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**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
Non-Access-Stratum (NAS)
functions related to Mobile Station (MS) in idle mode
(3GPP TS 23.122 version 16.12.0 Release 16)**

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Contents

Foreword

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

The present document specifies functions related to Mobile Station (MS) in idle mode and within the 3GPP system.

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.

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1 Scope

The present document gives an overview of the tasks undertaken by the Core network protocols of a Mobile Station (MS) when in idle mode, that is, switched on but typically not having a dedicated channel allocated. It also describes the corresponding network functions. The idle mode functions are also performed by a GPRS MS as long as no dedicated channel is allocated to the MS. The conditions when the idle mode functions are performed by an MS in the UTRA RRC connected mode states are specified in 3GPP TS 25.331 [33]. The conditions when the idle mode functions are performed by an MS in the E-UTRAN are specified in 3GPP TS 36.304 [43]. The conditions when the idle mode functions are performed by an MS in the NG-RAN are specified in 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61]. The conditions when the idle mode functions are performed by an MS in the NG-RAN RRC inactive state are specified in 3GPP TS 36.331 [42] and 3GPP TS 38.331 [65].

The present document defines the PLMN selection for a multi mode MS that supports both 3GPP and 3GPP2 systems. The common PLMN selection logic covers also PLMNs that are available in 3GPP2 system, but the present document makes no changes on the cdma2000® signalling towards networks that are available via 3GPP2 system.

The present document gives procedures for using the CSG cells, whenever such use is permitted.

The present document gives procedures for using the CAG cells, when the MS supports CAG.

The present document specifies the SNPN selection.

This 3GPP TS outlines how the requirements of the 22 series Technical Specifications (especially 3GPP TS 22.011 [9]) on idle mode operation shall be implemented. Further details are given in 3GPP TS 24.008 [23].

Clause 2 of this 3GPP TS gives a general description of the idle mode process. Clause 3 outlines the main requirements and technical solutions of those requirements. Clause 4 describes the processes used in idle mode. There is inevitably some overlap between these clauses.

NOTE: cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

The present document describes the procedures for control plane solution of steering of roaming in 5GS in annex C.

Annex C is applicable to the MS, the AMF, the UDM and the SOR-AF in the 5GS.

The present document does not consider GERAN Iu mode.

1.1 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] Void.

[2] Void.

[3] Void.

[4] Void.

[5] Void.

[6] Void.

[7] Void

[8] Void.

[9] 3GPP TS 22.011: "Service accessibility".

[10] Void.

[11] Void.

[12] Void.

[13] Void.

[14] Void.

[15] Void.

[16] Void.

[17] Void.

[18] Void.

[19] Void.

[20] Void.

[21] Void.

[22] Void.

[22A] 3GPP TS 23.003: "Numbering, addressing and identification".

[23] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification, Core Network Protocols - Stage 3".

[23A] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[24] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[25] 3GPP TS 45.008: "Radio subsystem link control".

[26] Void.

[27] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[27A] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[28] Void.

[29] Void.

[30] Void.

[31] Void.

[32] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[33] 3GPP TS 25.331: "RRC Protocol Specification".

[34] 3GPP TS 44.018:"Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[35] 3GPP TS 43.022: "Functions related to Mobile Station (MS) in idle mode and group receive mode".

[35A] 3GPP TS 43.318: "Generic Access Network (GAN); Stage 2".

[35B] 3GPP TS 44.318: "Generic Access Network (GAN); Mobile GAN interface layer 3 specification; Stage 3".

[36] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[37] Void.

[38] 3GPP TS 21.111: "USIM and IC card requirements".

[39] 3GPP TS 44.060: "General Packet Radio Service (GPRS);Mobile Station (MS) - Base Station System (BSS) interface;Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[40] 3GPP TS 31.102: "Characteristics of the USIM Application".

[41] 3GPP TS 31.111: "Universal Subscriber Identity Module (USIM), Application Toolkit (USAT)".

[42] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol specification".

[43] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".

