**3GPP TSG-RAN WG2 Meeting #109 electronic            R2-2002317**

**Elbonia, 24th Feb – 6th Mar 2020**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.304** | **CR** | **0785** | **rev** | **1** | **Current version:** | **15.5.0** |  |
|  | | | | | | | | |
| *For* ***[HELP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <http://www.3gpp.org/Change-Requests>.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | CR on cell selection/ reselection for NR V2X UE | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation, Sanechips | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL | | | | |  | ***Date:*** | | | 2020-03-05 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | Cell selection/ reselection for UE of 5G V2X with NR sidelink should be added into TS36.304, specially for the case LTE Uu control NR sidelink | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Add description 11.5 for NR V2X cell selection/reselection, for Rel-16 V2X UE performing frequency prioritization. * RAN2#106 agreements are captured * RAN2#107 agreements are captured * RAN2#108 email discussion#103 results are captured * RAN2#109e agreements are captured. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Cell selection/reselection for 5G V2X with NR Sidelink will not be introduced in Rel-16. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1/2/3.1/4.1/4.3/5.2.4.1/11.1/11.2/11.3/11.4.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ...,CR… | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

***3GPP***

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis

Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

<http://www.3gpp.org>

***Copyright Notification***

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

UMTS™ is a Trade Mark of ETSI registered for the benefit of its members

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners

LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners

GSM® and the GSM logo are registered and owned by the GSM Association

START OF THE CHANGE

Contents

Foreword 5

1 Scope 6

2 References 6

3 Definitions and abbreviations 8

3.1 Definitions 8

3.2 Symbols 9

3.3 Abbreviations 10

4 General description of Idle mode 11

4.1 Overview 11

4.2 Functional division between AS and NAS in Idle mode 12

4.3 Service types in Idle Mode 14

4.4 NB-IoT functionality in Idle Mode 16

5 Process and procedure descriptions 16

5.1 PLMN selection 16

5.1.1 Void 17

5.1.2 Support for PLMN selection 17

5.1.2.1 General 17

5.1.2.2 E-UTRA and NB-IoT case 17

5.1.2.3 UTRA case 17

5.1.2.4 GSM case 17

5.1.2.5 CDMA2000 case 17

5.1.2.6 NR case 17

5.2 Cell selection and reselection 18

5.2.1 Introduction 18

5.2.2 States and state transitions in Idle Mode 19

5.2.3 Cell Selection process 20

5.2.3.1 Description 20

5.2.3.2 Cell Selection Criterion 21

5.2.3.2a Cell Selection Criterion for NB-IoT 22

5.2.3.3 CSG cells and Hybrid cells in Cell Selection 22

5.2.3.4 GSM case in Cell Selection 23

5.2.3.5 UTRAN case in Cell Selection 23

5.2.3.6 NR case in Cell Selection 23

5.2.4 Cell Reselection evaluation process 23

5.2.4.1 Reselection priorities handling 23

5.2.4.2 Measurement rules for cell re-selection 25

5.2.4.2a Measurement rules for cell re-selection for NB-IoT 25

5.2.4.3 Mobility states of a UE 25

5.2.4.3.1 Scaling rules 26

5.2.4.4 Cells with cell reservations, access restrictions or unsuitable for normal camping 27

5.2.4.5 E-UTRAN Inter-frequency and inter-RAT Cell Reselection criteria 27

5.2.4.6 Intra-frequency and equal priority inter-frequency Cell Reselection criteria 28

5.2.4.6a Reselection for enhanced coverage 30

5.2.4.7 Cell reselection parameters in system information broadcasts 30

5.2.4.7.1 Speed dependant reselection parameters 32

5.2.4.8 Cell reselection with CSG cells 33

5.2.4.8.1 Cell reselection from a non-CSG cell to a CSG cell 33

5.2.4.8.2 Cell reselection from a CSG cell 33

5.2.4.9 Cell reselection with Hybrid cells 33

5.2.4.10 E-UTRAN Inter-frequency Redistribution procedure 34

5.2.4.10.1 Redistribution target selection 34

5.2.4.11 Cell reselection when storing UE AS context 35

5.2.4.12 Relaxed monitoring 35

5.2.4.12.0 Relaxed monitoring measurement rules 35

5.2.4.12.1 Relaxed monitoring criterion 35

5.2.5 Void 35

5.2.6 Camped Normally state 35

5.2.7 Cell Selection at transition to RRC\_IDLE or RRC\_INACTIVE state 36

5.2.7a Cell Selection when leaving RRC\_CONNECTED state for NB-IoT 36

