**3GPP TSG-CT WG1 Meeting #135-eC1-22aabb**

**E-Meeting, 6th – 12th April 2022 was C1-222656**

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|  |  | **CR** | **0914** | **rev** | **1** | **Current version:** | **17.6.0** |  |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | PLMN selection for satellite E-UTRAN access | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MediaTek Inc. | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IOT\_SAT\_ARCH\_EPS | | | | |  | ***Date:*** | | | 2022-04-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | PLMN selection aspects for satellite NB- and WB-EUTRAN IoT devices to be specified aligning with PLMN selection principles approved for satellite NG-RAN devices. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Specifying PLMN selection aspects for satellite NB- and WB-EUTRAN IoT devices. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Satellite E-UTRAN specific PLMN selection aspects not specified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1.2, 3.1, 4.4.3.1.1, 4.4.3.3.1, 4.5.2, 5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**\*\*\*\*\*\*\***

\* \* \* First Change \* \* \* \*

## 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, NG-RAN, satellite NG-RAN or satellite E-UTRAN). 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" which is, if the MS supports access to an SNPN using credentials from a credentials holder, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, and is not in the list of "temporarily forbidden SNPNs" which is, if the MS supports access to an SNPN using credentials from a credentials holder, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription.

**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, satellite E-UTRAN, satellite NG-RAN (see 3GPP TS 22.261 [74]) 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].

Editor's note: conditions that make a PLMN available when a UE is accessing NR via satellite access, are FFS.

**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 defined in ITU-T recommendation E.212 [76], with the exception of the following MCC ranges that identify a single country:

- values 310 through 316 (USA);

- values 404 through 406 (India);

- values 440 through 441 (Japan);

- values 460 through 461 (China); and

- values 234 through 235 (United Kingdom).

**Permitted CSG list:** 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 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 [42], 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.

**MINT: Minimization of service interruption (see 3GPP TS 22.261 [71]).**

**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.

**Onboarding services in SNPN**: Onboarding services in SNPN allow an MS to access an SNPN indicating that onboarding is allowed, using default UE credentials in order for the MS to be configured with one or more entries of the "list of subscriber data".

NOTE 3: When the MS is registered for onboarding services in SNPN, services other than the onboarding services in SNPN are not available. When the MS is not registered for onboarding services in SNPN, onboarding services in SNPN are not available.

**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 one or both of the following:

- list of preferred PLMN/access technology combinations,

- SOR-CMCI,

encapsulated with a security mechanism as described in 3GPP TS 31.115 [67].

Editor's note (WI eNPN, CR#0790): Whether the secured packet can contain SOR-SNPN-SI is FFS.

**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 MCC:** MCC assigned by ITU-T as shared MCC according to ITU-T E.212 [76], except within this specification for PLMN selection purposes the MCC of value 999 is not considered a shared MCC.

**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.

**Subscribed SNPN:** An SNPN for which the UE has a 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) one or more of the following:

- list of preferred PLMN/access technology combinations;

- SOR-CMCI, together with the "Store SOR-CMCI in ME" indicator if applicable;

- SOR-SNPN-SI;

b) a secured packet, together with the indicator, if applicable, that "the list of preferred PLMN/access technology combinations is not included in the secured packet"; or

c) neither of a) or b),

generated dynamically based on operator specific data analytics solutions.

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

a) the following indicators, of whether:

- the UDM requests an acknowledgement from the UE for successful reception of the steering of roaming information.

- the UDM requests the UE to store the SOR-CMCI in the ME, which is provided along with the SOR-CMCI in plain text; and

b) one of the following:

1) one or more of the following:

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

- SOR-CMCI; or

- SOR-SNPN-SI;

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

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'; or

4) the subscribed SNPN or HPLMN indication that 'no change of the SOR-SNPN-SI stored in the UE is needed and thus no SOR-SNPN-SI is provided', and SOR-CMCI, if any.

**Steering of roaming connected mode control information (SOR-CMCI):** HPLMN information to control the timing for a UE in connected mode to move to idle mode in order to perform steering of roaming.

**Steering of roaming SNPN selection information (SOR-SNPN-SI):** Provisioning information for SNPN selection consisting of:

a) the credentials holder controlled prioritized list of preferred SNPNs;

b) the credentials holder controlled prioritized list of GINs; or

c) both of the above.

**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)**

**Credentials holder**

**Default UE credentials**

**Group ID for Network Selection (GIN)**

**Network identifier (NID)**

**NG-RAN**

**NR RedCap**

**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**

**CAG cell**

**Emergency PDU session**

**Initial registration for emergency services**

**Initial registration for onboarding services in SNPN**

**Non-CAG cell**

**Registered for emergency services**

**Registered for onboarding services in SNPN**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.261 [74] apply:

**Disaster condition**

**Disaster roaming**

\* \* \* Next Change \* \* \* \*

## 3.1 PLMN selection and roaming

The MS normally operates on its home PLMN (HPLMN) or equivalent home PLMN (EHPLMN). However, a visited PLMN (VPLMN) may be selected, e.g., if the MS loses coverage. There are two modes for PLMN selection:

i) Automatic mode ‑ This mode utilizes a list of PLMN/access technology combinations in priority order. The highest priority PLMN/access technology combination which is available and allowable is selected.

ii) Manual mode ‑ Here the MS indicates to the user which PLMNs are available. Only when the user makes a manual selection does the MS try to obtain normal service on the VPLMN.

To prevent repeated attempts to have roaming service on a not allowed area (i.e. LA or TA), when the MS is informed that an area is forbidden, the LA or TA is added to a list of "forbidden location areas for roaming" or "forbidden tracking areas for roaming" respectively which is stored in the MS. These lists, if existing, are deleted when the MS is switched off or when the SIM is removed, and periodically (with period in the range 12 to 24 hours). LA area restrictions are always valid for complete location areas independent of possible subdivision into GPRS routing areas. The structure of the routing area identifier (see 3GPP TS 23.003 [22A]) supports area restriction on LA basis.

To prevent repeated attempts to obtain service on a PLMN through satellite NG-RAN access technology, when the MS receives an integrity protected reject message with cause value #78 "PLMNs not allowed to operate at the present UE location" from a satellite NG-RAN cell, the MS maintains a list of "PLMNs not allowed to operate at the present UE location" in which it stores the PLMN ID of the rejecting PLMN, the current geographical location and a timer. An entry in the list is deleted if the timer associated to the entry expires or the UE successfully registers to the PLMN stored in the entry, for details see 3GPP TS 24.501 [64].

In automatic PLMN selection mode, if the MS detects a PLMN in satellite NG-RAN access technology which is part of the list of "PLMNs not allowed to operate at the present UE location" the MS shall consider the PLMN as PLMN selection candidate for satellite NG-RAN access technology only if:

a) the current MS location is known, a geographical location is stored for the entry of this PLMN, and the distance to the current UE location is larger than a UE implementation specific value; or

b) the timer associated with the entry of this PLMN has expired.

