**3GPP TSG-RAN4 Meeting #116R4-2512354**

**[Bengaluru](https://www.3gpp.org/Specification-Groups/" \t "_blank), India, 25 August – 29 August, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | 6020 | **rev** | - | **Current version:** |  |  |
|  | | | | | | | | |
| *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 on RRM requirements for LP-WUS/WUR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_LPWUS-Core | | | | |  | ***Date:*** | | | 2025-09-01 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Big CR to capture all endorsed draft CRs for TS 38.133 for NR\_LPWUS-Core WI. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This CR includes contents of the following CRs endorsed in RAN4#116:   |  |  |  |  | | --- | --- | --- | --- | | **R4-2512209** |  | Draft CR to TS 38.133 on definitions, symbols and abbreviations | CATT | | [**R4-2512210**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512210.zip) |  | Draft CR to TS 38.133 on measurements of inter-RAT E-UTRAN cells for UE with LP-WUR | CATT | | [**R4-2512211**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512211.zip) |  | DraftCR on measurements of intra-frequency NR cells for UE with LP-WUR in IDLE and INACTIVE state | OPPO | | [**R4-2512212**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512212.zip) |  | Draft CR for Measurements of inter-frequency NR cells for UE with LP-WUR | LG Electronics Inc. | | [**R4-2512213**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512213.zip) |  | (NR\_LPWUS) draftCR on 5.X.2.3 MR serving cell measurement and evaluation requirements | Xiaomi | | [**R4-2512214**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512214.zip) |  | (NR\_LPWUS-Core) draftCR on Introduce inter-frequency and inter-RAT cell re-selection requirements for UE with LP-WUR in RRC\_Inactive | CMCC | | [**R4-2512215**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512215.zip) |  | Draft CR for inactive state LP-WUR serving cell measurement and evaluation requirements | vivo | | [**R4-2512346**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512346.zip) |  | draftCR on MR measurement requirements for serving cell in IDLE | Huawei, HiSilicon, vivo | | [**R4-2512217**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512217.zip) |  | draftCR on LP-WUS introduction | Ericsson | | [**R4-2512218**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512218.zip) |  | (NR\_LPWUS-Core) LP-WUR and MR measurement capability in IDLE state | ZTECorporation,Sanechips | | [**R4-2512219**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512219.zip) |  | (NR\_LPWUS-Core) LP-WUR and MR measurement capability in INACTIVE state | ZTECorporation,Sanechips | | [**R4-2512220**](ftp://10.10.10.10/ftp/tsg_ran/WG4_Radio/TSGR4_116/Inbox/R4-2512220.zip) |  | DraftCR to TS 38.133 on LP-WUR requirements | Nokia | | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | RRM requirements for LP-WUR are not completed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3; 3.6.x (new); 4.x (new); 5.x (new); | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

<Start of Change 1>

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [11] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [11].

AoA Angle of Arrival

AoD Angle of Departure

ATG Air to Ground

AWGN Additive White Gaussian Nouse

BFD Beam Failure Detection

BFD-RS BFD Reference Signal

BLER Block Error Rate

BM-RS Beam Management Reference Signal

BW Bandwidth

BWP Bandwidth Part

CA Carrier Aggregation

CBD Candidate Beam Detection

CBW Channel Bandwidth

CC Component Carrier

CCA Clear Channel Assessment

CCE Control Channel Element

CG-SDT Configured Grant Small Data Transmission

CHO Conditional Handover

CLI Cross Link Interference

CMR Channel Measurement Resource

CN Core Network

CORESET Control Resource Set

CP Cyclic Prefix

CPC Conditional PSCell Change

CSI Channel-State Information

CSI-RS CSI Reference Signal

CSI-RSRP CSI Reference Signal based Reference Signal Received Power

CSI-RSRQ CSI Reference Signal based Reference Signal Received Quality

CSI-SINR CSI Reference Signal based Signal to Noise and Interference Ratio

CSI\_RP Received (linear) average power of the resource elements that carry NR CSI-RS signals and channels, measured at the UE antenna connector

DAPS Dual Active Protocol Stack

DBT Discovery Burst Transmission

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DL-AoD Downlink Angle-of-Departure