[44] 3GPP2 C.S0016-D v1.0: "Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Standards".

[45] 3GPP2 C.S0011-C v2.0: "Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations".

[46] 3GPP2 C.S0033-A v2.0: "Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal".

[47] 3GPP TS 24.285: "Allowed Closed Subscriber Group (CSG) List Management Object (MO)".

[48] Void.

[49] 3GPP TS 22.220: "Service requirements for Home Node B (HNB) and Home eNode B (HeNB)".

[50] 3GPP TS 24.368: "Non-Access Stratum (NAS) configuration Management Object (MO)".

[51] 3GPP TS 24.334: "Proximity-services (ProSe) User Equipment (UE) to Proximity-services (ProSe) Function Protocol aspects; Stage 3".

[52] 3GPP TS 24.333: "Proximity-services (ProSe) Management Objects (MO)".

[53] 3GPP TS 24.105: "Application specific Congestion control for Data Communication (ACDC) Management Object (MO)".

[54] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities".

[55] 3GPP TS 43.064: "Overall description of the GPRS Radio Interface; Stage 2".

[56] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description".

[57] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[58] 3GPP TS 23.401: "GPRS enhancements for E-UTRAN access".

[59] 3GPP TS 24.386: "User Equipment (UE) to V2X control function; protocol aspects; Stage 3".

[60] 3GPP TS 24.385: "V2X services Management Object (MO)".

[61] 3GPP TS 38.304: "New Generation Radio Access Network; User Equipment (UE) procedures in Idle mode".

[62] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[63] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[64] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[65] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[66] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[67] 3GPP TS 31.115: "Secured packet structure for (Universal) Subscriber Identity Module (U)SIM Toolkit applications".

[68] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and Functional Description".

[69] 3GPP TS 23.221: "Architectural requirements".

[70] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS)".

[71] 3GPP TS 29.544: "5G System (5GS); Secured Packet Application Function (SP-AF) services; Stage 3".

[72] 3GPP TS 29.571: "5G System (5GS); Common Data Types for Service Based Interfaces; Stage 3".

[73] ETSI TS 102 225: "Smart Cards; Secured packet structure for UICC based applications".

[74] Void

[75] 3GPP TS 24.587: "Vehicle-to-Everything (V2X) services in 5G System (5GS); Stage 3".

[76] Void

[77] Void

[78] Void

[79] 3GPP TS 24.588: "Vehicle-to-Everything (V2X) services in 5G System (5GS); User Equipment (UE) policies; Stage 3".

1.2 Definitions and abbreviations

For the purposes of the present document, the abbreviations defined in 3GPP TR 21.905 [36] apply.

(A/Gb mode only): Indicates this clause applies only to a GSM system which operates in A/Gb mode. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS. For multi system case this is determined by the current serving radio access network.

NOTE 1: In accordance with the description of packet services in Iu mode in 3GPPS TS 24.008 [23], the terms 'CS/PS mode of operation' and 'PS mode of operation' are not used in the present document. Instead the terms 'MS operation mode A' and 'MS operation mode C' are used.

(S1 mode only): Indicates this clause applies only to an EPS. For multi system case this is determined by the current serving radio access network.

Acceptable Cell: This is a cell that the MS may camp on to make emergency calls or to access RLOS. It must satisfy criteria which are defined for A/Gb mode in 3GPP TS 43.022 [35], for Iu mode in 3GPP TS 25.304 [32], for S1 mode in 3GPP TS 36.304 [43], and for NR access in N1 mode in 3GPP TS 38.304 [61] and for E-UTRA access in N1 mode in 3GPP TS 36.304 [43]. For an MS in eCall only mode, an acceptable cell must further satisfy the criteria defined in clause 4.4.3.1.1.

Access Technology: The access technology associated with a PLMN or SNPN. The MS uses this information to determine what type(s) of radio carrier to search for when attempting to select a specific PLMN or SNPN (e.g., GSM, UTRAN, GSM COMPACT, E-UTRAN or NG-RAN). A PLMN may support more than one access technology. SNPNs only support NG-RAN.

