**3GPP TSG-RAN WG4 Meeting #116bis R4-2513093**

**Prague, Czech Republic, October 13th – 17th, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **6022** | **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:*** | CR on core requirements for UE with LP-WUSWUR in IDLE state | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | OPPO | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_LPWUS-Core | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***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:*** | | **This CR is based on the agreed bigCR R4-2512354. The new changes are marked with “OPPO-RAN4#116bis”.**   1. The time for cell selection initiation for LP-WUS UE in case 3 i.e., relaxed measurement mode needs to be updated due to measurement relaxation. 2. The abbreviation OOK is not used in the requirements and no need to add it in the abbreviation list. 3. It was agreed not to define filtering requirements for LP-SS measurement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Update the time for cell selection initiation for LP-WUS UE in case 3 i.e., relaxed measurement mode. 2. Remove OOK from abbreviation list. 3. Remove the filtering requirements for LP-SS measurement. 4. Other corrections. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The core requirements for UE with LP-WUR is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.X.2.2, 4.X.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(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

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>

#### 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 entry 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.2.2.2 or 4.x.2.2.3.

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.2.2.2 and 4.x.2.2.3 apply to LP-WUR entry and exit criteria evaluation.

Prior to performing LP-WUR evaluation specified in 4.x.2.2.2 or 4.x.2.2.3, 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 LP-WUS monitoring, 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 LP-WUS monitoring, 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

- exit condition for RRM relaxation

**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.

# < End of Change 2>

# < Start of Change 3>

#### 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 LP-WUS 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 LP-WUS UE is not in relaxed measurement mode as defined in [1], the requirements in clause 4.2.2.2 shall apply.

When LP-WUS 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 LP-WUS 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.

If the LP-WUS 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 LP-WUS UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting LP-WUS UE measurement activities.

If the LP-WUS 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 LP-WUS UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1], where T= max(10s, 16\*DRX cycle).

**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 LP-WUS UE is in relaxed measurement mode as defined in [1], the LP-WUS 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 LP-WUS 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.

If the LP-WUS 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 LP-WUS 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. | | | |

# < End of Change 3>