This does not prevent selection of such a PLMN if it is available in another RAT.

To prevent repeated attempts to obtain service on a PLMN through satellite E-UTRAN access technology, when the MS receives an integrity protected reject message with cause value #78 "PLMNs not allowed to operate at the present UE location" from a satellite E-UTRAN cell, the MS maintains a list of "PLMNs not allowed to operate at the present UE location" in which it stores the PLMN ID of the rejecting PLMN, the current geographical location and a timer. An entry in the list is deleted if the timer associated to the entry expires or the UE successfully registers to the PLMN stored in the entry, for details see 3GPP TS 24.301 [64].

In automatic PLMN selection mode, if the MS detects a PLMN in satellite E-UTRAN access technology which is part of the list of "PLMNs not allowed to operate at the present UE location" the MS shall consider the PLMN as PLMN selection candidate for satellite E-UTRAN access technology only if:

a) the current MS location is known, a geographical location is stored for the entry of this PLMN, and the distance to the current UE location is larger than a UE implementation specific value; or

b) the timer associated with the entry of this PLMN has expired.

This does not prevent selection of such a PLMN if it is available in another RAT.

If a message with cause value #15 (see 3GPP TS 24.008 [23], 3GPP TS 24.301 [23A] and 3GPP TS 24.501 [64]) is received by an MS, then the MS shall take the following actions depending on the access technology in which the message was received:

GSM, GSM COMPACT or UTRAN:

The location area is added to the list of "forbidden location areas for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to an LA or TA which is not in the "forbidden location areas for roaming" or "forbidden tracking areas for roaming" list respectively.

E-UTRAN:

The tracking area is added to the list of "forbidden tracking areas for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to a TA or LA which is not in the "forbidden tracking areas for roaming" or "forbidden location areas for roaming" list respectively

NG-RAN:

The tracking area is added to the list of "5GS forbidden tracking areas for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to a tracking area which is not in the "5GS forbidden tracking areas for roaming" list.

A VPLMN is added to a list of "forbidden PLMNs" in the SIM and thereafter that VPLMN will not be accessed except for disaster roaming services, by the MS when in automatic mode if a message with cause value "PLMN not allowed" or "Requested service option not authorized in this PLMN" or "Serving network not authorized" is received by an MS in response to an LR request from that VPLMN and:

- the MS is configured to use timer T3245 as defined in 3GPP TS 24.008 [23], 3GPP TS 24.301 [23A], and 3GPP TS 24.501 [64];

- the MS is not configured to use timer T3245 and the message is integrity-protected;

- the MS is not configured to use timer T3245, the message is not integrity-protected and the MS does not maintain a list of PLMN-specific attempt counters; or

- the MS is not configured to use timer T3245, the message is not integrity-protected, the MS maintains a list of PLMN-specific attempt counters and the value of the PLMN-specific attempt counter for that VPLMN is equal to the MS implementation specific maximum value as defined in 3GPP TS 24.008 [23], 3GPP TS 24.301 [23A] and 3GPP TS 24.501 [64].

If:

- after a subsequent manual selection of that PLMN, there is a successful LR not for disaster roaming, then the PLMN is removed from the "forbidden PLMNs" list;

- the MS is configured to use timer T3245 and the timer T3245 expires, then the PLMN is removed from the "forbidden PLMNs" list ; or

- the MS is not configured to use timer T3245 and:

1) the MS maintains a list of PLMN-specific attempt counters, the value of the PLMN-specific attempt counter for that PLMN is greater than zero and less than the MS implementation specific maximum value, and timer T3247 expires, then the PLMN is removed from the "forbidden PLMNs" list stored in memory as defined in 3GPP TS 24.301 [23A] and 3GPP TS 24.501 [64]; or

2) the MS does not maintain a list of PLMN-specific attempt counters, the PLMN is stored in the "forbidden PLMNs" list in the SIM, and the timer T3247 expires, then the PLMN is removed from the "forbidden PLMNs" list in the SIM as defined in 3GPP TS 24.301 [23A].

This list is retained when the MS is switched off or the SIM is removed. The HPLMN (if the EHPLMN list is not present or is empty) or an EHPLMN (if the EHPLMN list is present) shall not be stored on the list of "forbidden PLMNs".

In A/Gb mode, an ME not supporting SoLSA may consider a cell with the escape PLMN code (see 3GPP TS 23.073) to be a part of a PLMN belonging to the list of "forbidden PLMNs".

Optionally the ME may store in its memory an extension of the "forbidden PLMNs" list. The contents of the extension of the list shall be deleted when the MS is switched off or the SIM is removed.

A VPLMN may be stored in the extension of the "forbidden PLMNs" list if a message with cause value "PLMN not allowed" or "Requested service option not authorized in this PLMN" or "Serving network not authorized" is received by an MS in response to an LR request from that VPLMN, and the following is valid:

- the MS is not configured to use timer T3245, the message is not integrity-protected, the MS maintains a list of PLMN-specific attempt counters and the value of the PLMN-specific attempt counter for that VPLMN is less than an MS implementation specific maximum value as defined in 3GPP TS 24.008 [23], 3GPP TS 24.301 [23A] and 3GPP TS 24.501 [64].

If a message with cause value "GPRS services not allowed in this PLMN" or "EPS services not allowed in this PLMN" is received by an MS in response to an GPRS attach, routing area update, EPS attach or tracking area update request or received in a network initiated GPRS detach or EPS detach request (see 3GPP TS 24.008 [23] and 3GPP TS 24.301 [23A]) from a VPLMN, that VPLMN is added to a list of "forbidden PLMNs for GPRS service" which is stored in the MS and thereafter that VPLMN will not be accessed by the MS for GPRS service except for disaster roaming services, when in automatic mode. This list is deleted when the MS is switched off or when the SIM is removed. A PLMN is removed from the list of "forbidden PLMNs for GPRS service" if:

- after a subsequent manual selection of that PLMN, there is a successful GPRS attach, Routing Area Update, EPS attach or Tracking Area Update;

- the MS is configured to use timer T3245 and timer T3245 expires; or

- the MS is not configured to use timer T3245, the MS maintains a list of PLMN-specific PS-attempt counters as specified in 3GPP TS 24.008 [23] and 3GPP TS 24.301 [23A], the value of the PLMN-specific PS-attempt counter for that PLMN has a value greater than zero and less than the MS implementation-specific maximum value as defined in clause 5.3.7b in 3GPP TS 24.301 [23A], and T3247 expires.

The maximum number of possible entries in this list is implementation dependant, but must be at least one entry. The HPLMN (if the EHPLMN list is not present or is empty) or an EHPLMN (if the EHPLMN list is present) shall not be stored on the list of "forbidden PLMNs for GPRS service".

An MS that is attaching for emergency bearer services or for access to RLOS, or is attached for emergency bearer services or for access to RLOS, may access PLMNs in the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service". The MS shall not remove any entry from the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service" as a result of such accesses.