DL-TDOA Downlink Time Difference Of Arrival

DMRS Demodulation Reference Signal

DPC Delta Power Class

DRX Discontinuous Reception

E-CID Enhanced Cell ID

eDRX Extended DRX

E-UTRA Evolved UTRA

E-UTRAN Evolved UTRAN

EMR Early measurement reporting

EMW Effective measurement window

EMWRP Effective measurement window repetition period

EN-DC E-UTRA-NR Dual Connectivity

FDD Frequency Division Duplex

FH Frequency Hopping

FR Frequency Range

GEO Geostationary Earth Orbit

GNSS Global Navigation Satellite System

GSO Geosynchronous Orbit

HARQ Hybrid Automatic Repeat Request

HO Handover

HST High Speed Train

GAP Refers to any of Measurement Gap, activated Pre-MG and NCSG

IMR Interference Measurement Resource

kHz Kilo Hertz

L1-RSRP Layer 1 RSRP

L1 SL-RSRP Layer 1 Sidelink RSRP which corresponds to PSCCH-RSRP and/or PSSCH-RSRP

LEO Low Earth Orbit

LMF Location Management Function

LO LP-WUS Occasion

LPP LTE Positioning Protocol

LP-SS Low Power-Synchronization Signal

LP-WUR Low Power-Wake up Receiver

LP-WUS Low Power-Wake up Signal

LR Low Power-Wake up Receiver

LTM L1/L2 triggered mobility

MAC Medium Access Control

MCG Master Cell Group

MDT Minimization of Drive Tests

MG Measurement Gap

MGL Measurement Gap Length

MGRP Measurement Gap Repetition Period

MHz Mega Hertz

MIB Master Information Block

ML Measurement Length

MN Master Node

MR-DC Multi-Radio Dual Connectivity

MR  Main Receiver

MUSIM Multi-Universal Subscriber Identity Module

NCSG Network Controlled Small Gap

NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NGSO Non-Geosynchronous Orbit

NR New Radio

NR-DC NR-NR Dual Connectivity

NTN Non-Terrestrial Network

OCNG OFDMA Channel Noise Generator

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

OOK On-Off Keying

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel

PCC Primary Component Carrier

PCell Primary Cell

PCI Physical Cell Identity

PDCCH Physical Downlink Control Channel

PDSCH Physical Downlink Shared Channel

PLMN Public Land Mobile Network

PRACH Physical RACH

Pre-MG Pre-configured Measurement Gap

ProSe Proximity-based Service

PRB Physical Resource Block

PRP PRS Received Power

PRS Positioning Reference Signal

PRS-RSRP Positioning Reference Signal based Reference Signal Received Power

PPW PRS Processing Window

PPWL PRS Processing Window Length

PPWRP PRS Processing Window Repetition Period

PSBCH Physical Sidelink Broadcast Channel

PSBCH-RSRP Physical Sidelink Broadcast Channel DMRS based Reference Signal Received Power

PSCCH Physical Sidelink Control Channel

PSCCH-RSRP Physical Sidelink Control Channel DMRS based Reference Signal Received Power

PSCell Primary SCell

PSS Primary Synchronization Signal

PSSCH Physical Sidelink Shared Channel

PSSCH-RSRP Physical Sidelink Shared Channel DMRS based Reference Signal Received Power

pTAG Primary Timing Advance Group

PTW Paging Time Window

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

QCL Quasi Co-Location

RACH Random Access Channel

RAN Radio Access Network

RAT Radio Access Technology

RF Radio Frequency

RLM Radio Link Monitoring

RLM-RS Reference Signal for RLM

RMC Reference Measurement Channel

RMSI Remaining Minimum System Information

RRC Radio Resource Control

RRH Remote Radio Head

RRM Radio Resource Management

RRT RF Retuning Time

RS Reference Signal

RSCP Reference Signal Carrier Phase

RSCPD Reference Signal Carrier Phase Difference

RSSI Received Signal Strength Indicator

RSRP Reference Signal Received Power

RSRPP Reference Signal Received Path Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

RTD Receive Timing Difference

RTOA Relative Time Of Arrival

RTT Round Trip Time

S-SSB Sidelink Synchronization Signal Block

SSB Synchronization Signal Block

SSB\_RP Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector or radiated interface boundary.

SA Standalone operation mode

SAB Satellite access band

SAN Satellite Access Node

SCC Secondary Component Carrier

SCCH Sidelink Control Channel

SCell Secondary Cell

SCG Secondary Cell Group

SCH Synchronization Channel

SCS Subcarrier Spacing

SCSSSB SSB subcarrier spacing

SDL Supplementary Downlink

SDT Small Data Transmission

SFN System Frame Number

SFTD SFN and Frame Timing Difference

SI System Information

SIB System Information Block

SL Sidelink

SL AoA Sidelink AoA

SL PRS-RSRP Sidelink PRS-based RSRP

SL PRS-RSRPP Sidelink PRS-based RSRPP

SL RSTD Sidelink RSTD

SL RTOA Sidelink RTOA

SL Rx-Tx Sidelink Receive-Transmit time difference

SL-PRP SL-PRS Received Power

SL-PRS Sidelink PRS

SL-RSSI Sidelink Received Signal Strength Indicator

SLPP Sidelink Positioning Protocol

SLSS Sidelink Synchronization Signal

SMTC SSB-based Measurement Timing configuration

SpCell Special Cell

SRS Sounding Reference Signal

SRS-RSRP Sounding Reference Signal based Reference Signal Received Power

SS-RSRP Synchronization Signal based Reference Signal Received Power

SS-RSRQ Synchronization Signal based Reference Signal Received Quality

SS-SINR Synchronization Signal based Signal to Noise and Interference Ratio

SSB Synchronization Signal Block

SSB\_RP Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector.

