3GPP TSG-CN1 Meeting #33 Tdoc N1-040444
Atlanta, Georgia, USA 16 – 20 February 2004

Title: LS on background scan requirements
Response to:
Release:
Work Item:

Source: CN1
To: TSG CN
Cc: TSG SA

Contact Person:
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Attachments: Two alternative CRs N1-040478 and N1-040494

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1. Overall Description:

CN1 has studied the issue of PLMN background scanning over several meetings without being able to decide whether the UE in background scan needs to seach for higher priority PLMN + RAT combination or just higher priority PLMN.

This discussion has been started as a R99 roaming issue requiring urgent solution. Due to already existing different R99 ME implementations, it was seen difficult to propose changes to the frozen specifications.

Two alternative CRs have been technically reviewed in CN1 but neither of them could be agreed due to disagreement on what is the service requirement in background scan.

Both CRs are on Rel-6 but there is no technical reason why either of the CRs could not be supported by UEs based on earlier versions of the protocol, starting from R99 onwards.

Both proposals fulfil the requirement that has been added in 22.011 CR 054 in tdoc S1-040200.

Due to this, CN1 asks TSGN plenary help to make the decision by approving one of the two related CRs on 3GPP TS 23.122.

2. Actions:

To TSG CN group.

ACTION:

CN plenary is requested to approve one of the two alternative CRs on 23.122.

3. Date of Next TSG-CN1 Meetings:

CN1_34	10th – 14th May 2004	Zagreb, Croatia (EF3)
CN1_35	16th – 20th August 2004	Sophia Antipolis, France (ETSI)

3GPP TSG-CN1 Meeting #33 **Tdoc N1-040478**
Atlanta, Georgia, USA 16 – 20 February 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **069** ⌘**rev** **4** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification on the use of the RAT during background scanning.
Source:	⌘	O_2, T-Mobile, Orange, Ericsson
Work item code:	⌘	TEI6
Date:	⌘	19/02/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Alignment of stage 2 with stage 1 (S1-040200) regarding the fact that MS shall not change the Radio Access Technology (RAT) within the Visited PLMN (VPLMN) due to background scan. Clarification of the stage 2 on the fact that radio access technology information associated to PLMN entries in the PLMN selector has to be considered and taken into account during background scan procedure. The discussions in CN1 showed that there were different understanding of the specification. The proposed changes do not have any impact on the existing “Equivalent PLMNs” feature.
Summary of change:	⌘	This change request mandates that MS shall not change the access technology within the Visited PLMN due to background scan. Additionally, the change request mandates that access technology information associated to PLMN entry in the PLMN Selector is taken into account during background scanning, as currenlty done for PLMN selection at switch on or on recovery from lack of coverage. Furthermore, it is clarified that all PLMN/access technology combinations of PLMNs included in the "Equivalent PLMNs" list are regarded as equivalent.
Consequences if not approved:	⌘	Stage 2 will not be in line with stage 1: The background scan procedure can lead the MS to change of radio access technology within its Visited PLMN, cell re-selection can lead the UE to this previous access technology which creates a ping-pong effect within the Visited PLMN.

	The specification will remain un-clear on the usage or not of access technology information associated to PLMN entry in PLMN selectors during background scan procedure, leading to different implementations.

Clauses affected:	⌘	1.2, 4.4.3, 4.4.3.3			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

************************************FIRST CHANGES***************************************

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 GSM system. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS system. 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. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022 and for Iu mode in 3GPP TS 25.304.

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

Allowable PLMN: In the case of a MS operating in MS operation mode A or B, **t**his is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of a MS operating in MS operation mode C, this is a PLMN which is not in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service" in the MS

Available PLMN: For A/Gb mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 43.022. For Iu mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 25.304.

Available PLMN/access technology: This is a PLMN in a specific access technology where the MS has found a cell that satisfies certain conditions defined for that access technology (e.g., specified in 3GPP TS 43.022 for A/Gb mode, and in 3GPP TS 25.304 for Iu mode).

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 may not be aware of the existence of the MS (ME) within the chosen cell.

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.

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 for the GSM radio access technology, 3GPP TS 25.304 for the UMTS radio access technology (FDD or TDD mode).

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 GSM System. For multi system case this is determined by the current serving radio access network.