NOTE 2: Access technology "E-UTRAN" maps to core network type "EPC" and access technology "NG-RAN" maps to core network type "5GCN", see 3GPP TS 24.501 [64].

ACDC: Application specific Congestion control for Data Communication, see 3GPP TS 22.011 [9].

Allowable PLMN: In the case of an MS operating in MS operation mode A or B, this is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of an MS operating in MS operation mode C or an MS not supporting A/Gb mode and not supporting Iu mode, this is a PLMN which is not in the list of "forbidden PLMNs" and not in the list of "forbidden PLMNs for GPRS service" in the MS.

Allowable SNPN: In the case of an MS operating in SNPN access mode, this is an SNPN which is not in the list of "permanently forbidden SNPNs" and is not in the list of "temporarily forbidden SNPNs".

Allowable PLMN/access technology combination: For an MS operating in MS operation mode C or an MS not supporting A/Gb mode and not supporting Iu mode, this is an allowable PLMN in any specific access technology. For an MS operating in MS operation mode A or B, this is a PLMN/access technology combination where:

- the PLMN is an allowable PLMN and the specific access technology is supporting non-GPRS services; or
- the PLMN is not in the list of "forbidden PLMNs" and not in the list of "forbidden PLMNs for GPRS service" in the MS and the specific access technology is only supporting GPRS services.

EXAMPLE: E-UTRAN and NG-RAN are access technologies that are only supporting GPRS services.

Available PLMN: For GERAN A/Gb mode see 3GPP TS 43.022 [35]. For UTRAN see 3GPP TS 25.304 [32]. For E-UTRAN see 3GPP TS 36.304 [43]. For NG-RAN see 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61]. For cdma2000® 1xRTT and cdma2000® HRPD see 3GPP2 C.S0016 [44].

Available SNPN: For NG-RAN see 3GPP TS 38.304 [61].

Available PLMN/access technology combination: This is an available PLMN in a specific access technology.

Camped on a cell: The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN or the SNPN may not be aware of the existence of the MS (ME) within the chosen cell.

Country: A country is identified by a single MCC value, with the exception that MCC values 310 through 316 identify a single country (USA), MCC values 404 through 406 identify a single country (India), and MCC values 440 and 441 identify a single country (Japan).

CSG whitelist: See 3GPP TS 36.304 [43].

Current serving cell: This is the cell on which the MS is camped.

CTS MS: An MS capable of CTS services is a CTS MS.

EAB: Extended Access Barring, see 3GPP TS 22.011 [9].

Extended Coverage in GSM for Internet of Things (EC-GSM-IoT): Extended coverage in GSM for IoT is a feature which enables extended coverage operation. See 3GPP TS 43.064 [55].

EHPLMN: Any of the PLMN entries contained in the Equivalent HPLMN list.

Equivalent HPLMN list: To allow provision for multiple HPLMN codes, PLMN codes that are present within this list shall replace the HPLMN code derived from the IMSI for PLMN selection purposes. This list is stored on the USIM and is known as the EHPLMN list. The EHPLMN list may also contain the HPLMN code derived from the IMSI. If the HPLMN code derived from the IMSI is not present in the EHPLMN list then it shall be treated as a Visited PLMN for PLMN selection purposes.

Generic Access Network (GAN): See 3GPP TS 43.318 [35A].

GAN mode: See 3GPP TS 43.318 [35A].

GPRS MS: An MS capable of GPRS services is a GPRS MS.

MS operation mode: See 3GPP TS 23.060 [27].