SSS Secondary Synchronization Signal

sTAG Secondary Timing Advance Group

SUL Supplementary Uplink

TA Timing Advance

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TDCP Time Domain Channel Properties

TDD Time Division Duplex

TDOA Time Difference Of Arrival

TE Test Equipment

TN Terrestrial Network

TRP Transmission-Reception Point

TRS Tracking Reference Signal

TTI Transmission Time Interval

U2N UE-to-Network

U2U UE-to-UE

UE User Equipment

UL Uplink

V2X Vehicle-to-Everything service

VIL Visible Interruption Length

VIRP Visible Interruption Repetition Period

VSAT Very Small Aperture Terminal

<End of Change 1>

<Start of Change 2>

### 3.6.x Applicability of requirements for UE with LP-WUR

The requirements for LP-WUR and LP-WUS apply under the assumption that the LR and the MR are operating on the same carrier frequency.

<End of Change 2>

<Start of Change 3>

## 4.x IDLE mode measurement for LP-WUS operation

### 4.x.1 Introduction

The UE which supports *LP-WUS capability* in RRC\_IDLE shall be capable of:

* performing serving cell measurement based on LP-SS or SSB by LR.
* performing serving cell and neighbour cell measurement relaxation by MR together with LP-SS or SSB based serving cell measurement by LR.

### 4.X.2 Requirements

#### 4.X.2.1 UE Measurement Capability

##### 4.x.2.1.1 LP-WUR measurement capability

UE LP-WUR shall be capable of monitoring at least the serving cell.

##### 4.X.2.1.2 MR measurement capability with LP-WUR

For the UE meausrment capability, the requirements in clause 4.2.2.1 apply.

For the Redcap UE meausrmen capability, the requirements in clause 4.2B.2.1 apply.

<End of Change 3>

<Start of Change 4>

#### 4.x.2.2 LP-WUR Serving cell measurement and evaluation requirement

##### 4.x.2.2.1 General description

This sub-clause specifies the serving cell measurements and evaluation requirements for a UE with LP-WUR in RRC\_IDLE State.

The requirements apply for to a UE supporting *FG-62-1* or *FG-62-1a* and when the corresponding evaluation thresholds are configured by higher layers.

The requirements in this clause 4.x.2 apply when the LP-WUR is in ON state.

Before entering LP-WUS monitoring, RRM offloading or RRM relaxation mode and after exiting LP-WUS monitoring, RRM offloading and RRM relaxation mode, it is up to UE implementation when and how to turn the LP-WUR to ON state for serving cell measurement.

When LP-WUR is in the ON state, the UE may perform serving cell measurements based on LP-SS or PSS/SSS, where the requirements for LP-SS based measurements and evaluations in the clause 4.x.2 apply only if the LP-SS is configured and transmitted on the same carrier frequency as the serving cell.

The requirements in section 4.2 apply when the network has not configured thresholds for RRM measurement offloading or RRM measurement relaxation, or when the corresponding conditions are not fulfilled. If the UE applies RRM measurement offloading or RRM measurement relaxation, it shall perform measurements based on LP-SS or PSS/SSS following the requirements specified in section 4.x.2.2 or 4.x.2.3.

The requirements in this clause apply for Redcap UE supporting FG-62-1 or, FG-62-1a.

LP-WUR evaluation requirements specified in 4.x.2.2 and 4.x.2.3 apply to LP-WUR entry and exit criteria evaluation.

Prior to performing LP-WUR evaluation specified in 4.x.2.2 or 4.x.2.3, if configured, the UE shall meet the corresponding LR entry criteria at least once for:

- entry condition for LP-WUS monitoring

- entry condition for RRM relaxation

- entry condition for RRM offloading

##### 4.x.2.2.2 LP-WUR measurement and evaluation requirements for PSS/SSS

Upon meeting the entry conditions for RRM offloading or RRM relaxation, the UE shall measure the SS-RSRP and SS-RSRQ level once every LO cycle and evaluate whether one or more of the following conditions defined in TS 38.304 [1], if configured, are met within Tevaluate-LP-WUR-PSS/SSS

*-* exit condition for LP-WUS monitoring

- exit condition for RRM offloading

- exit condition for RRM relaxation

The UE shall filter the SS-RSRP and SS-RSRQ measurements of the serving cell using at least 2 measurement samples. Within the set of measurements used for the filtering, at least two measurement samples shall be spaced by *LO-periodicity*/2.