An MS that is registered for disaster roaming services, may access PLMNs in the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service" following the criteria as specified in clause 4.4.3.1.1 and shall not remove any entry from the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service" as a result of such accesses.

A UE capable of S101 mode maintains a list "forbidden PLMNs for attach in S101 mode"; the properties and handling in NAS signalling is defined in clause 5.3.3 of 3GPP TS 24.301 [23A].

If the MS is in GAN mode and a "Location not allowed" message is received (see 3GPP TS 44.318 [35B]), then the MS may attempt to select another PLMN so that further GAN registrations may again be attempted. The selection of the PLMN either automatically or manually is implementation dependent.

If an MS that has disabled its E-UTRA capability re-enables it when PLMN selection is performed, then the MS of which usage setting is "voice centric":

- should, for duration of timer TD, memorize the PLMNs where E-UTRA capability was disabled as PLMNs where voice service was not possible in E-UTRAN. The number of PLMNs where voice service was not possible in E-UTRAN that the MS can store is implementation specific, but it shall be at least one. The value of timer TD is MS implementation specific, but shall not exceed the maximum possible value of background scanning timer T as specified in clause 4.4.3.3.1.

- in automatic PLMN selection, shall not consider PLMNs where voice service was not possible in E-UTRAN as PLMN selection candidates for E-UTRA access technology, unless no other PLMN is available. This does not prevent selection of such a PLMN if it is available in another RAT; and

- shall delete stored information on PLMNs where voice service was not possible in E-UTRAN when the MS is switched off, the USIM is removed, timer TD expires or MS voice domain configuration changes so that E-UTRA capability disabling is no longer necessary.

The MS may support "E-UTRA Disabling for EMM cause #15" as specified in 3GPP TS 24.301 [23A]. If the MS supports "E-UTRA Disabling for EMM cause #15" and the "E-UTRA Disabling Allowed for EMM cause #15" parameter as specified in 3GPP TS 24.368 [50] or 3GPP TS 31.102 [40] is present and set to enabled:

- the MS shall maintain a list of "PLMNs with E-UTRAN not allowed";

- when the MS disables its E-UTRA capability on a PLMN due to E-UTRAN not allowed, it shall add the PLMN to the "PLMNs with E-UTRAN not allowed" list, and start timer TE if timer TE is not already running;

- the number of PLMNs that the MS can store in the "PLMNs with E-UTRAN not allowed" list is implementation specific, but it shall be at least one;

- the value of timer TE is MS implementation specific, but it shall not exceed the maximum possible value of background scanning timer T (8 hours or 240 hours for MSs supporting EC-GSM-IoT, Category M1 or Category NB1 as defined in 3GPP TS 36.306 [54])) as specified in clause 4.4.3.3.1;

- in automatic PLMN selection the MS shall not consider PLMNs included in the "PLMNs with E-UTRAN not allowed" list as PLMN selection candidates for E-UTRAN access technology, unless no other PLMN is available. This does not prevent selection of such a PLMN if it is available in another RAT; and

- the MS shall delete stored information in the "PLMNs with E-UTRAN not allowed" list when the MS is switched off, the USIM is removed or timer TE expires.

The MS should maintain a list of PLMNs where the N1 mode capability was disabled because IMS voice was not available and the MS's usage setting was "voice centric" as PLMNs where voice service was not possible in N1 mode. When the MS disables its N1 mode capability because IMS voice was not available and the MS's usage setting was "voice centric":

- the MS should add the identity of the PLMN to the list of PLMNs where voice service was not possible in N1 mode and should start timer TF if timer TF is not already running. The number of PLMNs that the MS can store where voice services is not possible is implementation specific, but it shall be at least one. The value of timer TF is MS implementation specific, but shall not exceed the maximum possible value of background scanning timer T as specified in clause 4.4.3.3.1;

- in automatic PLMN selection the MS shall not consider PLMNs where voice service was not possible in N1 mode as PLMN selection candidates for NG-RAN access technology, unless no other PLMN is available. This does not prevent selection of such a PLMN if it is available in another RAT; and

- the MS shall delete stored information on PLMNs where voice service was not possible in N1 mode when the MS is switched off, the USIM is removed, timer TF expires or the MS's usage setting changes so that N1 mode capability disabling is no longer necessary.

The MS should maintain a list of PLMNs where the N1 mode capability was disabled due to receipt of a reject from the network with 5GMM cause #27 "N1 mode not allowed", as PLMNs where N1 mode is not allowed for 3GPP access. When the MS disables its N1 mode capability due to receipt of a reject from the network with 5GMM cause #27 "N1 mode not allowed":

- the MS should add the identity of the PLMN to the list of PLMNs where N1 mode is not allowed for 3GPP access and should start timer TG if timer TG is not already running. The number of PLMNs that the MS can store where N1 mode is not allowed for 3GPP access is implementation specific, but it shall be at least one. The value of timer TG is MS implementation specific, but shall not exceed the maximum possible value of background scanning timer T as specified in clause 4.4.3.3.1;

- in automatic PLMN selection the MS shall not consider PLMNs where N1 mode is not allowed for 3GPP access as PLMN selection candidates for NG-RAN access technology, unless no other PLMN is available. This does not prevent selection of such a PLMN if it is available in another RAT;

- if the MS is not configured to use timer T3245, the MS maintains a list of PLMN-specific N1 mode attempt counters for 3GPP access as specified in 3GPP TS 24.501 [64] and T3247 expires, then the MS removes for each PLMN-specific N1 mode attempt counter for 3GPP access that has a value greater than zero and less than the MS implementation-specific maximum value the respective PLMN from the list of PLMNs where N1 mode is not allowed for 3GPP access, as specified in clause 5.3.20.2 in 3GPP TS 24.501 [64]; and

- the MS shall delete stored information on PLMNs where N1 mode is not allowed for 3GPP access when the MS is switched off, the USIM is removed or timer TG expires.

NOTE: The expiry of timer TG does not cause a reset of the PLMN-specific N1 mode attempt counters for 3GPP access (see 3GPP TS 24.501 [64]).

The MS in NB-S1 mode may maintain a list of "PLMNs with NB-IoT not allowed" where the NB-IoT capability was disabled due to receipt of a reject from the network with EMM cause #15 "no suitable cells in tracking area" and an Extended EMM cause IE with value "NB-IoT not allowed", as PLMNs where NB-S1 mode is not allowed. When the MS disables its NB-IoT capability due to receipt of a reject from the network with EMM cause #15 "no suitable cells in tracking area" and an Extended EMM cause IE with value "NB-IoT not allowed":

- the MS may add the identity of the PLMN to the list of "PLMNs with NB-IoT not allowed" and start timer TH if timer TH is not already running. The number of PLMNs that the MS can store in the "PLMNs with NB-IoT not allowed" list is implementation specific, but it shall be at least one. The value of timer TH is MS implementation specific, but shall not exceed the maximum possible value of background scanning timer T as specified in clause 4.4.3.3.1;

- in automatic PLMN selection the MS shall not consider PLMNs included in the "PLMNs with NB-IoT not allowed" list as PLMN selection candidates for NB-IoT access technology, unless no other PLMN is available. This does not prevent selection of such a PLMN if it is available in another RAT; and

- the MS shall delete stored information in the "PLMNs with NB-IoT not allowed" list when the MS is switched off, the USIM is removed or timer TH expires.