5.2.8 Any Cell Selection state 36

5.2.8a Any Cell Selection state for NB-IoT 36

5.2.9 Camped on Any Cell state 36

5.3 Cell Reservations and Access Restrictions 37

5.3.1 Cell status and cell reservations 37

5.3.2 Access control 39

5.3.3 Emergency call 39

5.4 Tracking Area registration 39

5.5 Support for manual CSG selection 40

5.5.1 E-UTRA case 40

5.5.2 UTRA case 40

5.6 RAN-assisted WLAN interworking 40

5.6.1 RAN assistance parameter handling in RRC\_IDLE 40

5.6.2 Access network selection and traffic steering rules 40

5.6.3 RAN assistance parameters definition 41

6 Reception of broadcast information 42

6.1 Reception of system information 42

6.2 Reception of MBMS 42

7 Paging 43

7.1 Discontinuous Reception for paging 43

7.2 Subframe Patterns 44

7.3 Paging in extended DRX 45

7.4 Paging with Wake Up Signal 46

8 Logged measurements 46

9 Accessibility measurements 47

10 Mobility History Information 47

11 Sidelink operation 47

11.1 Sidelink communication and V2X sidelink communication 47

11.2 Sidelink discovery 47

11.3 Sidelink synchronisation 48

11.4 Cell selection and reselection for sidelink 48

11.4.1 Parameters used for cell selection and reselection triggered for sidelink 48

12. General description of UE camping on E-UTRA connected to 5GC 48

Annex A (informative): Void 50

Annex B (informative): Example of Hashed ID Calculation using 32-bit FCS 51

Annex C (informative): Change history 52

# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document specifies the Access Stratum (AS) part of the Idle Mode procedures applicable to a UE. The non-access stratum (NAS) part of Idle mode procedures and processes is specified in TS 23.122 [5].

The present document specifies the model for the functional division between the NAS and AS in a UE.

The present document applies to all UEs that support at least E-UTRA, including multi-RAT UEs as described in 3GPP specifications, in the following cases:

- When the UE is camped on an E-UTRA cell;

- When the UE is searching for a cell to camp on;

NOTE: When the UE is camped on or searching for a cell to camp on belonging to other RATs, the UE behaviour is described in the specifications of the other RAT.

The Idle Mode procedures defined in this specification are also applicable for a UE in RRC\_INACTIVE state unless specified otherwise.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 25.990: "Vocabulary for UTRAN".

[2] 3GPP TS 36.300: "E-UTRA and E-UTRAN Overall Description; Stage 2".

[3] 3GPP TS 36.331: "E-UTRA; Radio Resource Control (RRC) - Protocol Specification".

[4] 3GPP TS 22.011: "Service accessibility".

[5] 3GPP TS 23.122: "NAS functions related to Mobile Station (MS) in idle mode".

[6] 3GPP TS 36.213: "E-UTRA; Physical layer procedures".

[7] 3GPP TS 36.214: "E-UTRA; Physical layer; Measurements".

[8] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode"

[9] 3GPP TS 43.022: "Functions related to Mobile Station in idle mode and group receive mode".

[10] 3GPP TS 36.133: "Requirements for Support of Radio Resource Management".

[11] void

[12] void

[13] void

[14] void

[15] void

[16] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3"

[17] 3GPP2 C.S0024-C v2.0: "cdma2000 High Rate Packet Data Air Interface Specification".

[18] 3GPP2 C.S0005-F v1.0: "Upper Layer (Layer 3) Signalling Standard for cdma2000 Spread Spectrum Systems".

[19] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".

[20] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3"

[21] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[22] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".

[23] 3GPP TS 23.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[24] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[25] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[26] IEEE 802.11, Part 11: "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.".

[27] Wi-Fi Alliance Technical Committee, Hotspot 2.0 Technical Task Group: "Hotspot 2.0 (Release 2) Technical Specification".

[28] 3GPP TS 24.302: "Access to the 3GPP Evolved Packet Core (EPC) via non-3GPP access networks".

[29] 3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".

[30] 3GPP TS 36.321: "E-UTRA; Medium Access Control (MAC) protocol specification".

[31] 3GPP TS 24.105: "Application specific Congestion control for Data Communication (ACDC) Management Object (MO)".