**Table 4.x.2.2-1: Tevaluate-LP-WUR-PSS/SSS for FR1 and FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **LO periodicity [s] Note 1** | **Scaling Factor (NLP-WUS)** | | **Tevaluate-LP-WUR-PSS/SSS (number of LO Cycles [s])** |
| **FR1** | **FR2** |
| 0.32 | 1 | 8 | 0.32 x 4x NLP-WUS (1.28s x NLP-WUS) |
| 0.64 | 5 | 0.64 x 4 x NLP-WUS (2.56s x NLP-WUS) |
| 1.28 | 4 | 1.28 x 4 x NLP-WUS (5.12s x NLP-WUS) |
| 2.56 | 3 | 2.56 x 4 x NLP-WUS (10.24s x NLP-WUS) |
| Note 1: The LO periodicity is the same as the configured DRX cycle length | | | |

The UE shall evaluate and consider an *entry* or *exit* criteria is fulfilled within Tevaluate-LP-WUR-PSS/SSS, provided that the corresponding criteria is met by a margin of 6 dB for SS-RSRP and/or 3.5 dB for SS-RSRQ in FR1 and by a margin of 7.5 dB for SS-RSRP and/or 3.5 dB for SS-RSRQ in FR2 when SSB Ês/Iot ≥ -3dB

Upon fulfilling a configured entry or exit condition, the UE shall perform corresponding actions as defined in clause 5.2 in TS 38.304 [1].

The requirements in this clause apply for UE which supports FG 62-1a and measures PSS/SSS.

##### 4.x.2.2.3 LP-WUR measurement and evaluation requirements for LP-SS

Upon meeting the entry conditions for RRM offloading or RRM relaxation, the UE shall measure the LP-RSRP and LP-RSRQ level once every LP-SS cycle and evaluate whether one or more of the following conditions defined in TS 38.304 [1] are met within Tevaluate-LP-WUR-LP-SS

- exit condition for LP-WUS monitoring

- exit condition for RRM offloading

The UE shall filter the LP-SS measurements of the serving cell using at least 2 measurement samples.

**Table 4.x.2.3-1: Tevaluate-LP-WUR-LP-SS**

|  |  |
| --- | --- |
| **LP-SS periodicity [s]** | **Tevaluate-LP-WUR-LP-SS**  **(number of LP-SS Cycles [s])** |
| 0.16 | 0.16 x 6(0.96s) |
| 0.32 | 0.32 x 6 (1.92s) |

The UE shall evaluate and consider an *entry* or *exit* criteria is fulfilled within Tevaluate-LP-WUR-LP-SS, provided that the criteria is met by a margin of 6 dB for LP-RSRP and/or 3.5 dB for LP-RSRQ in FR1 when LP-SS Ês/Iot ≥ -3dB

Upon fulfilling a configured entry or exit condition, the UE shall perform corresponding actions as defined in clause 5.2 in TS 38.304 [1].

The requirements in this clause apply for UE which supports FG 62-1, or UE which supports FG 62-1a-LP-SS and measures only LP-SS.

4.X.2.3 Measurement and evaluation of serving cell by MR

The requirements in this claue apply for UE measurement and evaluation of serving cell using MR, when a UE is not in serving cell offloading mode as defined in [1].

4.X.2.3.1 Requirements for evaluation of cell selection criterion

When the UE is not in relaxed measurement mode as defined in [1], the requirements in claue 4.2.2.2 shall apply.

When the UE is in relaxed measurement mode as defined in [1], the UE shall measure the SS-RSRP and SS-RSRQ level of the serving cell and evaluate the cell selection criterion S defined in TS 38.304 [1] for the serving cell at least once every N1\*16 DRX cycle.

The UE shall filter the SS-RSRP and SS-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 either 8 DRX cycles or DRX cycle/2.

If the UE has evaluated according to table 4.X.2.3.1-1 in 16\*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 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 TS 38.304 [1], where T= 10s.