\* \* \* Next Change \* \* \* \*

##### 4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMN/access technology combinations, if available and, for bullets i, ii, iii, iv, v, allowable, in the following order:

i) either the HPLMN (if the EHPLMN list is not present or is empty) or the highest priority EHPLMN that is available (if the EHPLMN list is present) ;

ii) each PLMN/access technology combination in the "User Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order);

iii) each PLMN/access technology combination in the "Operator Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order) or stored in the ME (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

NOTE 1: High quality signal is defined in the appropriate AS specification.

v) other PLMN/access technology combinations in order of decreasing signal quality.

vi) PLMN/NG-RAN combinations for any forbidden PLMNs matching the below conditions:

a) if the indication of 'applicability of "lists of PLMN(s) to be used in disaster condition" provided by a VPLMN' is set to true:

- each PLMN in the "list of PLMN(s) to be used in disaster condition" stored in the ME which is associated with the PLMN ID of the determined PLMN with disaster condition, if any, ordered based on this list; otherwise

- if the ME does not have a stored "list of PLMN(s) to be used in disaster condition" associated with the PLMN ID of the determined PLMN with disaster condition, each PLMN in the "list of PLMN(s) to be used in disaster condition" stored in the ME which is associated with the PLMN ID of the HPLMN, if any, ordered based on this list.

b) if the indication of 'applicability of "lists of PLMN(s) to be used in disaster condition" provided by a VPLMN' is set to false:

- each PLMN in the "list of PLMN(s) to be used in disaster condition" stored in the ME which is associated with the HPLMN, if any, ordered based on this list.

vii) PLMN/NG-RAN combinations for other forbidden PLMNs, in random order.

When following the above procedure the following requirements apply:

a) An MS with voice capability shall ignore PLMNs for which the MS has identified at least one GSM COMPACT.

b) In A/Gb mode or GSM COMPACT, an MS with voice capability, or an MS not supporting packet services shall not search for CPBCCH carriers.

c) In ii and iii, the MS should limit its search for the PLMN to the access technology or access technologies associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list).

An MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data files are not present) shall instead use the "PLMN Selector" data file, for each PLMN in the "PLMN Selector" data file, the MS shall search for all access technologies it is capable of. The priority ordering amongst the access technologies is implementation dependent.

d) In iv, v, vi and vii, the MS shall search for all access technologies it is capable of, before deciding which PLMN to select.

e) In ii, and iii, a packet only MS which supports GSM COMPACT, but using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data files are not present) shall instead use the "PLMN Selector" data file, for each PLMN in the "PLMN Selector" data file, the MS shall search for all access technologies it is capable of and shall assume GSM COMPACT access technology as the lowest priority radio access technology.

f) In i, the MS shall search for all access technologies it is capable of. No priority is defined for the preferred access technology and the priority is an implementation issue, but "HPLMN Selector with Access Technology" data file on the SIM may be used to optimise the procedure.

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data file is not present) shall search for all access technologies it is capable of. The priority ordering amongst the access technologies is implementation dependent. A packet only MS which supports GSM COMPACT using a SIM without access technology information storage shall also assume GSM COMPACT access technology as the lowest priority radio access technology.

NOTE 2: For f) and g), the MS in automatic network selection mode can end the PLMN search procedure once the HPLMN or the highest priority EHPLMN is found on an access technology.

NOTE 3: For i, ii and iii, the MS can use location information to determine which PLMNs can be available in its present location.

h) In v, the MS shall order the PLMN/access technology combinations in order of decreasing signal quality within each access technology. The order between PLMN/access technology combinations with different access technologies is an MS implementation issue.

NOTE 4: Requirements a) and b) apply also to requirement d), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if capable of GSM COMPACT.

NOTE 5: Requirements a) and b) apply also to requirement f), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if this is the only access technology on the "HPLMN Selector with Access Technology" data file on the SIM.

i) In i to vii, the MS shall not consider PLMNs where voice service was not possible as PLMN selection candidate, unless such PLMN is available in GERAN or UTRAN or no other allowed PLMN is available.

j) In i to v, if the MS only supports EMM-REGISTERED without PDN connection (see 3GPP TS 24.301 [23A]), the MS shall not consider PLMNs which do not advertise support of EMM-REGISTERED without PDN connection.

k) In i to v, if the MS only supports control plane CIoT EPS optimization (see 3GPP TS 24.301 [23A]) and the MS camps on a E-UTRA cell which is not NB-IoT cell (see 3GPP TS 36.304 [43], 3GPP TS 36.331 [42]), the MS shall not consider PLMNs which do not advertise support of EPS services with control plane CIoT EPS optimization.

l) In i to vii, if the MS is in eCall only mode, the MS shall not consider PLMNs which do not advertise support for eCall over IMS, unless such PLMNs are available in GERAN or UTRAN.

NOTE 6: As an implementation option, an MS in eCall only mode that was not able to select any PLMN according to l) can perform a second iteration of i to v with no restriction.

m) In i to vii, if the MS supports CAG and:

1) is provisioned with a non-empty "CAG information list", the MS shall consider a PLMN indicated by an NG-RAN cell only if:

A) the cell is a CAG cell and broadcasts a CAG-ID for the PLMN such that there exists an entry with the PLMN ID of the PLMN in the "CAG information list" and the CAG-ID is included in the "Allowed CAG list" of the entry; or

B) the cell is not a CAG cell and:

- there is no entry with the PLMN ID of the PLMN in the "CAG information list"; or

- there exists an entry with the PLMN ID of the PLMN in the "CAG information list" but the "indication that the MS is only allowed to access 5GS via CAG cells" is not included in the entry; or

2) is provisioned with an empty "CAG information list" or is not provisioned with a "CAG information list", the MS shall consider a PLMN indicated by an NG-RAN cell only if the cell is not a CAG cell.

n) In i to vii, if the MS only supports control plane CIoT 5GS optimization (see 3GPP TS 23.501 [62]) and the MS camps on an E-UTRA cell connected to 5GCN, which is not NB-IoT cell (see 3GPP TS 36.304 [43], 3GPP TS 36.331 [42]), the MS shall not consider PLMNs which do not advertise support of 5GS services with control plane CIoT 5GS optimization.

o) In i to vii, if the MS supports CIoT 5GS optimizations, the MS shall not consider the PLMN/access technology combinations for which the MS preferred CIoT network behaviour is not advertised as supported by the PLMN/access technology combination (see 3GPP TS 24.501 [64]).