[32] 3GPP TS 31.102: "Characteristics of the Universal Subscriber Identity Module (USIM) application".

[33] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[34] Void

[35] 3GPP TS 23.003: "Numbering, addressing and identification".

[36] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[37] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[38] 3GPP TS 38.304: "New Generation Radio Access Network; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[39] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[xx] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Acceptable Cell:** A cell that satisfies certain conditions as specified in 4.3. A UE can always attempt emergency calls on an acceptable cell, but restriction as in 5.3.3 apply.

**CSG Whitelist**: A list provided by NAS containing all the CSG identities and their associated PLMN IDs of the CSGs to which the subscriber belongs.

NOTE: This list is known as Allowed CSG List in Rel-8 Access Stratum specifications.

**Available PLMN(s):** One or more PLMN(s) for which the UE has found at least one cell and read its PLMN identity(ies).

**Barred Cell**: A cell a UE is not allowed to camp on.

**Camped on a cell:** UE has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

**Camped on any cell**: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

**Closed Subscriber Group (CSG):** A Closed Subscriber Group identifies subscribers of an operator who are permitted to access one or more cells of the PLMN but which have restricted access (CSG cells).

**CN type:** The type of core network connectivity supported by an E-UTRA cell, either EPC or 5GC.

**Commercial Mobile Alert System:** Public Warning System that delivers *Warning Notifications* provided by *Warning Notification Providers* to CMAS capable UEs.

**CSG cell:** A cell broadcasting a CSG indication that is set to TRUE and a specific CSG identity.

**CSG identity:** An identifier broadcast by a CSG or hybrid cell/cells and used by the UE to facilitate access for authorised members of the associated Closed Subscriber Group.

**CSG member cell:** a cell broadcasting the identity of the selected PLMN, registered PLMN or equivalent PLMN and for which the CSG whitelist of the UE includes an entry comprising cell's CSG ID and the respective PLMN identity.

**DRX cycle:** Individual time interval between monitoring Paging Occasion for a specific UE.

**eDRX cycle:** Time interval between the first Paging Occasions occurring after successive extended DRX periods.

**eCall Only Mode:** A UE configuration option that allows the UE to attach at EPS and register in IMS to perform only eCall Over IMS, and a non-emergencyIMS call for test and/or terminal reconfiguration services.

**EHPLMN:** Any of the PLMN entries contained in the Equivalent HPLMN list TS 23.122 [5].

**Equivalent PLMN list:** List of PLMNs considered as equivalent by the UE for cell selection, cell reselection, and handover according to the information provided by the NAS.

**EU-Alert:** Public Warning System that delivers Warning Notifications provided by Warning Notification Providers using the same AS mechanisms as defined for CMAS.

**Home PLMN:** A PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

**HNB Name**: The Home eNodeB Name is a broadcast string in free text format that provides a human readable name for the Home eNodeB CSG identity and any broadcasted PLMN identity.

**HSDN cell**: A cell that has higher priority than other cells for cell reselection for HSDN capable UE in a High-mobility state.

**Hybrid cell:** A cell broadcasting a CSG Indicator that is set to FALSE and a specific CSG identity.

**Hyper SFN:** Index broadcast in System Information that increments at every SFN wrap around (i.e every 10.24s).

**Korean Public Alert System (KPAS):** Public Warning System that delivers Warning Notifications provided by Warning Notification Providers using the same AS mechanisms as defined for CMAS.

**Location Registration (LR):** UE registers its presence in a registration area, for instance regularly or when entering a new tracking area.

**MBMS-dedicated cell**: cell dedicated to MBMS transmission.

**MBMS/****Unicast-mixed cell**: cell supporting both unicast and MBMS transmissions.

**FeMBMS/Unicast-mixed cell**: cell supporting MBMS transmission and unicast transmission as SCell.

**NB-IoT:** NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz.

**Paging Time Window:** The period configured for a UE in extended DRX, during which the UE monitors Paging Occasions following DRX cycle.

**Power saving mode**: Mode allowing the UE to reduce its power consumption, as defined in TS 24.301 [16], TS 23.401 [23], TS 23.682 [24].

**Process:** A local action in the UE invoked by a RRC procedure or an Idle Mode or RRC\_INACTIVE state procedure.

**Radio Access Technology:** Type of technology used for radio access, for instance E-UTRA, UTRA, GSM, CDMA2000 1xEV-DO (HRPD) or CDMA2000 1x (1xRTT).