**Table 4.X.2.3.1-1: Nserv**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Nserv [number of 16\*DRX cycles]** |
| **FR1** | **FR2-1Note1** |
| 0.32 | 1 | 8 | N1\*4 |
| 0.64 | 5 | N1\*4 |
| 1.28 | 4 | N1\*2 |
| 2.56 | 3 | N1\*2 |
| NOTE 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length. | | | |

4.X.2.3.2 Requirements for evaluation of LP-WUS related conditions

When the UE is in relaxed measurement mode as defined in [1], the UE shall measure the SS-RSRP and SS-RSRQ level of the serving cell and evaluate the following LP-WUR related conditions defined in TS 38.304 [1], if configured, for the serving cell at least once every N1\*16 DRX cycle.

*-* exit condition for relaxed measurement mode

The UE shall filter the SS-RSRP and SS-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 either 8 DRX cycles or DRX cycle/2.

If the UE has evaluated according to table 4.X.2.3.2-1 in 16\*Nserv consecutive DRX cycles that the serving cell fulfils the exit condition for relaxed measurement mode, the UE shall perform corresponding actions as defined in clause 5.2.4.x in [1].

**Table 4.X.2.3.2-1: Nserv when UE is in relaxed measurement mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | | **Nserv [number of 16\*DRX cycles]** |
| **FR1** | **FR2-1Note1** |
| 0.32 | 1 | 8 | N1\*4 |
| 0.64 | 5 | N1\*4 |
| 1.28 | 4 | N1\*2 |
| 2.56 | 3 | N1\*2 |
| NOTE 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length. | | | |

4.X.2.3A Measurement and evaluation of serving cell by RedCap UE

The requirements in this clause apply for RedCap UE measurement and evaluation of serving cell using MR, when the RedCap UE is not in serving cell measurement offloading mode as defined in [1].

Requirements defined in clause 4.2B.1 shall apply.

4.X.2.3A.1 Requirements for evaluation of cell selection criterion for RedCap UE

Requirements in clause 4.x.2.3.1 shall apply, except that clause 4.2.2.2 is replaced with 4.2B.2.2.

4.X.2.3A.2 Requirements for evaluation of LP-WUS related conditions for RedCap UE

Requirements defined in clause 4.x.2.3.2 shall apply.

<End of Change 4>

<Start of Change 5>

#### 4.X.2.4 Measurements of intra-frequency NR cells for UE with LP-WUR

For a UE supporting LP-WUR capability and not configured with eDRX\_IDLE cycle, the requirements in clause 4.2.2.3 for FR1 and FR2-1 apply except for the requirements specified in this clause when the relaxed measurement criterion defined in 5.2.4.x.2 in TS 38.304 [1] is fulfilled.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [1] within KLPW x Tdetect,NR\_Intrawhen that Treselection= 0, where KLPW = 16.

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

The UE shall filter SS-RSRP and SS-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 KLPW x Tmeasure,NR\_Intra/2.

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 in TS 38.304 [1] within KLPW x Tevaluate,NR\_Intra when Treselection = 0, provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3 dB better ranked in FR1.

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 in TS 38.304 [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 3 dB better ranked in FR1 if the current serving cell is among them.

Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra are specified in table 4.2.2.3-1 for FR1 and FR2-1.

#### 4.X.2.4A Measurements of intra-frequency NR cells for RedCap UE with LP-WUR

For a Redcap UE supporting LP-WUR capability and not configured with eDRX\_IDLE cycle, the requirements in clause 4.2B.2.3 apply except for the requirements specified in this clause when the relaxed measurement criterion defined in 5.2.4.x.2 in TS 38.304 [1] is fulfilled.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [1] within KLPW x Tdetect,NR\_Intra\_RedCapwhen that Treselection= 0, where KLPW = 16.

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

The UE shall filter SS-RSRP and SS-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 KLPW x Tmeasure,NR\_Intra\_RedCap /2.

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 in TS 38.304 [1] within KLPW x Tevaluate,NR\_Intra\_RedCap when Treselection = 0, provided that:

when rangeToBestCell is not configured:

- the cell is at least 3 dB better ranked in FR1 or 4.5 dB better ranked in FR2 for 2 Rx RedCap.

- the cell is at least 4 dB better ranked in FR1 for 1 Rx RedCap.

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 in TS 38.304 [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 3 dB better ranked in FR1 or 4.5 dB better ranked in FR2 if the current serving cell is among them for 2 Rx RedCap.

- the cell is at least 4 dB better ranked in FR1 if the current serving cell is among them for 1 Rx RedCap.

Tdetect,NR\_Intra\_RedCap, Tmeasure,NR\_Intra\_RedCap and Tevaluate,NR\_Intra\_RedCap are specified in table 4.2B.2.3-1.