NOTE 7: As an implementation option, the MS supporting CIoT 5GS optimizations that was not able to select any PLMN according to o) can perform a second iteration of i to v with no restriction.

p) In iii, the MS shall use the PLMN/access technology combination in the "Operator Controlled PLMN Selector with Access Technology" stored in the ME, if the last update of the "Operator Controlled PLMN Selector with Access Technology" was due to receiving steering of roaming information containing the "list of preferred PLMN/access technology combinations" (see annex C) and storing it in the ME. Otherwise, the MS shall use the "Operator Controlled PLMN Selector with Access Technology" list retrieved from the SIM.

q) for vi and vii, the MS shall determine the PLMN with disaster condition as follows:

i) if the MS's RPLMN is included in any "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell and is allowable, the MS shall consider that the MS's RPLMN is the PLMN with disaster condition; or

ii) if the MS's RPLMN is not included in any "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell or the MS's RPLMN is not allowable, the MS shall determine the PLMN with disaster condition from PLMNs:

- in the "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" broadcast by any NG-RAN cell; and

- which are allowable;

in the following order:

- either the HPLMN (if the EHPLMN list is not present or is empty) or the highest priority EHPLMN that is available (if the EHPLMN list is present);

- each PLMN in the "User Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order);

- each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data file in the SIM (in priority order) or stored in the ME (in priority order); and

- other PLMNs.

r) The MS shall perform vi and vii to select a PLMN for disaster roaming only if:

1) the MS supports MINT;

2) the indication of whether disaster roaming is enabled in the UE stored in the ME is set to "Disaster roaming is enabled in the UE";

3) there is no available PLMN which is allowable;

4) the MS is not in 5GMM-REGISTERED state and 5GMM-CONNECTED mode over non-3GPP access (see 3GPP TS 24.501 [64]);

4a) the MS does not have a PDN connection via an ePDG connected to EPC; and

5) an NG-RAN cell of the PLMN:

A) broadcasts the disaster related indication; or

Editor's note: (WI:MINT, CR#0734) it is FFS whether the disaster related indication indicates (a) solely that the available PLMN is accessible for disaster inbound roamers or (b) that the available PLMN is accessible for disaster inbound roamers and all other PLMNs have disaster condition.

Editor's note: (WI:MINT, CR#0841) PLMN Selection aspects for disaster related indication is FFS.

B) broadcasts a "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" which includes the determined PLMN with disaster condition.

s) In i to vii, if the MS only supports NR RedCap and the MS camps on an NR cell connected to 5GCN, the MS shall not consider PLMNs which do not advertise support of NR RedCap.

t) In i to vii, if the MS detects a PLMN in satellite NG-RAN access technology which fulfils the conditions related to the list of "PLMNs not allowed to operate at the present UE location" as defined in clause 3.1, it shall not consider the PLMN as PLMN selection candidate for satellite NG-RAN access technology.

x) In i to vii, if the MS detects a PLMN in a satellite E-UTRAN access technology which fulfils the conditions related to the list of "PLMNs not allowed to operate at the present UE location" as defined in clause 3.1, it shall not consider the PLMN as PLMN selection candidate for the satellite E-UTRAN access technology.

If successful registration is achieved, the MS indicates the selected PLMN.

If registration cannot be achieved because no PLMNs are available and allowable, and the MS does not support access to RLOS, the MS indicates "no service" to the user, waits until a new PLMN is available and allowable and then repeats the procedure.

If there were one or more PLMNs which were available and allowable, but an LR failure made registration on those PLMNs unsuccessful or an entry in any of the lists "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service", "CAG information list", or "PLMNs not allowed to operate at the present UE location" prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

If:

- the MS supports access to RLOS;

- either the UICC containing the USIM is not present in the MS, or the UICC containing the USIM is present in the MS and the MCC part of the IMSI in the USIM is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]);

- one or more PLMNs offering access to RLOS has been found;

- registration cannot be achieved on any PLMN; and

- the MS is in limited service state,

the MS shall select a PLMN offering access to RLOS as follows:

a) if at least one preferred PLMN exists based on the RLOS preferred PLMN list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]) and the MCC part of the preferred PLMN ID is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), the MS shall select the preferred PLMN offering access to RLOS and indicate the selected preferred PLMN for access to RLOS; and

b) if none of the preferred PLMNs for access to RLOS is available, the MS shall evaluate the remaining PLMNs offering access to RLOS that are not in the RLOS preferred PLMN list. If the MCC part of a PLMN ID is present in the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), the MS shall select this PLMN and indicate the selected PLMN for access to RLOS.

If registration cannot be achieved because no PLMNs are available and allowable, and if no PLMN offering access to RLOS has been found, or none of the PLMNs offering access to RLOS is allowed to be accessed according to the RLOS allowed MCC list configured in the USIM (see 3GPP TS 31.102 [40]) or in the ME (see 3GPP TS 24.368 [50]), or the MS does not support access to RLOS, the MS indicates "no service" to the user, waits until a new PLMN is available and then repeats the procedure.

\* \* \* Next Change \* \* \* \*

##### 4.4.3.3.1 Automatic and manual network selection modes

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN (if the EHPLMN list is not present or is empty) or one of its EHPLMNs (if the EHPLMN list is present) or a higher priority PLMN/access technology combinations listed in "user controlled PLMN selector" or "operator controlled PLMN selector" by scanning in accordance with the requirements that are applicable to i), ii) and iii) as defined in the Automatic Network Selection Mode in clause 4.4.3.1.1. In the case that the mobile has a stored "Equivalent PLMNs" list the mobile shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN which are stored in the "Equivalent PLMNs" list. For this purpose, a value of timer T may be stored in the SIM. The interpretation of the stored value depends on the radio capabilities supported by the MS:

- For an MS that does not support any of the following: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]), if:

a) the MS is in a VPLMN through satellite NG-RAN access with a shared MCC, T is in the range 6 multiplied by integer M minutes to 8 multiplied by integer M hours in 6 multiplied by integer M minutes steps. If no value for M is stored in the SIM, a default value of M equal to one is used; otherwise

b) T is either in the range 6 minutes to 8 hours in 6 minutes steps or it indicates that no periodic attempts shall be made. If no value for T is stored in the SIM, a default value of 60 minutes is used for T.

- For an MS that only supports any of the following or a combination of: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]), T is either in the range 2 hours to 240 hours, using 2 hour steps from 2 hours to 80 hours and 4 hour steps from 84 hours to 240 hours, or it indicates that no periodic attempts shall be made. If no value for T is stored in the SIM, a default value of 72 hours is used.

