**3GPP TSG-CT WG1 Meeting #132-eC1-215676-rev02**

**E-meeting, 11-15 October 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.122** | **CR** | **0786** | **rev** | **-** | **Current version:** | **17.4.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Alignment to KI#2 conclusion on not allowable PLMN for PLMN selection | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | OPPO, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GSAT\_ARCH-CT | | | | |  | ***Date:*** | | | 2021-09-30 |
|  |  | | | |  | |  | | |  |
| ***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)* | |
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| ***Reason for change:*** | | In CT1#131e, the conclusion for KI#2 in TR 24.821 in C1-215029 was agreed.  As part of that conclusion, it is agreed that at normative phase of work  the PLMN that provide the reject cause "PLMN not allowed to operate at the present UE location" shall not be considered as a candidate for PLMN selection for satellite NG-RAN access. The scope and duration that this PLMN is considered as not allowed for NTN access will be dealt with in normative phase  This CR propose to progress on the agreed conclusions.  However, further studies and work are needed to determine for how long and under what crieria that PLMN that provided the reject cause be deemed as not allowed PLMN. Thus this CR proposes an Editor's note to allow further studies on this topic of duration and criteria. | | | | | | | | |
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| ***Summary of change:*** | | Indicate that the PLMN that provided the reject cause "PLMN not allowed to operate at the present UE location" is not an allowed PLMN for subsequent PLMN selection.  Editor's note added to cover further studies on duration and criteria for which the PLMN that provided the reject cause is sonsidered not allowable.  Exceptions for automatic NW selection and manual NW selection introduced.  . | | | | | | | | |
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| ***Consequences if not approved:*** | | Normative work on PLMN selection on receipt of reject cause "PLMN not allowed to operate at the present UE location" is incomplete. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 4.4.3.1.1, 4.4.3.1.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \*

## 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.

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.

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 due to IMS voice 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 due to IMS voice 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.

To prevent repeated attempts to have service on a PLMN through satellite NG-RAN access technology, when the MS receives a reject message with cause value "PLMN not allowed to operate at the present UE location" from a satellite NG-RAN cell, the MS shall store the PLMN ID of the rejecting PLMN in the list of "PLMNs not allowed to operate at the present UE location".

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", it shall not consider the PLMN as PLMN selection candidate for satellite NG-RAN access technology. This does not prevent selection of such a PLMN if it is available in another RAT.

Editor's note: [5GSAT\_ARCH-CT, CR#0786] The duration and criteria that the PLMN providing reject cause "PLMN not allowed to operate at the present UE location" is to be considered as not allowed PLMN is FFS.

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

#### 4.4.3.1 At switch‑on or recovery from lack of coverage

At switch on, or following recovery from lack of coverage, the MS selects the registered PLMN or equivalent PLMN (if it is available) using all access technologies that the MS is capable of and if necessary (in the case of recovery from lack of coverage, see clause 4.5.2) attempts to perform a Location Registration.

NOTE 1: The MS in automatic network selection mode can end the PLMN search procedure once the registered PLMN or equivalent PLMN is found on an access technology.

NOTE 2: An MS in automatic network selection mode can use location information to determine which PLMNs can be available in its present location.

EXCEPTION: As an alternative option to this, if the MS is in automatic network selection mode and it finds coverage of an EHPLMN, the MS may register to that EHPLMN and not return to the registered PLMN or equivalent PLMN. If the EHPLMN list is not present or is empty, and the HPLMN is available, the MS may register on the HPLMN and not return to the registered PLMN or equivalent PLMN. The operator shall be able to control by SIM configuration whether an MS that supports this option is permitted to perform this alternative behaviour.

EXCEPTION: As an alternative option to this, if the MS is in automatic network selection mode, the MS has a list of "PLMNs where registration was aborted due to SOR" and the registered PLMN is part of the list of "PLMNs where registration was aborted due to SOR", the MS may choose not to return to the registered PLMN or equivalent PLMN and proceed as defined in clause 4.4.3.1.1 with the exception that in iii), the MS considers PLMNs which are in the list of "PLMNs where registration was aborted due to SOR" as lowest priority.

EXCEPTION: In A/Gb mode an MS with voice capability, shall not search for CPBCCH carriers. In A/Gb mode an MS not supporting packet services shall not search for CPBCCH carriers.

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

If there is no registered PLMN, or if registration is not possible due to the PLMN being unavailable or registration failure, the MS follows one of the following two procedures depending on its PLMN selection operating mode. At switch on, if the MS provides the optional feature of user preferred PLMN selection operating mode at switch on then this operating mode shall be used. Otherwise, the MS shall use the PLMN selection mode that was used before switching off.