**Registered PLMN:** This is the PLMN on which certain Location Registration outcomes have occurred TS 23.122 [5].

**Registration Area**: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

**Reserved Cell**: A cell on which camping is not allowed, except for particular UEs, if so indicated in the system information.

**Restricted Cell**: A cell on which camping is allowed, but access attempts are disallowed for UEs whose access classes are indicated as barred.

**Selected PLMN:** This is the PLMN that has been selected by the NAS, either manually or automatically.

**Serving cell:** The cell on which the UE is camped.

**Sidelink**: UE to UE interface for sidelink communication, V2X sidelink communication and sidelink discovery. The Sidelink corresponds to the PC5 interface as defined in TS 23.303 [29].

**Sidelink communication**: AS functionality enabling ProSe Direct Communication as defined in TS 23.303 [29], between two or more nearby UEs, using E-UTRA technology but not traversing any network node. The terminology "sidelink communication" without "V2X" prefix only concerns PS unless specifically stated otherwise.

**Sidelink discovery**: AS functionality enabling ProSe Direct Discovery as defined in TS 23.303 [29], using E-UTRA technology but not traversing any network node.

**Strongest cell:** The cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure TS 36.213 [6], TS 36.214 [7].

**Suitable Cell:** This is a cell on which an UE may camp. For a E-UTRA cell, the criteria are defined in subclause 4.3, for a UTRA cell in TS 25.304 [8], for a GSM cell in TS 43.022 [9], and for a NR cell in TS 38.304 [38].

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [xx], between two or more nearby UEs, using NR technology but not traversing any network node.

**V2X sidelink communication:** AS functionality enabling V2X Communication as defined in TS 23.285 [36], between nearby UEs, using E-UTRA technology but not traversing any network node.

NEXT CHANGE

# 4 General description of Idle mode

## 4.1 Overview

The idle mode tasks can be subdivided into four processes:

- PLMN selection;

- Cell selection and reselection;

- Location registration;

- Support for manual CSG selection.

The relationship between these processes is illustrated in Figure 4.1-1.

**

Figure 4.1-1: Overall Idle Mode process

When a UE is switched on, a public land mobile network (PLMN) is selected by NAS. For the selected PLMN, associated RAT(s) may be set TS 23.122 [5]. The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for cell selection and cell reselection.

With the cell selection, the UE searches for a suitable cell of the selected PLMN and chooses that cell to provide available services, further the UE shall tune to its control channel. This choosing is known as "camping on the cell".

For E-UTRA a cell may be associated with more than one CN type (EPC and/or 5GC) and hence the selected cell can be suitable for more than one CN type. The CN type(s) for which the selected cell is suitable are reported to NAS which selects a CN type to be used for camping and for the NAS registration procedure (see below). Note that CN type selection is only applicabe for UE supporting E-UTRA connected to 5GC.

The UE shall, if necessary, then register its presence, by means of a NAS registration procedure, in the tracking area of the chosen cell and as outcome of a successful Location Registration the selected PLMN becomes the registered PLMN TS 23.122 [5].

If the UE finds a more suitable cell, according to the cell reselection criteria, it reselects onto that cell and camps on it. Similar to cell selection procedure, if the reselected cell is an E-UTRA cell and the UE supports E-UTRA connected to 5GC, the CN type(s) for which the cell is suitable are reported to NAS which selects one of them. If the new cell does not belong to at least one tracking area to which the UE is registered, location registration is performed. In RRC\_INACTIVE state, if the new cell does not belong to the configured RNA, a RNA update procedure is performed.

If necessary, the UE shall search for higher priority PLMNs at regular time intervals as described in TS 22.011 [4] and search for a suitable cell if another PLMN has been selected by NAS.

Search of available CSGs may be triggered by NAS to support manual CSG selection.

If the UE loses coverage of the registered PLMN, either a new PLMN is selected automatically (automatic mode), or an indication of which PLMNs are available is given to the user, so that a manual selection can be made (manual mode).

Registration is not performed by UEs only capable of services that need no registration.

The UE may perform sidelink communication or V2X sidelink communication or sidelink discovery or NR sidelink communication while in-coverage or out-of-coverage for sidelink, as specified in clause 11.