<End of Change 5>

<Start of Change 6>

#### 4.X.2.5 Measurements of inter-frequency NR cells for UE with LP-WUR

##### 4.X.2.5.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells for UE with LP-WUR when the UE is configured with any of following measurement criteria:

- Relaxed measurement criterion for UE with LP-WUR defined in TS 38.304 [1],

- Serving cell measurement offloading criterion for UE with LP-WUR defined in TS 38.304 [1],

##### 4.X.2.5.2 Measurements for UE with LP-WUR fulfilling relaxed measurement criterion

The requirements for measurements on inter-frequency NR cells specified in this clause apply provided that:

- UE is configured with relaxed measurement [2] criterion and UE has fulfilled the relaxed measurement [2] criterion.

The UE shall not relax measurements on NR inter-frequency carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

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

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then:

- When T331 is running, for a UE not configured with eDRX\_IDLE, Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter for NR inter-frequency layers configure and not configured for idle mode CA/DC measurements specified in Table 4.2.2.4-1.

- When T331 is not running, for a UE not configured with eDRX\_IDLE, Tdetect,NR\_Inter\_Relax, Tmeasure,NR\_Inter\_Relax and Tevaluate,NR\_Inter\_Relax for NR inter-frequency layers not configured for idle mode CA/DC measurements and NR inter-frequency layers configured for idle mode CA/DC measurements and mobility measurement are as specified in table 4.X.2.5.2-1.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ,

- When T331 is running, the UE shall search for NR inter-frequency layers configured for idle mode CA/DC measurements and inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7.

- When T331 is not running, the UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 and, K2 = 60

Table 4.X.2.5.2-1: Tdetect,NR\_Inter\_Relax, Tmeasure,NR\_Inter\_Relax and Tevaluate,NR\_Inter\_Relax

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DRX cycle length [s] | Scaling Factor (N1) | | Tdetect,NR\_Inter\_Relax [s] (number of DRX cycles) | Tmeasure,NR\_Inter\_Relax [s] (number of DRX cycles) | Tevaluate,NR\_Inter\_Relax [s] (number of DRX cycles) |
| FR1 | FR2-1Note1 |
| 0.32 | 1 | 8 | 11.52 x N1 x KLPW x 1.5 (36 x N1 x KLPW x 1.5) | 1.28 x N1 x KLPW 1.5 (4 x N1 x KLPW x 1.5) | 5.12 x N1 x KLPW 1.5 (16 x N1 x KLPW x 1.5) |
| 0.64 |  | 5 | 17.92x N1 x KLPW (28 x N1 x KLPW) | 1.28 x N1 x KLPW (2 x N1 x KLPW) | 5.12 x N1 x KLPW (8 x N1 x KLPW) |
| 1.28 |  | 4 | 32 x N1 x KLPW (25 x N1 x KLPW) | 1.28 x N1 x KLPW (1 x N1 x KLPW) | 6.4 x N1 x KLPW (5 x N1 x KLPW) |
| 2.56 |  | 3 | 58.88 x N1 x KLPW (23 x N1 x KLPW) | 2.56 x N1 x KLPW (1 x N1 x KLPW) | 7.68 x N1 x KLPW (3 x N1 x KLPW) |
| NOTE 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length.  NOTE 2: KLPW = 16 is the measurement relaxation factor applicable for UE with LP-WUR fulfilling relaxed measurement criterion. | | | | | |

##### 4.X.2.5.3 Measurements for UE with LP-WUR fulfilling serving cell measurement offloading criterion

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

- Entry conditions for serving cell measurement offloading for UE with LP-WUR defined in clause 5.2.4.x.4 in 38.304 [1] are fulfilled.

- UE is configured with Rel-19 LP-WUR and UE has fulfilled serving cell measurement offloading criterion.

The UE shall not relax measurements on NR inter-frequency carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

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

- When T331 is not running, the UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7 and, K2 = 60

- When T331 is running, the UE shall search for inter-frequency layers of higher priority and inter-frequency NR layers configured for idle mode DC measurements at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.7.

#### 4.X.2.5A Measurements of inter-frequency NR cells for Redcap with LP-WUR

##### 4.X.2.5A.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells for Redcap with LP-WUR when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with LP-WUR defined in clause 5.2.4.x.2 in [1],

- Serving cell measurement offloading criterion for UE with LP-WUR defined in clause 5.2.4.x.4 in [1],

When the relaxed measurement criterion is not met, or the serving cell measurement offloading criterion is not met or both the relaxed measurement and the serving cell measurement offloading criteria are not met, the requirements in clause 4.2B.2.4 apply for UE.