High quality signal: The high quality signal limit is used in the PLMN selection procedure. It is defined in the appropriate AS specification: 3GPP TS 43.022 [35] for the GSM radio access technology, 3GPP TS 25.304 [32] for the UMTS radio access technology (FDD or TDD mode), 3GPP TS 36.304 [43] for the E-UTRAN radio access technology (WB-S1 mode, NB-S1 mode, WB-N1 mode or NB-N1 mode), 3GPP TS 36.304 [43] and and 3GPP TS 38.304 [61] for the NG-RAN radio access technology. For 3GPP2 access technologies the high quality signal limit is defined in 3GPP2 C.S0011 [45] for cdma2000® 1xRTT and in 3GPP2 C.S0033 [46] for cdma2000® HRPD. A mobile station attempting to find a cell that supports EC-GSM-IoT (see 3GPP TS 43.064 [55]) does not use high quality signal limit in the PLMN selection procedure, i.e. for the purpose of PLMN selection, when attempting to find a cell that supports EC-GSM-IoT, any found cell supporting EC-GSM-IoT is considered to be received with high quality signal. A UE attempting to find a cell that supports enhanced coverage when operating in any WB-S1 or WB-N1 enhanced coverage mode does not use high quality signal limit in the PLMN selection procedure, i.e. for the purpose of PLMN selection, when attempting to find a cell that supports enhanced coverage, any found cell supporting enhanced coverage and satisfying the coverage specific quality signal limit defined for CE mode (see 3GPP TS 36.304 [43]) is considered to be received with high quality signal.

Home PLMN: This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

In A/Gb mode,...: Indicates this clause applies only to a GSM system which operates in A/Gb mode. For multi system case this is determined by the current serving radio access network.

In Iu mode,...: Indicates this clause applies only to UMTS. For multi system case this is determined by the current serving radio access network.

In N1 mode,...: Indicates this clause applies only to an 5GS. For multi system case this is determined by the current serving radio access network.

In NB-N1 mode: Indicates this paragraph applies only to a system which operates in NB-N1 mode. For a multi-access system this case applies if the current serving radio access network provides access to 5G network services via E-UTRA connected to 5GCN by NB-IoT (see 3GPP TS 36.300 [56], 3GPP TS 36.331 [22], 3GPP TS 36.306 [54]).

In WB-N1 mode: Indicates this paragraph applies only to a system which operates in WB-N1 mode. For a multi-access system this case applies if the system operates in N1 mode with E-UTRA connected to 5GCN, but not in NB-N1 mode.

In S1 mode,...: Indicates this clause applies only to an EPS. The S1 mode includes WB-S1 mode and NB-S1 mode. For multi system case this is determined by the current serving radio access network.

In NB-S1 mode: Indicates this paragraph applies only to a system which operates in NB-S1 mode. For a multi-access system this case applies if the current serving radio access network provides access to network services via E-UTRA by NB-IoT (see 3GPP TS 36.300 [56], 3GPP TS 36.331 [22], 3GPP TS 36.306 [54]).

In WB-S1 mode: Indicates this paragraph applies only to a system which operates in WB-S1 mode. For a multi-access system this case applies if the system operates in S1 mode, but not in NB-S1 mode.

Limited Service State: See clause 3.5.

Localised Service Area (LSA): A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

Location Registration (LR): An MS which is IMSI attached to non-GPRS services only performs location registration by the Location Updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the Routing Area Update procedure only when in a network of network operation mode I. Both location updating and routing area update procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II (see 3GPP TS 23.060 [27]). An MS which is attached via the E-UTRAN performs location registration by the tracking area update procedure. An MS which is registered via the NG-RAN performs location registration by the mobility registration update procedure.

MS: Mobile Station. The present document makes no distinction between MS and UE.

N1 mode capability: Capability of the UE associated with an N1 NAS signalling connection between the UE and network. The present document refers to the N1 mode capability over 3GPP access only (see 3GPP TS 24.501 [64]).

NarrowBand Internet of Things (NB-IoT): NB-IoT is a non-backward compatible variant of E-UTRAN supporting a reduced set of functionality. NB-IoT allows access to EPC or 5GCN network services via E-UTRA with a channel bandwidth limited to 180 kHz (see 3GPP TS 36.300 [20], 3GPP TS 36.331 [42], 3GPP TS 36.306 [44]).