The purpose of camping on a cell in idle mode is fivefold:

a) It enables the UE to receive system information from the PLMN.

b) When registered and if the UE wishes to establish an RRC connection, it can do this by initially accessing the network on the control channel of the cell on which it is camped.

c) If the PLMN receives a call for the registered UE, it knows (in most cases) the set of tracking areas (in RRC\_IDLE state) or RNAs (in RRC\_INACTIVE state) in which the UE is camped. It can then send a "paging" message for the UE on the control channels of all the cells in this set of tracking areas. The UE will then receive the paging message because it is tuned to the control channel of a cell in one of the registered tracking areas and the UE can respond on that control channel.

d) It enables the UE to receive ETWS and CMAS notifications.

e) It enables the UE to receive MBMS services.

If the UE is unable to find a suitable cell to camp on or if the location registration failed (except for LR rejected with cause #12, cause #14, cause #15 or cause #25, see TS 23.122 [5] and TS 24.301 [16]), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state.

When NAS indicates that PSM starts, the AS configuration (e.g. priorities provided by dedicated signalling and logged measurements) is kept, all running timers continue to run but the UE need not perform any idle mode tasks. If a timer expires while the UE is in PSM it is up to UE implementation whether it performs the corresponding action immediately or the latest when PSM ends. When NAS indicates that PSM ends, the UE shall perform all idle mode tasks.

NEXT CHANGE

## 4.3 Service types in Idle Mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode.

The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE:

- Limited service (emergency calls, ETWS and CMAS on an acceptable cell). It is not applicable to RRC\_INACTIVE state.

- Normal service (for public use on a suitable cell)

- Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:

**acceptable cell:**

An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls and receive ETWS and CMAS notifications), and it is not applicable to RRC\_INACTIVE state. Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call and to receive ETWS and CMAS notification in a E-UTRAN network:

- The cell is not barred, see subclause 5.3.1;

- The cell selection criteria are fulfilled, see subclause 5.2.3.2;

**suitable cell:**

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. The UE shall have a valid USIM and such a cell shall fulfil all the following requirements.

- The cell is part of either:

- the selected PLMN, or:

- the registered PLMN, or:

- a PLMN of the Equivalent PLMN list

- For a CSG cell, the cell is a CSG member cell for the UE;

According to the latest information provided by NAS:

- The cell is not barred, see subclause 5.3.1;

- The cell is part of at least one TA that is not part of the list of "forbidden tracking areas for roaming" TS 22.011 [4], which belongs to a PLMN that fulfils the first bullet above;

- The cell selection criteria are fulfilled, see subclause 5.2.3.2;

- Except for NB-IoT, if the UE supports authorization of coverage enhancements and upper layers indicated that use of coverage enhancements is not authorized for the selected PLMN:

- the cell selection criterion S in normal coverage shall be fulfilled;

- If the UE supports CE mode B and upper layers indicated that CE mode B is restricted:

- the cell selection criterion S in normal coverage based on values Qrxlevmin and Qqualmin or in enhanced coverage based on values Qrxlevmin\_CE and Qqualmin\_CE shall be fulfilled.

If more than one PLMN identity is broadcast in the cell, the cell is considered to be part of all TAs with TAIs constructed from the PLMN identities and the TAC broadcast in the cell.

**barred cell:**

A cell is barred if it is so indicated in the system information TS 36.331 [3].

**reserved cell:**

A cell is reserved if it is so indicated in system information TS 36.331 [3].

Following exceptions to these definitions are applicable for UEs:

- camped on a cell that belongs to a registration area that is forbidden for regional provision of service; a cell that belongs to a registration area that is forbidden for regional provision service (TS 23.122 [5], TS 24.301 [16]) is suitable but provides only limited service.

- as an outcome of the manual CSG selection procedure the UE is allowed to access an acceptable cell which fulfils the cell selection criteria and is not barred or reserved for operator use for UEs not belonging to AC 11 or 15 and inform NAS that access is possible (for location registration procedure).

NOTE: UE is not required to support manual search and selection of PLMN or CSGs while in RRC CONNECTED state. The UE may use local release of RRC connection to perform manual search if it is not possible to perform the search while RRC connected.

- if a UE has an ongoing emergency call, all acceptable cells of that PLMN are treated as suitable for the duration of the emergency call.

- if the UE in RRC\_IDLE fulfils the conditions to support sidelink communication or PS related sidelink discovery in limited service state as specified in TS 23.303 [29, 4.5.6], the UE may perform sidelink communication or PS-related sidelink discovery.