- For an MS that supports both:

a) any of the following or a combination of: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]); and

b) any access technology other than the following: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]),

then T is interpreted depending on the access technology in use as specified below:

1) if the MS is using any of the following at the time of starting timer T: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]), T is either in the range 2 hours to 240 hours, using 2 hour steps from 2 hours to 80 hours and 4 hour steps from 84 hours to 240 hours, or it indicates that no periodic attempts shall be made. If no value for T is stored in the SIM, a default value of 72 hours is used; and

2) if the MS is not using any of the following at the time of starting timer T: EC-GSM-IoT, Category M1 or Category NB1 (as defined in 3GPP TS 36.306 [54]), T is either in the range 6 minutes to 8 hours in 6 minutes steps or it indicates that no periodic attempts shall be made. If the MS is using the satellite NG-RAN access technology with a shared MCC at the time of starting timer T: T is in the range 6 multiplied by integer M minutes to 8 multiplied by integer M hours in 6 multiplied by integer M minutes steps. If no value for M is stored in the SIM, a default value of M equal to one is used. If no value for T is stored in the SIM, a default value of 60 minutes is used for T.

Editor's note: Whether the existing timer T duration can be reused if the UE has selected a PLMN offering disaster roaming service as VPLMN or a new timer duration needs to be defined is FFS.

If the MS is configured with the MinimumPeriodicSearchTimer as specified in 3GPP TS 24.368 [50] or 3GPP TS 31.102 [40], the MS shall not use a value for T that is less than the MinimumPeriodicSearchTimer. If the value stored in the SIM, or the default value for T (when no value is stored in the SIM), is less than the MinimumPeriodicSearchTimer, then T shall be set to the MinimumPeriodicSearchTimer.

The MS does not stop timer T, as described in 3GPP TS 24.008 [23] and 3GPP TS 24.301 [23A], when it activates power saving mode (PSM) (see 3GPP TS 23.682 [27A]) or mobile initiated connection only mode (MICO) as described in 3GPP TS 24.501 [64].

The MS can be configured for Fast First Higher Priority PLMN search as specified in 3GPP TS 31.102 [40] or 3GPP TS 24.368 [50]. Fast First Higher Priority PLMN search is enabled if the corresponding configuration parameter is present and set to enabled. Otherwise, Fast First Higher Priority PLMN search is disabled.

The attempts to access the HPLMN or an EHPLMN or higher priority PLMN shall be as specified below:

a) The periodic attempts shall only be performed in automatic mode when the MS is roaming, and not while the MS is attached for emergency bearer services, is registered for emergency services, has a PDU session for emergency services or has a PDN connection for emergency bearer services;

b) The MS shall make the first attempt after a period of at least 2 minutes and at most T minutes:

- only after switch on if Fast First Higher Priority PLMN search is disabled; or

- after switch on or upon selecting a VPLMN if Fast First Higher Priority PLMN search is enabled.

c) The MS shall make the following attempts if the MS is on the VPLMN at time T after the last attempt;

d) Periodic attempts shall only be performed by the MS while in idle mode or 5GMM-CONNECTED mode with RRC inactive indication (see 3GPP TS 24.501 [64]);

d1) Periodic attempts may be postponed while the MS is in power saving mode (PSM) (see 3GPP TS 23.682 [27A]).

d2) Periodic attempts may be postponed while the MS is receiving eMBMS transport service in idle mode (see 3GPP TS 23.246 [68]).

d3) Periodic attempts may be postponed till the next eDRX occasion while the MS is configured with eDRX.

d4) Periodic attempts may be postponed while the MS is in relaxed monitoring (see 3GPP TS 36.304 [43]).

d5) Periodic attempts may be postponed while the MS is in Mobile Initiated Connection Only mode (MICO).

e) If the HPLMN (if the EHPLMN list is not present or is empty) or a EHPLMN (if the list is present) or a higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) of clause 4.4.3.1.1 the MS shall limit its attempts to access higher priority PLMN/access technology combinations to PLMN/access technology combinations of the same country as the current serving VPLMN, as defined in Annex B.

EXCEPTION: If the MS is in a VPLMN through satellite NG-RAN access or satellite E-UTRAN access with a shared MCC, the MS may attempt to access higher priority PLMN/access technology combinations irrespective of their MCC values.

EXCEPTION: If the MS is in a VPLMN through non-satellite access, the MS may attempt to access higher priority PLMNs with a shared MCC with satellite NG-RAN access technology or satellite E-UTRAN access technology (do 31.102 CR).

f1) In the case that the MS has a stored "Equivalent PLMNs" list the MS shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN which are stored in the "Equivalent PLMNs" list.

EXCEPTION: If the MS is in a VPLMN through satellite NG-RAN access or satellite E-UTRAN access with a shared MCC, the MS shall only select a PLMN if it is of a higher priority than those which are stored in the "Equivalent PLMNs" list.

EXCEPTION: If the MS is in a VPLMN through non-satellite access, the MS shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN or those with a shared MCC with satellite NG-RAN access technology or satellite E-UTRAN access technology which are stored in the "Equivalent PLMNs" list.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN, as defined in Annex B, and which are not in the list of "PLMNs where registration was aborted due to SOR" if the UE has a list of "PLMNs where registration was aborted due to SOR" shall be taken into account to compare with the priority level of a selected PLMN.

h) If the PLMN of the highest priority PLMN/access technology combination available is the current VPLMN, or one of the PLMNs in the "Equivalent PLMNs" list and is not in the list of "PLMNs where registration was aborted due to SOR" if the UE has a list of "PLMNs where registration was aborted due to SOR", the MS shall remain on the current PLMN/access technology combination.

i) In step iii) of clause 4.4.3.1.1 the MS shall consider PLMNs which are in the list of "PLMNs where registration was aborted due to SOR" as lowest priority, if the UE has a list of "PLMNs where registration was aborted due to SOR".

NOTE 1: As an MS implementation option, the MS can make an attempt when the timer TD, TE, TF, TG or TH expires and there is a PLMN/access technology combination which the MS could not select while the timer was running (e.g. the PLMN was in the list of PLMNs where voice service was not possible in E-UTRAN) that is higher priority than the current serving PLMN and belongs to the same country as the current serving PLMN, as defined in Annex B.

NOTE 2: As an MS implementation option, upon a transition in or out of international areas, a UE supporting satellite NG-RAN or satellite E-UTRAN can attempt to obtain service on a higher priority PLMN as defined in this subclause. It is up to the UE implementation to determine when it is transitioning in and out of international areas. What constitutes an international area is out of scope of this specification and not the responsibility of 3GPP.

\* \* \* Next Change \* \* \* \*

### 4.5.2 Initiation of Location Registration

An LR request indicating Normal Updating is made when, in idle mode,

- the MS changes cell while the update status is "NOT UPDATED"; (for MS capable of GPRS and non-GPRS services when at least one of both update statuses is "NOT UPDATED")

- the MS detects that it has entered a new registration area, i.e., when the received registration area identity differs from the one stored in the MS, and the LAI, TAI or PLMN identity is not contained in any of the lists of "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" respectively, while being in one of the following update statuses:

- UPDATED;

- NOT UPDATED;

- ROAMING NOT ALLOWED.