Network Type: The network type associated with HPLMN or a PLMN on the PLMN selector (see 3GPP TS 31.102 [40]). The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN. A PLMN may support more than one network type.

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1). In a shared network the RPLMN is the PLMN defined by the PLMN identity of the CN operator that has accepted the LR.

Registered SNPN (RSNPN): This is the SNPN on which certain LR outcomes have occurred. In a shared network the RSNPN is the SNPN defined by the SNPN identity of the CN operator that has accepted the LR.

Registration: This is the process of camping on a cell of the PLMN or the SNPN and doing any necessary LRs.

Registration Area: A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure, to routing area for performing the GPRS attach or routing area update procedures, and to a list of tracking areas (TAs) for performing the EPS attach, tracking area update, or 5GS registration procedure.

The PLMN to which a cell belongs (PLMN identity):

- for GERAN, in the system information (MCC + MNC part of LAI) broadcast as specified in 3GPP TS 44.018 [34];
- for UTRA, see the broadcast information as specified in 3GPP TS 25.331 [33];
- for E-UTRA, see the broadcast information as specified in 3GPP TS 36.331 [42]; and
- for NR, see the broadcast information as specified in 3GPP TS 38.331 [65].

The SNPN to which a cell belongs (SNPN identity):

- for NR, see the broadcast information as specified in 3GPP TS 38.331 [65].

In a shared network, a cell belongs to all PLMNs given in the system information broadcasted as specified in 3GPP TS 44.018 [34] for GERAN, in 3GPP TS 25.331 [33] for UTRAN, and in 3GPP TS 36.331 [42] for E-UTRAN, and a cell belongs to all PLMNs, all SNPNs, or all PLMNs and all SNPNs, given in the system information broadcasted as specified in 3GPP TS 36.331 [42] for E-UTRA connected to 5GCN, and in 3GPP TS 38.331 [65] for NR.

Secured packet: In this specification, a secured packet contains the list of preferred PLMN/access technology combinations encapsulated with a security mechanism as described in 3GPP TS 31.115 [67].

Selected PLMN: This is the PLMN that has been selected according to clause 3.1, either manually or automatically.

Selected SNPN: This is the SNPN that has been selected according to clause 3.9, either manually or automatically.

Shared Network: An MS considers a cell to be part of a shared network, when multiple PLMN identities are received as specified in 3GPP TS 44.018 [34] for GERAN, in 3GPP TS 25.331 [33] for UTRAN, and in 3GPP TS 36.331 [42] for E-UTRAN, and when multiple PLMN identities, multiple SNPN identities or one or more PLMN identities and one or more SNPN identities are received as specified in 3GPP TS 36.331 [42] for E-UTRA connected to 5GCN, and in 3GPP TS 38.331 [65] for NR.

SIM: Subscriber Identity Module (see 3GPP TS 21.111 [38]). The present document makes no distinction between SIM and USIM.

SNPN identity: a PLMN ID and an NID combination.

SoLSA exclusive access: Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which are defined for GERAN A/Gb mode in 3GPP TS 43.022 [35], for UTRAN in 3GPP TS 25.304 [32], for E-UTRAN in 3GPP TS 36.304 [43] and for NG-RAN see 3GPP TS 36.304 [43] and 3GPP TS 38.304 [61]. For 3GPP2 access technologies the criteria are defined

in 3GPP2 C.S0011 [45] for cdma2000® 1xRTT and in 3GPP2 C.S0033 [46] for cdma2000® HRPD. For an MS in eCall only mode, a suitable cell must further satisfy the criteria defined in clause 4.4.3.1.1.

Steering of Roaming (SOR): A technique whereby a roaming UE is encouraged to roam to a preferred roamed-to-network indicated by the HPLMN.

Steering of Roaming application function (SOR-AF): An application function that can provide UDM with one of the following:

a) list of preferred PLMN/access technology combinations;

b) a secured packet; or

c) neither of them,

generated dynamically based on operator specific data analytics solutions.