- if the UE in RRC\_IDLE fulfils the conditions to support V2X sidelink communication or NR sidelink communication in limited service state as specified in TS23.285 [36, 4.4.8] and TS23.287[xx, 5.7], the UE may perform V2X sidelink communication or NR sidelink communication.

For E-UTRA the cell categorization defined above is per CN type. In this specification, when the term suitable/acceptable cell is used without specifying the CN type, it means the cell is suitable/acceptable for any of the CN type(s) supported by the UE.

NOTE: The selected CN Type is not considered during cell selection and reselection procedure.

NEXT CHANGE

# 5 Process and procedure descriptions

## 5.2 Cell selection and reselection

### 5.2.4 Cell Reselection evaluation process

#### 5.2.4.1 Reselection priorities handling

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCConnectionRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an E-UTRAN frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCConnectionReject* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values). While the UE is camped on a suitable CSG cell in normal coverage, the UE shall always consider the current frequency to be the highest priority frequency (i.e. higher than any of the network configured values), irrespective of any other priority value allocated to this frequency. When the HSDN capable UE is in High-mobility state, the UE shall always consider the HSDN cells to be the highest priority (i.e. higher than any other network configured priorities). When the HSDN capable UE is not in High-mobility state, the UE shall always consider HSDN cells to be the lowest priority (i.e. lower than network configured priorities). If the UE capable of sidelink communication is configured to perform sidelink communication and can only perform the sidelink communication while camping on a frequency, the UE may consider that frequency to be the highest priority. If the UE capable of V2X sidelink communication is configured to perform V2X sidelink communication and can only perform the V2X sidelink communication while camping on a frequency, the UE may consider that frequency to be the highest priority. If the UE capable of V2X sidelink communication is configured to perform V2X sidelink communication and can only use pre-configuration while not camping on a frequency, the UE may consider the frequency providing inter-carrier V2X sidelink configuration to be the highest priority. If the UE is configured to perform both V2X sidelink communication and NR sidelink communication, the UE may consider the frequency providing both V2X sidelink communication and NR sidelink communication configuration to be the highest priority.If the UE is configured to perform only V2X sidelink communication, the UE may consider the frequency providing V2X sidelink communication configuration to be the highest priority. If the UE is configured to perform only NR sidelink communication, the UE may consider the frequency providing NR sidelink communication configuration to be the highest priority. If the UE capable of sidelink discovery is configured to perform Public Safety related sidelink discovery and can only perform the Public Safety related sidelink discovery while camping on a frequency, the UE may consider that frequency to be the highest priority.

NOTE 1: The prioritization among the frequencies which UE considers to be the highest priority frequency is left to UE implementation.

NOTE X: The frequency only providing the anchor frequency configuration should not be prioritized for V2X service during cell reselection as specified in TS 36.331[3].

NOTE Y: When UE is configured to perform NR sidelink communication or V2X sidelink communication performs cell reselection, it may consider the frequencies providing the intra-carrier and inter-carrier configuration have equal priority in cell reselection.

NOTE W: The UE is configured to perform V2X sidelink communication or NR sidelink communication, if it has the capability and is authorized for the corresponding sidelink operation.

NOTE Z: When UE is configured to perform both NR sidelink communication and V2X sidelink communication, but cannot find a frequency which can provide both NR sidelink communication configuration and V2X sidelink communication configuration, UE may consider the frequency providing either NR sidelink communication configuration or V2X sidelink communication configuration to be the highest priority.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBMS session TS 36.300 [2] as long as the two following conditions are fulfilled:

1) Either:

- the UE is capable of MBMS service continuity and the reselected cell is broadcasting SIB13; or

- the UE is capable of SC-PTM reception and the reselected cell is broadcasting SIB20;

2) Either:

- SIB15 of the serving cell indicates for that frequency one or more MBMS SAIs included and associated with that frequency in the MBMS User Service Description (USD) TS 26.346 [22] of this service; or

- SIB15 is not broadcast in the serving cell and that frequency is included in the USD of this service.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service provided on a downlink only MBMS frequency, on a frequency used by dedicated MBMS cells, on a frequency used by FeMBMS/Unicast-mixed cells as defined in TS 36.300 [2], or on a frequency belonging to PLMN different from its registered PLMN, the UE may consider cell reselection candidate frequencies at which it can not receive the MBMS service to be of the lowest priority during the MBMS session TS 36.300 [2], as long as the above mentioned condition 1) is fulfilled for the cell on the MBMS frequency which the UE monitors or this cell broadcasts SIB1-MBMS and as long as the above mentioned condition 2) is fulfilled for the serving cell.