- the MS detects that it has entered a new registration area, i.e., when the received registration area identity differs from the one stored in the MS, and the MS is attached for access to RLOS;

- the MS detects that it has entered a registration area that has the same identity as the one stored in the MS, while the update status is "ROAMING NOT ALLOWED", and

the LAI, TAI or PLMN identity is not contained in any of the lists of "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs" respectively; and

- if the selected cell is a satellite NG-RAN cell or a satellite E-UTRAN cell, it does not fulfil the conditions related to the list of "PLMNs not allowed to operate at the present UE location" as defined in clause 3.1, i.e. it is considered as candidate for PLMN selection.

- the Periodic Location Updating Timer expires while the non-GPRS update status is "NOT UPDATED" (triggers Location Updating);

- the Periodic Routing Area Update timer expires while the GPRS update status is "NOT UPDATED" (triggers Routing Area Update);

- the Periodic Tracking Area Update timer expires while the EPS update status is "NOT UPDATED" (triggers Tracking Area Update);

- the Periodic Registration Update timer expires while the 5GS update status is "NOT UPDATED" (triggers mobility and periodic registration update procedure);

- a manual network reselection has been performed, an acceptable cell of the selected PLMN or the selected SNPN is present, and the MS is not in the update status "UPDATED" on the selected PLMN or the selected SNPN; or

- emergency bearer services over packet services are requested by upper layers.

An MS which is attached for PS services other than RLOS and enters a new PLMN shall perform a routing area update or a tracking area update or an MS which is registered via NG-RAN and enters a new PLMN or SNPN shall perform a registration update if the following conditions are fulfilled:

a) if the MS:

1) does not operate in SNPN access mode, is in S1 mode or N1 mode and the currently stored TAI list does not contain the TAI of the current serving cell; or

2) operates in SNPN access mode;

b) the LAI, TAI or PLMN identity of the current serving cell is not contained in any of the lists "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service", "forbidden PLMNs for GPRS service" or "forbidden PLMNs", or the MS has a PDN connection for emergency bearer services, or the MS has a PDU session for emergency services;

b1) if the selected cell is a satellite NG-RAN cell or a satellite E-UTRAN cell, it does not fulfil the conditions related to the list of "PLMNs not allowed to operate at the present UE location" as defined in clause 3.1, i.e. it is considered as candidate for PLMN selection; and

c) the current update state is different from "Idle, No IMSI"; and

1) the MS is configured to perform the attach procedure with IMSI at PLMN change (see "AttachWithIMSI" leaf of the NAS configuration MO in 3GPP TS 24.368 [50] or USIM file NASCONFIG in 3GPP TS 31.102 [40]) and the new PLMN is the registered PLMN or an equivalent PLMN; or

2) the MS is not configured to perform the attach procedure with IMSI at PLMN change.

An MS which is attached for access to RLOS and enters a new PLMN shall perform tracking area update if the following condition is fulfilled:

- the currently stored TAI list does not contain the TAI of the current serving cell.

If the new PLMN the MS has entered is neither the registered PLMN nor an equivalent PLMN, an MS which is attached for PS services and configured to perform the attach procedure with IMSI at PLMN change (see "AttachWithIMSI" leaf of the NAS configuration MO in 3GPP TS 24.368 [50] or USIM file NASCONFIG in 3GPP TS 31.102 [40]) shall perform an attach procedure using IMSI as mobile identity.

An LR request indicating Periodic Location Updating is made when, in idle mode, the Periodic Location Updating timer expires while the non-GPRS update status is "UPDATED".

An LR request indicating Periodic Routing Area Update is made when the Periodic Routing Area Update timer expires while the GPRS update status is "UPDATED", except when the MS is attached for emergency bearer services.

An LR request indicating Periodic Tracking Area Update is made when the Periodic Tracking Area Update timer expires while the EPS update status is "UPDATED", except when the MS is attached for emergency bearer services.

An LR request indicating Periodic Registration Updating is made when the periodic registration timer expires while the 5GS update status is "UPDATED", except when the MS is registered for emergency services.

An LR request indicating IMSI attach is made when the MS is activated in the same location area in which it was deactivated while the non-GPRS update status is "UPDATED", and the system information indicates that IMSI attach/detach shall be used.

A GPRS attach is made by a GPRS MS when activated and capable of services which require registration. A GPRS attach may only be performed if the selected PLMN is not contained in the list of "forbidden PLMNs for GPRS service". Depending on system information about GPRS network operation mode MSs operating in MS operation mode A or B perform combined or non-combined location registration procedures. When the combined routing area update or GPRS attach is accepted with indication "MSC not reachable" or is not answered the MS performs also the corresponding location updating procedure or falls back to a GPRS only MS. When the combined routing area update or GPRS attach is rejected with cause "GPRS not allowed" the GPRS update status is "ROAMING NOT ALLOWED" and the MS performs the corresponding location updating procedure.

An LR request indicating Disaster Roaming Registration Updating is made when the MS supporting MINT needs to register to the PLMN offering disaster roaming for the first time.

Furthermore, an LR request indicating Normal Location Updating is also made when the response to an outgoing request shows that the MS is unknown in the VLR or SGSN, respectively.

Table 2 in clause 5 summarizes the events in each state that trigger a new LR request. The actions that may be taken while being in the various states are also outlined in table 2.

A GPRS MS which is both IMSI attached for GPRS and non-GPRS services and which is capable of simultaneous operation of GPRS and non-GPRS services shall perform Routing Area Update in connected mode when it has entered a new routing area which is not part of a LA contained in the list of "forbidden location areas for roaming" or "forbidden location areas for regional provision of service".