Steering of Roaming information: This consists of the following HPLMN protected information (see 3GPP TS 33.501 [66]):

a) an indication of whether the UDM requests an acknowledgement from the UE for successful reception of the steering of roaming information; and

b) one of the following:

1) list of preferred PLMN/access technology combinations with an indication that it is included;

2) a secured packet with an indication that it is included; or

3) the HPLMN indication that 'no change of the "Operator Controlled PLMN Selector with Access Technology" list stored in the UE is needed and thus no list of preferred PLMN/access technology combinations is provided'.

Visited PLMN: This is a PLMN different from the HPLMN (if the EHPLMN list is not present or is empty) or different from an EHPLMN (if the EHPLMN list is present).

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.167 [57] apply:

eCall over IMS
EPC
E-UTRAN

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.401 [58] apply:

eCall only mode

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.221 [69] apply:

Restricted local operator services (RLOS)

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.501 [62] apply:

Closed Access Group (CAG)
Network identifier (NID)
NG-RAN
Stand-alone Non-Public Network (SNPN)
SNPN access mode

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.501 [64] apply:

5GCN
Emergency PDU session
Initial registration for emergency services
Registered for emergency services

2 General description of idle mode

When an MS is switched on, it attempts to make contact with a public land mobile network (PLMN) or stand-alone non-public network (SNPN). The particular PLMN or SNPN to be contacted may be selected either automatically or manually.

The MS looks for a suitable cell of the chosen PLMN or SNPN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as "camping on the cell". The MS will then register its presence in the registration area of the chosen cell if necessary, by means of a location registration (LR), GPRS attach, IMSI attach or registration procedure.

If the MS loses coverage of a cell, or find a more suitable cell, it reselects onto the most suitable cell of the selected PLMN or SNPN and camps on that cell. If the new cell is in a different registration area, an LR request is performed.

If the MS loses coverage of a PLMN or SNPN, either a new PLMN or SNPN is selected automatically, or an indication of which PLMNs or SNPNs are available is given to the user, so that a manual selection can be made.

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

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

a) It enables the MS to receive system information from the PLMN or SNPN.

b) If the MS wishes to initiate a call, 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 or SNPN receives a call for the MS, it knows (in most cases) the registration area of the cell in which the MS is camped. It can then send a "paging" message for the MS on control channels of all the cells in the registration area. The MS will then receive the paging message because it is tuned to the control channel of a cell in that registration area, and the MS can respond on that control channel.

d) It enables the MS to receive cell broadcast messages.

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or there is no valid entry in "list of subscriber data" in case the MS is operating in SNPN access mode, or if it receives certain responses to an LR request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity or the SNPN identity, and enters a "limited service" state in which it can only attempt to make emergency calls or to access RLOS. An MS operating in NB-S1 mode, never attempts to make emergency calls or to access RLOS. An MS operating in SNPN access mode never attempts to make emergency calls. An MS operating in N1 mode never attempts to access RLOS.

If the MS is in eCall only mode, it attempts to camp on a suitable cell and enters an "eCall inactive" state in which it can only attempt an eCall over IMS, or a call to a non-emergency MSISDN or URI for test or terminal reconfiguration services as specified in 3GPP TS 31.102 [40].

If the MS is in eCall only mode and is unable to find a suitable cell to camp on, it attempts to camp on an acceptable cell in limited service state, and enters an "eCall inactive" state in which it can only attempt an eCall over IMS.

While in eCall inactive state, the MS does not perform LR with the PLMN of the cell on which the MS is camped.

In A/Gb mode, if the CTS MS is in CTS mode only or in automatic mode with CTS preferred, it will start by attempting to find a CTS fixed part on which it is enrolled.

The idle mode tasks can be subdivided into the following processes:

- PLMN selection;
- SNPN selection (N1 mode only);
- CSG selection (Iu mode and S1 mode only);
- Cell selection and reselection;
- Location registration;
- CTS fixed part selection (A/Gb mode only); and