NOTE 2: Example scenarios in which the previous down-prioritisation may be needed concerns the cases where camping is not possible, while the UE can only receive this MBMS frequency when camping on a subset of cell reselection candidate frequencies, e.g. the MBMS frequency is a downlink only carrier, the MBMS frequency is used by dedicated MBMS cells, the MBMS frequency is used by FeMBMS/Unicast-mixed cells TS 36.300 [2], or the MBMS frequency belongs to a PLMN different from UE's registered PLMN.

If the UE is not capable of MBMS Service Continuity but has knowledge on which frequency an MBMS service of interest is provided, it may consider that frequency to be the highest priority during the MBMS session TS 36.300 [2] as long as the reselected cell is broadcasting SIB13.

If the UE is not capable of MBMS Service Continuity but has knowledge on which downlink only frequency, on which frequency used by dedicated MBMS cells, on which frequency used by FeMBMS/Unicast-mixed cells as defined in TS 36.300 [2] or on which frequency belonging to PLMN different from its registered PLMN an MBMS service of interest is provided, it may consider cell reselection candidate frequencies at which it can not receive the MBMS service to be of the lowest priority during the MBMS session TS 36.300 [2] as long as the cell on the MBMS frequency which the UE monitors is broadcasting SIB13 or SIB1-MBMS.

NOTE 3: The UE considers that the MBMS session is ongoing using the session start and end times as provided by upper layers in the USD i.e. the UE does not verify if the session is indicated on MCCH.

In case UE receives *RRCConnectionReject* with *deprioritisationReq*, UE shall consider current carrier frequency and stored frequencies due to the previously received *RRCConnectionReject* with *deprioritisationReq* or all the frequencies of EUTRA to be the lowest priority frequency (i.e. lower than any of the network configured values) while T325 is running irrespective of camped RAT. The UE shall delete the stored deprioritisation request(s) when a PLMN selection is performed on request by NAS TS 23.122 [5].

NOTE 4: Connecting to CDMA2000 does not imply PLMN selection.

NOTE 5: UE should search for a higher priority layer for cell reselection as soon as possible after the change of priority. The minimum related performance requirements specified in TS 36.133 [10] are still applicable.

The UE shall delete priorities provided by dedicated signalling when:

- the UE enters a different RRC state; or

- the optional validity time of dedicated priorities (T320) expires; or

- a PLMN selection is performed on request by NAS TS 23.122 [5].

NOTE 6: Equal priorities between RATs are not supported.

The UE shall only perform cell reselection evaluation for E-UTRAN frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

The UE shall not consider any black listed cells as candidate for cell reselection.

The UE shall inherit the priorities provided by dedicated signalling and the remaining validity time (i.e., T320 in E-UTRA and NR, T322 in UTRA and T3230 in GERAN), if configured, at inter-RAT cell (re)selection.

NOTE 7: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.

While T360 is running, redistribution target is considered to be the highest priority (i.e. higher than any of the network configured values). UE shall continue to consider the serving frequency as the highest priority until completion of E-UTRAN Inter-frequency Redistribution procedure specified in 5.2.4.10 if triggered on T360 expiry/ stop.

NEXT CHANGE

# 11 Sidelink operation

## 11.1 Sidelink communication and V2X sidelink communication and NR sidelink communication

The UE may transmit or receive sidelink communication if it fulfils the condition(s) defined in TS 36.331 [3, 5.10.1a]. The UE may transmit or receive V2X sidelink communication if it fulfils the condition(s) defined in TS 36.331 [3, 5.10.1d]. When UE is in-coverage for sidelink operation as defined in clause 11.4, the UE may perform the sidelink communication according to *SystemInformationBlockType18* or perform the V2X sidelink communication according to *SystemInformationBlockType21* or *SystemInformationBlockType26,* and when out-of-coverage for sidelink, the UE may perform the sidelink communication according to *SL-Preconfiguration* or perform V2X sidelink communication according to *SL-V2X-Preconfiguration* or according to *SystemInformationBlockType21* or *SystemInformationBlockType26* of the cell on the frequency which provides inter-carrier V2X sidelink configuration, as specified in TS 36.331 [3]. The UE shall not perform V2X sidelink communication according to *SL-V2X-Preconfiguration* if the UE detects a cell providing V2X sidelink configuration or inter-carrier V2X sidelink configuration for the frequency UE is interested to perform V2X sidelink communication on.