##### 4.X.2.5A.2 Measurements for UE with LP-WUR fulfilling relaxed measurement criterion

The requirements for measurements on inter-frequency NR cells specified in this clause apply provided that:

- UE is configured with relaxed measurement [2] criterion and UE has fulfilled the relaxed measurement [2] criterion.

The requirements defined in clause 4.2B.2.4 apply for this clause except that:

When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ:

- For a UE not configured with eDRX\_IDLE, Tdetect,NR\_Inter\_Relax, Tmeasure,NR\_Inter\_Relax and Tevaluate,NR\_Inter\_Relax are as specified in table 4.X.2.5.2-1.

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ:

- The UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60

##### 4.X.2.5A.3 Measurements for UE with LP-WUR fulfilling serving cell measurement offloading criterion

The requirements for measurements on inter-frequency NR cells specified in this clause apply provided that:

- UE is configured with serving cell measurement offloading [1] criterion and UE has fulfilled the serving cell measurement offloading [1] criterion.

The requirements defined in clause 4.2B.2.4 apply for this clause except that:

- The UE shall search for inter-frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60

<End of Change 6>

<Start of Change 7>

#### 4.X.2.6     Measurements of inter-RAT E-UTRAN cells for UE with LP-WUR

##### 4.X.2.6.1 Introduction

This clause specifies the requirements for measurements on inter-RAT E-UTRAN cells performed by MR when the UE with LP-WUR is configured with any of the following relaxed measurement criteria:

- Relaxed measurement criteria for UE with LP-WUR defined in clause 5.2.4.x.2 in TS 38.304 [1],

- Serving cell measurement offloading criteria for UE with LP-WUR defined in clause 5.2.4.x.4 in TS 38.304 [1].

##### 4.X.2.6.2 Measurements for UE fulfilling relaxed measurement criteria

The requirements for measurements on inter-RAT E-UTRAN cells specified in this clause apply provided that:

- Relaxed measurement criteria for UE with LP-WUR defined in clause 5.2.4.x.2 in TS 38.304 [1] are fulfilled.

The UE shall not relax measurements on inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

The requirements defined in clause 4.2.2.5 apply for this clause except that:

- When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, then

- When T331 is running, for a UE not configured with eDRX\_IDLE, Tdetect,EUTRAN\_Relax, Tmeasure,EUTRAN\_Relax and Tevaluate,EUTRAN\_Relax for inter-RAT E-UTRAN carriers configure and not configured for idle mode CA/DC measurements are specified in Table 4.2.2.5-1.

- When T331 is not running, for a UE not configured with eDRX\_IDLE, Tdetect,EUTRAN\_Relax, Tmeasure,EUTRAN\_Relax and Tevaluate,EUTRAN\_Relax for inter-RAT E-UTRAN layers not configured for idle mode CA/DC measurements and inter-RAT E-UTRAN configured for idle mode CA/DC measurements and mobility measurement are as specified in table 4.X.2.6.2-1.

- When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ the requirements are defined as follows:

- When T331 is running, the UE shall search for inter-RAT E-UTRAN configured for idle mode CA/DC measurements and inter-RAT E-UTRAN frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7.

- When T331 is not running, the UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60.

Table 4.X.2.6.2-1: Tdetect,EUTRAN\_Relax, Tmeasure,EUTRAN\_Relax, and Tevaluate,EUTRAN\_Relax for UE with LP-WUR

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

##### 4.X.2.6.3 Measurements for UE fulfilling serving cell measurement offloading entry criteria

The requirements for measurements on inter-RAT E-UTRAN cells specified in this clause apply provided that:

- Entry conditions for serving cell measurement offloading for UE with LP-WUR defined in clause 5.2.4.x.4 in TS 38.304 [1] are fulfilled.

The UE shall not relax measurements on inter-RAT E-UTRAN carriers configured for idle mode CA/DC measurements (defined in clause 4.4) while T331 is running.

The requirements defined in clause 4.2.2.5 apply for this clause except that:

- When T331 is not running, the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60.

- When T331 is running, the UE shall search for inter-RAT E-UTRAN layers of higher priority and inter-RAT E-UTRAN layers configured for idle mode DC measurements at least every Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7.

Note: It is assumed that Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ is always met when the entry conditions for serving cell measurement offloading are met.

#### 4.X.2.6A   Measurements of inter-RAT E-UTRAN cells for RedCap with LP-WUR

##### 4.X.2.6A.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells performed by RedCap UE when the UE with LP-WUR is configured with any of the following relaxed measurement criteria:

- Relaxed measurement criteria for UE with LP-WUR defined in clause 5.2.4.x.2 in TS 38.304 [1],

- Serving cell measurement offloading criteria for UE with LP-WUR defined in clause 5.2.4.x.4 in TS 38.304 [1].