EXCEPTION: At switch on, if the MS is in manual mode and neither registered PLMN nor PLMN that is equivalent to it is available but EHPLMN is available, then instead of performing the manual network selection mode procedure of clause 4.4.3.1.2 the MS may select and attempt registration on the highest priority EHPLMN. If the EHPLMN list is not available or is empty and the HPLMN is available, then the MS may select and attempt registration on the HPLMN. The MS shall remain in manual mode.

NOTE 3: If successful registration is achieved, then the current serving PLMN becomes the registered PLMN and the MS does not store the previous registered PLMN for later use.

EXCEPTION: If registration is not possible on recovery from lack of coverage due to the registered PLMN being unavailable, an MS attached to GPRS services, attached via E-UTRAN or registered via the NG-RAN may, optionally, continue looking for the registered PLMN for an implementation dependent time.

NOTE 4: An MS attached to GPRS services, attached via E-UTRAN or registered via the NG-RAN should use the above exception only if one or more PDP contexts, PDN connections or PDU sessions are currently active.

\* \* \* 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 disaster roaming with a PLMN in the "list of PLMN(s) to be used in disaster condition", ordered based on the "list of PLMN(s) to be used in disaster condition".

vii) PLMN/NG-RAN combinations for disaster roaming with a PLMN not in the "list of PLMN(s) to be used in disaster condition", 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 received steering of roaming information contains the "list of preferred PLMN/access technology combinations"(see annex C) and is stored in the ME. Otherwise, the MS shall use the "Operator Controlled PLMN Selector with Access Technology" list retrieved from the SIM.

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

1) the MS supports MINT;

2) the "list of PLMN(s) to be used in disaster condition" is non-empty;

3) there is no available PLMN which is allowable;

4) the MS is not registered via non-3GPP access connected to 5GCN; 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.

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

i) if the MS's RPLMN is included in the "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN", 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, 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.

??) In i to vii, 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", it shall not consider the PLMN as PLMN selection candidate for satellite NG-RAN access technology.

Editor's note: [5GSAT\_ARCH-CT, CR#0786] The duration and criteria that the PLMN providing reject cause "PLMN not allowed to operate at the present UE location" is to be considered as not allowed PLMN is FFS.

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 is a PLMN whose PLMN ID is in the list of "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 \* \* \*

##### 4.4.3.1.2 Manual Network Selection Mode Procedure

The MS indicates whether there are any PLMNs, which are available using all supported access technologies. This includes PLMNs in the "forbidden PLMNs" list, "forbidden PLMNs for GPRS service" list and PLMNs which only offer services not supported by the MS. An MS which supports GSM COMPACT shall also indicate GSM COMPACT PLMNs (which use PBCCH).

If displayed, PLMNs meeting the criteria above are presented in the following order:

i)- either the HPLMN (if the EHPLMN list is not present or is empty) or, if one or more of the EHPLMNs are available then based on an optional data field on the SIM either only the highest priority available EHPLMN is to be presented to the user or all available EHPLMNs are presented to the user in priority order. If the data field is not present on the SIM, then only the highest priority available EHPLMN is presented;

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

iii)- PLMN/access technology combinations contained 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.

In ii and iii, 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 present the PLMNs contained in the "PLMN Selector" data file in the SIM (in priority order).

In v, requirement h) in clause 4.4.3.1.1 applies.

In i to v, requirements j), k) and l) in clause 4.4.3.1.1 apply.

In iii, requirement p) in clause  4.4.3.1.1 applies.

In GSM COMPACT, the non-support of voice services shall be indicated to the user.

The HPLMN may provide on the SIM additional information on the available PLMNs. If this information is provided, then the MS shall indicate it to the user. This information, provided as free text may include:

- preferred partner,

- roaming agreement status,

- supported services

Furthermore, the MS may indicate whether the available PLMNs are present on the EHPLMN list, the Forbidden list, the User Controlled PLMN List or the Operator Controlled PLMN List. The MS may also indicate that the PLMN is not present on any of these lists.

In i to v, if the MS supports CAG, for each PLMN/access technology combination of NG-RAN access technology, the MS shall present to the user:

a) the PLMN/access technology combination and a list of CAG-IDs composed of one or more CAG-IDs such that for each CAG-ID:

1) there is an available CAG cell which broadcasts the CAG-ID for the PLMN; and

2) the following is true:

i) 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

ii) the available CAG cell broadcasting the CAG-ID for the PLMN also broadcasts that the PLMN allows a user to manually select the CAG-ID.