The UE may transmit or receive NR sidelink communication if it fulfills the condition(s) defined in TS 38.331[37,5.X.2]. When UE is in-coverage for sidelink operation as defined in clause 11.4, the UE may perform NR sidelink communication according to *SystemInformationBlockType Xx2* of the cell on an E-UTRAN frequency.

## 11.2 Sidelink discovery

The UE may transmit sidelink discovery if it fulfils the condition(s) defined in TS 36.331 [3, 5.10.1b and 5.10.1c]. When UE is in-coverage for sidelink as defined in clause 11.4, the UE may perform the sidelink discovery according to *SystemInformationBlockType19*, and when out-of-coverage for sidelink as defined in clause 11.4, the UE may perform the sidelink discovery according to *SL-Preconfiguration*, as specified in TS 36.331 [3].

NOTE: Sidelink discovery reception in idle mode is up to UE implementation.

## 11.3 Sidelink synchronisation

The UE may perform sidelink synchronisation according to *SystemInformationBlockType18* for sidelink communication, *SystemInformationBlockType19* for sidelink discovery or *SystemInformationBlockType21* for V2X sidelink communication, as specified in TS 36.331 [3].

## 11.4 Cell selection and reselection for sidelink

The requirements defined in this section for sidelink operation apply for UEs in RRC\_IDLE and in RRC\_CONNECTED.

When UE is interested to perform sidelink communication or sidelink discovery announcement on non-serving frequency, it shall perform measurements on that frequency for cell selection and intra-frequency reselection purpose in accordance with TS 36.133 [10]. When UE is interested to perform V2X sidelink communication on non-serving frequency, it may perform measurements on that frequency or the frequencies which can provide inter-carrier V2X sidelink configuration for that frequency for cell selection and intra-frequency reselection purpose in accordance with TS 36.133 [10].

If the UE detects at least one cell on the frequency which UE is configured to perform sidelink operation on fulfilling the S criterion in accordance with clause 11.4.1, it shall consider itself to be in-coverage for sidelink operation on that frequency. If the UE cannot detect any cell on that frequency meeting the S criterion, it shall consider itself to be out-of-coverage for sidelink operation on that frequency.

If the UE detects at least one cell on the frequency which UE is configured to perform NR sidelink communication on fulfilling the S criterion in accordance with clause 11.4.1, it shall consider itself to be in-coverage for NR sidelink communication on that frequency. If the UE cannot detect any cell on that frequency meeting the S criterion, it shall consider itself to be out-of-coverage for NR sidelink communication on that frequency.

If the UE has selected a cell on a non-serving frequency for sidelink communication or V2X sidelink communication or NR sidelink communication or sidelink discovery announcement, it shall perform additional intra-frequency reselection process to select a better cell for sidelink operation on that frequency in accordance with clause 11.4.1.

NOTE 1: The UE may consider the carrier pre-configured for sidelink communication or V2X sidelink communication, or the frequencies pre-configured for providing inter-carrier V2X sidelink configuration to have the highest cell reselection priority in accordance with clause 5.2.4.1.

NOTE 2: If the frequency the UE is configured to perform sidelink communication on is a serving frequency, the UE uses the serving cell on that frequency for the sidelink operation.

### 11.4.1 Parameters used for cell selection and reselection triggered for sidelink

When evaluating S criterion or R criterion (ranking), as defined in clause 5.2.3.2 and clause 5.2.4.6 respectively, for cell selection/reselection triggered for sidelink communication or V2X sidelink communication or sidelink discovery announcement or NR sidelink communication on a non-serving frequency, UE shall perform the evaluation as follows:

- if the UE intends to perform sidelink discovery announcement and it is configured with *discCellSelectionInfo* applicable for that frequency as specified in TS 36.331 [3], the UE shall use cell selection/reselection parameters included in the *discCellSelectionInfo* for the evaluation, and for a parameter used in the evaluation but not included in the *discCellSelectionInfo* applicable for thatfrequency, UE shall apply zero value.

- else, the UE shall use cell selection/reselection parameters broadcast by the concerned cell (i.e. selected cell for the sidelink operation) for the evaluation.

END OF THE CHANGE