\* \* \* Next Change \* \* \* \*

# 5 Tables and Figures

Table 1: Effect of LR Outcomes on PLMN Registration

|  |  |  |
| --- | --- | --- |
| Location Registration Task State | Registration Status | Registered PLMN is |
| Updated | Successful | Indicated in the stored registration area identity |
| Idle, No IMSI | Unsuccessful | No registered PLMN (3) (4) |
| Roaming not allowed: |  |  |
| a) PLMN not allowed | Unsuccessful | No registered PLMN (4) |
| b) LA not allowed or TA not allowed | Indeterminate(1) | No registered PLMN |
| c) Roaming not allowed in this LA or Roaming not allowed in this TA | Indeterminate (2) | No registered PLMN (4) |
| d) No suitable cells in location area or No suitable cells in tracking area | Indeterminate (5) | No registered PLMN |
| e) Not authorized for this CSG | Indeterminate (6) | No registered PLMN |
| Not updated | Unsuccessful | No registered PLMN (4) |
| 1) The MS will perform a cell selection and will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a new cell, when registration status will be unsuccessful.  2) The MS will select the HPLMN (if the EHPLMN list is not present or is empty) or an EHPLMN (if the EHPLMN list is present) if in automatic mode and will enter Automatic Network Selection Mode Procedure of clause 4.4.3.1.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of clause 4.4.3.1.2 If the appropriate process does not result in registration, the MS will eventually enter the limited service state.  3) An MS may have different update states for GPRS and non-GPRS. A PLMN is registered when at least one of both update states is updated.  4) The stored list of equivalent PLMNs is invalid and can be deleted.  5) The MS will attempt registration on another LA or TA of the same PLMN, or equivalent PLMN if available.Otherwise it will enter either the Automatic Network Selection Mode procedure of clause 4.4.3.1.1 or follow the Manual Network Selection Mode procedure of clause 4.4.3.1.2. If the appropriate process does not result in registration, the MS will eventually enter the limited service state.  6) The MS will attempt registration on another cell of the same PLMN, or equivalent PLMN if available.Otherwise it will enter either the Automatic Network Selection Mode procedure of clause 4.4.3.1.1 or follow the Manual Network Selection Mode procedure of clause 4.4.3.1.2. If the appropriate process does not result in registration, the MS will eventually enter the limited service state.  NOTE 1: MSs capable of GPRS and non-GPRS services may have different registration status for GPRS and for non-GPRS.  NOTE 2: The registered PLMN is determined by looking at the stored registration area identity and stored location registration status. | | |

Table 2: LR Process States and Allowed Actions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Location Registration | New LR request when | | | | Normal Calls | Paging responded |
| Task State | Changing Cell | Changing registration area | Changing PLMN | Other | Supported (1) | to |
| Null (4) | No | Yes | Yes | No | No | No |
| Updated, (5) | No | Yes | Yes | (2) | Yes | Yes |
| Idle, No IMSI (7) | No | No | No | No | No | No |
| Roaming not allowed: |  |  |  |  |  |  |
| a) Idle, PLMN not allowed | No | No | Yes | No | No | Optional if with IMSI |
| b) Idle, LA not allowed or TA not allowed | No | Yes(6) | Yes | No | No | Optional if with IMSI |
| c) Idle, Roaming not allowed in this LA or  Roaming not allowed in this TA | No | Yes(6,8) | Yes | No | No | Optional if with IMSI |
| d) No suitable cells in location area or  No suitable cells in tracking area | No | Yes(6,8) | Yes | No | No | Optional if with IMSI |
| e) Not authorized for this CSG | No | Yes (6,8) | Yes | No | No | Optional if with IMSI |
| Not updated | Yes | Yes | Yes | (2)&(3) | (3) | Yes if with IMSI |
| 1): Emergency calls may always be made, subject to access control permitting it.  2): A new LR is made when the periodic registration timer expires.  3): If a normal call request is made, an LR request is made. If successful the updated state is entered and the call may be made.  4): The MS is in the null state from switch on until it has camped on a cell and either made an LR attempt or decided that no LR attempt is needed.  5): In this state, IMSI detach is performed if the MS is deactivated and the BCCH indicates that IMSI attach/detach shall be used. An LR request indicating IMSI attach is performed if the MS is activated in the same registration area in which it was deactivated while being in this state.  6): An MS shall not perform a new LR when the new routing area is part of an LA or TA contained in any of the lists "forbidden location areas for roaming", "forbidden tracking areas for roaming", "5GS forbidden tracking areas for roaming", "forbidden location areas for regional provision of service", "forbidden tracking areas for regional provision of service", "5GS forbidden tracking areas for regional provision of service" or the new cell is a CSG cell which is not part of any of the lists "Allowed CSG list", "Operator CSG list". The MS shall not perform a LR on a satellite NG-RAN cell or a satellite E-UTRAN cell if it fulfils the conditions related to the list of "PLMNs not allowed to operate at the present UE location" as defined in clause 3.1, i.e. if it is not considered as candidate for PLMN selection.  7): The conditions in which the GPRS and/or non-GPRS registration status "Idle, No IMSI" is entered are specified in clause 4.3.3.  8): An MS shall perform a LR if it has entered a registration area whatever the registration area stored in the MS. | | | | | | |



Figure 1: Overall Idle Mode process

The individual steps are the following (they are not necessarily executed in the number sequence):

(1) The PLMN selection mode is set (e.g. by the user via the user interface or by AT command).

(2) The list of available PLMNs is presented to the user, according to the rules given in clause 4.4.3.1.2.

(3) In manual PLMN selection mode the user selects from the available PLMNs.

(4) If the MS supports CSGs, the list of available PLMNs and CSGs, together with an indication as to which of the available CSGs is in the Allowed or Operator CSG list, is presented to the user upon request. The detailed rules are defined in clause 5.5.4 of 3GPP TS 22.220 [49].

(5) Only for MSs supporting CSGs: when camping on a cell, the available CSGs (with PLMN information) are conveyed to the CSG selection/restriction procedure (see clause 3.1A).

(6) Only for MSs supporting CSGs: in manual CSG selection mode the user selects from the available CSGs.

(7) Only for MSs supporting CSGs: if the selected CSG is associated with the RPLMN, the MS performs selection of a cell belonging to this CSG.

(8) Only for MSs supporting CSGs: if the selected CSG is associated with a PLMN different from the RPLMN, the MS enters the PLMN selection process and performs the parts applicable after manual selection of a PLMN.

(9) After it has selected a PLMN, the MS performs selection of a cell belonging to this PLMN; this selection is additionally restricted by the selected CSG, if the PLMN selection was triggered by a manual CSG selection.

(10) After having selected a new cell and the registration area has changed, the MS shall enter the LR process (see figure 3).

(10a) An MS's CM requests may lead to a registration request.

(11) If the LR is not successful, and if the cause received from the network does not exclude the RPLMN, the MS performs another cell selection (i.e. cell re-selection) within the RPLMN.

(12) The information on available PLMNs, as detected by the cell selection process from detectable broadcast information, is made available to the PLMN selection process.

(13) If the LR is not successful, and if the cause received from the network excludes the RPLMN, the MS performs PLMN selection.

(14) The positive result of cell selection (suitable cell and in updated state, or in connected mode having been camped on a suitable cell) and location registration (updated, for MSs capable of services requiring registration) is indicated to the user.

Possible sequences of steps are e.g.:

1) 1🡪 2 🡪 3 🡪 9 🡪 10 🡪 11 (manual PLMN selection, MS is not CSG capable)

2) 1 🡪 9 🡪 4 🡪 5 🡪 6 🡪 8 🡪 9 🡪 10 🡪 11 (automatic PLMN selection, MS is CSG capable, manual CSG selection);



Figure 2a: PLMN Selection State diagram (automatic mode)



Figure 2b: PLMN Selection State diagram (manual mode)



NOTE 1: Whenever the MS goes to connected mode and then returns to idle mode again the MS selects appropriate state.

NOTE 2: An MS capable of GPRS and non-GPRS services has two Task State machines one for GPRS and one for non-GPRS operation.

Figure 3: Location Registration Task State diagram

\* \* \* End of Changes \* \* \* \*