\_Intraas specified in Table 4.2.2.8.3-1.

- Tmeasure,NR\_Intra as specified in Table 4.2.2.8.3-1.

- Tevaluate,NR\_Intra as specified in Table 4.2.2.8.3-1.

**Table 4.2.2.8.3-1: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of DRX cycles)** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | 11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1) | 1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1) | 5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1) |
| 0.64 | 5 | 17.92 x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.  Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the not-at-cell edge criterion. | | | | | |

##### 4.2.2.8.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria

This clause contains requirements for measurements on intra-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on intra-frequency NR carrier, and
* UE is configured with both low mobility criterion and not-at-cell edge criterion, and
* has also fulfilled both criteria

In this case the UE is not required to meet Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra as defined in Table 4.2.2.3-1.

------------------------------------------------------------- End of change 1 ------------------------------------------------------------

----------------------------------------------------- Beginning of Change 2 ------------------------------------------------------------

#### 4.2.2.9 Measurements of inter-frequency NR cells for UE configured with relaxed measurement criterion

##### 4.2.2.9.1 Introduction

This section contains the requirements for measurements on inter-frequency NR cells when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and when the UE is configured with any of following relaxed measurement criteria:

* Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.X.1 in [1],
* Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.X.2 in [1],
* Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.X.1 and 5.2.4.X.2 in [1] respectively.

##### 4.2.2.9.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
* UE is configured with low mobility criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criterion, and
* UE has fulfilled only the low mobility criterion.

The requirements defined in clause 4.2.2.4 apply for this section except that:

- Tdetect,NR\_Interas specified in Table 4.2.2.9.2-1.

- Tmeasure,NR\_Inter as specified in Table 4.2.2.9.2-1.

- Tevaluate,NR\_Inter as specified in Table 4.2.2.9.2-1.

* when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and the UE is configured with *highPriorityMeasRelax* [2] then the UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search seconds where Thigher\_priority\_search is described in clause 4.2.2.7 and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [2] 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 4.2.2.7.

Table 4.2.2.9.2-1: Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Tdetect,NR\_Inter [s] (number of DRX cycles)** | **Tmeasure,NR\_Inter [s] (number of DRX cycles)** | **Tevaluate,NR\_Inter [s] (number of DRX cycles)** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | | | |

##### 4.2.2.9.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
* UE is configured with not-at-cell edge criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criterion, but
* has fulfilled only the not-at-cell edge criterion.

The requirements defined in clause 4.2.2.3 apply for this section except that:

- Tdetect,NR\_Interas specified in Table 4.2.2.9.3-1.

- Tmeasure,NR\_Inter as specified in Table 4.2.2.9.3-1.

- Tevaluate,NR\_Inter as specified in Table 4.2.2.9.3-1.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [2] or not, 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 4.2.2.7

Table 4.2.2.9.3-1: Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Tdetect,NR\_Inter [s] (number of DRX cycles)** | **Tmeasure,NR\_Inter [s] (number of DRX cycles)** | **Tevaluate,NR\_Inter [s] (number of DRX cycles)** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | 11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1) | 1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1) | 5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1) |
| 0.64 | 5 | 17.92x N1 x K1 (28 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) | 5.12 x N1 x K1 (8 x N1 x K1) |
| 1.28 | 4 | 32 x N1 x K1 (25 x N1 x K1) | 1.28 x N1 x K1 (1 x N1 x K1) | 6.4 x N1 x K1 (5 x N1 x K1) |
| 2.56 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x N1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.  Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the not-at-cell edge criterion. | | | | | |

##### 4.2.2.9.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

* T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
* UE is configured with both low mobility criterion and not-at-cell edge criterion, and
* Has also fulfilled both criteria.

In this case the UE is not required to meet Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter as defined in Table 4.2.2.4-1.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and the UE configured with *highPriorityMeasRelax* [2] then the UE may choose not to search for or measure inter-frequency layers of higher priority and inter-RAT carriers.

------------------------------------------------------------- End of change 2 ------------------------------------------------------------

----------------------------------------------------- Beginning of Change 3 ------------------------------------------------------------

#### 4.2.2.10 Measurements of inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

##### 4.2.2.10.1 Introduction

This section contains the requirements for measurements on inter-RAT E-UTRAN cells when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and when the UE is configured with any of following relaxed measurement critera:

* Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.X.1 in [1],
* Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.X.2 in [1],
* Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.X.1 and 5.2.4.X.2 in [1] respectively.

##### 4.2.2.10.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

* T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
* UE is configured with low mobility criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criterion, but
* has fulfilled only the low mobility criterion.

The requirements defined in clause 4.2.2.4 apply for this section except that:

- Tdetect,EUTRANas specified in Table 4.2.2.10.2-1.

- Tmeasure,EUTRAN as specified in Table 4.2.2.10.2-1.

- Tevaluate,EUTRAN as specified in Table 4.2.2.10.2-1.

Table 4.2.2.10.2-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN [s] (number of DRX cycles) | Tmeasure,EUTRAN [s] (number of DRX cycles) | Tevaluate,EUTRAN  [s] (number of DRX cycles) |
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | |

##### 4.2.2.10.3 Measurements for UE fulfilling with not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

* T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
* UE is configured with not-at-cell edge criterion, or
* UE is configured with both low mobility criterion and not-at-cell edge criterion, but
* UE has fulfilled only the not-at-cell edge criterion.

The requirements defined in clause 4.2.2.3 apply for this section except that:

- Tdetect,EUTRANas specified in Table 4.2.2.10.3-1.

- Tmeasure,EUTRAN as specified in Table 4.2.2.10.3-1.

- Tevaluate,EUTRAN as specified in Table 4.2.2.10.3-1.

Table 4.2.2.10.3-1: Tdetect,EUTRAN, Tmeasure,EUTRAN, and Tevaluate,EUTRAN

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN [s] (number of DRX cycles) | Tmeasure,EUTRAN [s] (number of DRX cycles) | Tevaluate,EUTRAN  [s] (number of DRX cycles) |
| 0.32 | 11.52 x K1 (36 x K1) | 1.28 x K1 (4 x K1) | 5.12 x K1 (16 x K1) |
| 0.64 | 17.92 x K1 (28 x K1) | 1.28 x K1 (2 x K1) | 5.12 x K1 (8 x K1) |
| 1.28 | 32 x K1 (25 x K1) | 1.28 x K1 (1 x K1) | 6.4 x K1 (5 x K1) |
| 2.56 | 58.88 x K1 (23 x K1) | 2.56 x K1 (1 x K1) | 7.68 x K1 (3 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility. | | | |

##### 4.2.2.10.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

* T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
* UE is configured with both low mobility criterion and not-at-cell edge criterion, and
* has also fulfilled both criteria.

In this case the UE is not required to meet Tdetect,EUTRAN , Tmeasure,EUTRAN and Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,EUTRAN as defined in Table 4.2.2.5-1. When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and the UE configured with *highPriorityMeasRelax* [2] then the UE may choose not to search for or measure inter-frequency layers of higher priority and inter-RAT carriers.

------------------------------------------------------------- End of change 3 ------------------------------------------------------------