##### 4.X.2.6A.2 Measurements for UE fulfilling relaxed measurement criteria

The requirements for measurements on inter-RAT E-UTRAN cells specified in this clause apply provided that:

- Relaxed measurement criteria for UE with LP-WUR defined in clause 5.2.4.x.2 in TS 38.304 [1] are fulfilled:

The requirements defined in clause 4.2B.2.5 apply for this clause except:

- When Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ:

- For a UE not configured with eDRX\_IDLE, Tdetect,EUTRAN\_Relax, Tmeasure,EUTRAN\_Relax and Tevaluate,EUTRAN\_Relax are specified in Table 4.2B.2.5-1.

- When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ the requirements are defined as follows

- The UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60.

##### 4.X.2.6A.3 Measurements for UE fulfilling serving cell measurement offloading entry criteria

The requirements for measurements on inter-RAT E-UTRAN cells specified in this clause apply provided that:

- Entry conditions for serving cell measurement offloading for UE with LP-WUR defined in clause 5.2.4.x.4 in TS 38.304 [1] are fulfilled.

The requirements defined in clause 4.2B.2.5 apply for this clause except that:

- The UE shall search for inter-RAT E-UTRAN layers of higher priority at least every K2\*Thigher\_priority\_search where Thigher\_priority\_search is specified in clause 4.2.2.7 and, K2 = 60.

Note: It is assumed that Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ is always met when the entry conditions for serving cell measurement offloading are met.

<End of Change 7>

<Start of Change 8>

## 5.x INACTIVE mode measurement for LP-WUS operation

### 5.x.1 Introduction

The UE which supports *LP-WUS capability* in RRC\_IDLE shall be capable of:

* performing serving cell measurement based on LP-SS or SSB by LR.
* performing serving cell and neighbour cell measurement relaxation by MR together with LP-SS or SSB based serving cell measurement by LR.

### 5.X.2 Requirements

#### 5.X.2.1 UE measurement capability

##### 5.X.2.1.1 LP-WUR measurement capability

The requirements in clause 4.x.2.1.1 could be applied.

##### 5.X.2.1.2 MR measurement capability with LP-WUR

The requirements in clause 4.x.2.1.2 could be applied.

<End of Change 8>

<Start of Change 9>

#### 5.x.2.2 LP-WUR serving cell measurement and evaluation requirements

The requirements in clause 4.x.2.2 shall apply.

<End of Change 9>

<Start of Change 10>

#### 5.X.2.3 Measurement and evaluation of serving cell by MR

The requirements in clause 4.X.2.3 shall apply.

#### 5.X.2.3A Measurement and evaluation of serving cell by Redcap

The requirements in clause 4.X.2.3A shall apply.<End of Change 10>

<Start of Change 11>

#### 5.X.2.4 Measurements of intra-frequency NR cells for UE with LP-WUR

The requirements in clause 4.X.2.4 shall apply.

#### 5.X.2.4A Measurements of intra-frequency NR cells for RedCap UE with LP-WUR

The requirements in clause 4.XA.2.4 shall apply.

<End of Change 11>

<Start of Change 12>

#### 5.X.2.5 Measurements of inter-frequency NR cells for UE with LP-WUR

The requirements in clause 4.X.2.5 shall apply when UE with LP-WUR is not configured with eDRX\_IDLE and has fulfilled the relaxed measurement criterion.

If UE is not configured to perform PRS measurement, or if UE is configured to perform PRS measurement and supports *parallelPRS-MeasRRC-Inactive-r17*, Kcarrier in clause 4.X.2.5 shall apply regardless of whether the serving cell is subject to CCA or not.

If UE is configured to perform PRS measurement but does not support *parallelPRS-MeasRRC-Inactive-r17*, Kcarrier is replaced with Kcarrier + 1, regardless of whether the serving cell is subject to CCA or not.

#### 5.X.2.5A Measurements of inter-frequency NR cells for Redcap with LP-WUR

The requirements in clause 4.X.2.5A shall apply when UE with LP-WUR is not configured with eDRX\_IDLE and has fulfilled the relaxed measurement criterion.

#### 5.X.2.6 Measurements of inter-RAT E-UTRAN cells for UE with LP-WUR

The requirements in clause 4.X.2.6 shall apply when UE with LP-WUR is not configured with eDRX\_IDLE and has fulfilled the relaxed measurement criterion.

#### 5.X.2.6A Measurements of inter-RAT E-UTRAN cells for Redcap with LP-WUR

The requirements in clause 4.X.2.6A shall apply when UE with LP-WUR is not configured with eDRX\_IDLE and has fulfilled the relaxed measurement criterion.

<End of Change 12>