For each of the presented CAG-ID, the MS may indicate to the user whether the CAG-ID is present in the "Allowed CAG list" stored in the UE; and

b) the PLMN/access technology combination without a list of CAG-IDs, if there is an available NG-RAN cell which is not a CAG cell for the PLMN. If there exists an entry for the presented PLMN in the "CAG information list" and the entry includes an "indication that the MS is only allowed to access 5GS via CAG cells", the MS may indicate to the user that the MS is only allowed to access the PLMN via CAG cells.

If the NAS receives a human-readable network name associated with a CAG-ID and a PLMN ID from the AS, the human-readable network name shall be sent along with the CAG-ID and PLMN ID to the upper layer for use in manual CAG selection.

NOTE 2: A human-readable network name can be broadcasted per CAG-ID and PLMN ID by a CAG cell.

Upon selection of a PLMN (and CAG-ID if the user selected a desired CAG-ID as well) by the user, the NAS shall provide the AS with the selected PLMN ID (and CAG-ID if the user selected a desired CAG-ID as well or an indication to select a non-CAG cell if the user did not select any CAG-ID) and the MS initiates registration on this PLMN (and on a cell which broadcasts the CAG-ID if the user selected a desired CAG-ID as well) using the access technology chosen by the user for that PLMN or using the highest priority available access technology for that PLMN, if the associated access technologies have a priority order (this may take place at any time during the presentation of PLMNs). For such a registration, the MS shall ignore the contents of the "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", "forbidden PLMNs" and "PLMNs not allowed to operate at the present UE location" lists . Also for such a registration, if the NAS has provided the AS with an indication to select a non-CAG cell, the MS shall ignore the "indication that the MS is only allowed to access 5GS via CAG cells", if any, in the "CAG information list" for the selected PLMN.

NOTE 3: It is an MS implementation option whether to indicate access technologies to the user. If the MS does display access technologies, then the access technology selected by the user is only used for initial registration on the selected PLMN. If the MS does not display access technologies, then the access technology chosen for a particular PLMN should be the highest priority available access technology for that PLMN, if the associated access technologies have a priority order, and is only used for initial registration.

If the UE has a PDU session for emergency services, a PDN connection for emergency bearer services or a PDP context for emergency bearer services, manual network selection shall not be performed.

After selection of a PLMN and CAG-ID, if the AS does not provide an indication of finding a suitable or acceptable cell belonging to the selected PLMN and which broadcasts the selected CAG-ID for the registration procedure (see 3GPP TS 38.304 [40]), then:

i) the MS shall indicate to user that it can not find the selected PLMN and CAG-ID; and

ii) If there is an "indication that the MS is only allowed to access 5GS via CAG cells" in the "CAG information list" for the selected PLMN, the MS may attempt to camp on a suitable CAG cell broadcasting a CAG-ID present in the "Allowed CAG list" for the selected PLMN or an acceptable cell, otherwise the MS may attempt to camp on a suitable cell belonging to the selected PLMN (i.e. a non-CAG cell or a CAG cell broadcasting a CAG-ID present in the "Allowed CAG list" for the selected PLMN) or an acceptable cell.

Once the MS has registered on a PLMN selected by the user, the MS shall not automatically register on a different PLMN unless:

i) the new PLMN is declared as an equivalent PLMN by the registered PLMN;

ii) the user selects automatic mode;

iii) the user initiates an emergency call while the MS is in limited service state and either the network does not broadcast the indication of support of emergency calls in limited service state, the registration request for emergency services is rejected by the network or the attach request for emergency bearer services is rejected by the network; or

iv) the user initiates access to RLOS, while the MS is in limited service state and either the network does not broadcast the indication of support of RLOS in limited service state, or the EPS attach request for access to RLOS is rejected by the network, or the EPS tracking area update request for access to RLOS is rejected by the network.

NOTE 4: If case iii) or iv) occurs, the MS can provide an indication to the upper layers that the MS has exited manual network selection mode.

If the user does not select a PLMN (or PLMN and CAG-ID), the selected PLMN shall be the one that was selected before the PLMN selection procedure started. If no such PLMN was selected or that PLMN is no longer available, then the MS shall attempt to camp on any acceptable cell and enter the 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 indicates the PLMNs offering access to RLOS, presented in the following order:

i) PLMNs contained in 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]) (in priority order) if 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]); and

ii) any of the remaining PLMNs offering access to RLOS that are not in the RLOS preferred PLMN list if the MCC part of the 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]).

Upon selection of a PLMN by the user, the MS initiates registration for access to RLOS on the PLMN chosen by the user (this may take place at any time during the presentation of PLMNs).

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