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

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 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 or III (see 3GPP TS 23.060).

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

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

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1).

Registration: This is the process of camping on a cell of the PLMN 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 and it corresponds to routing area for performing the routing area update procedure.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

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

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

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

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022 and for Iu mode in 3GPP TS 25.304.

Visited PLMN of home country: This is a PLMN, different from the home PLMN, where the MCC part of the PLMN identity is the same as the MCC of the IMSI.

Visited PLMN: This is a PLMN, different from the home PLMN.

************************************NEXT CHANGES************************************

4.4.3 PLMN selection

The registration on the selected PLMN and the location registration are only necessary if the MS is capable of services which require registration. Otherwise, the PLMN selection procedures are performed without registration.

The "HPLMN Selector with Access Technology", "User Controlled PLMN Selector with Access Technology" and "Operator Controlled PLMN Selector with Access Technology" data fields in the SIM include associated access technologies for each PLMN entry, see 3GPP TS 31.102. The PLMN/access technology combinations are listed in priority order. If an entry includes more than one access technology, then no priority is defined for the preferred access technology and the priority is an implementation issue.

The Mobile Equipment stores a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. All PLMN/access technology combinations of the PLMNs ~~in the~~ stored in the "Equivalent PLMN" list are regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover.

The MS shall not use the PLMN codes contained in the "HPLMN Selector with Access Technology" data field.

NOTE 1: To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. This version of the specification does not support multiple HLPMN codes and the "HPLMN Selector with Access Technology" data field is only used by the MS to get the HPLMN access technologies. The HPLMN code is the PLMN code included in the IMSI.

NOTE 2: Different GSM frequency bands (eg. 900, 1800, 1900, 400) are all considered GSM access technology. An MS supporting more than one band should scan all the bands it's supports when scanning for GSM frequencies. However GSM COMPACT systems which use GSM frequency bands but with the CBPCCH broadcast channel are considered as a separate access technology from GSM.

**************************************NEXT CHANGES**

4.4.3.3 In VPLMN

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN or 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, taking into account the access technology(ies) associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list). 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 T minutes may be stored in the SIM, T is either in the range 6 minutes to 8 hours in 6 minute steps or it indicates that no periodic attempts shall be made. If no value is stored in the SIM, a default value of 60 minutes is used.

The attempts to access the HPLMN 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;

b) After switch on, a period of at least 2 minutes and at most T minutes shall elapse before the first attempt is made;

c) The MS shall make an attempt 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;

e) If the HPLMN or higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) 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.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN shall be taken into account to compare with the priority level of a selected PLMN.

he) If the PLMN of the highest available PLMN/access technology is the current serving VPLMN or it is in the "Equivalent PLMNs" list, the MS shall remain on its current PLMN/access technology.

**************************************END of CHANGES**

3GPP TSG-CN1 Meeting #33
Atlanta, Georgia, USA 16 – 20 February 2004

Tdoc N1-040494
Revision of Tdoc N1-040479

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **070** ⌘ **rev** **3** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Role of RAT as criteria in the PLMN selection
Source:	⌘	Infineon AG, Motorola, Siemens AG
Work item code:	⌘	TEI6
Date:	⌘	18/02/2004
Category:	⌘	**C**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	It is not clear whether the RAT should be taken into account for the "In VPLMN scan" or not. If the RAT is used here, there is the serious risk that the MS will circle between two or more PLMNs in an endless loop, if the priorities for the PLMN selection are not in line with those for the cell re-selection. This risk is even higher due to the fact that the priorities for the PLMN selection could be configured by the user who is not aware of the network configuration defining the cell re-selection. Such a endless PLMN re-selection would lead to a significant network load (due to the registration procedures) and thus to a significant unnecessary power consumption in the MS. The whole 3GPP system is designed in such a manner that the appropriate bearer for a certain service is selected by the network. The principal not to allow any kind of service based cell or PLMN selection is a commonly agreed principal which was confirmed in several discussions in the past. It was always, especially by the GERAN and RAN groups confirmed, that the PLMN selection has the purpose to select a network operator and that this selection shall not be based on the availability of certain services provided in the current available cells. One major argument for this was, that otherwise there is the great risk that the selection would collide with the radio network planning strategy of the operators.
Summary of change:	⌘	It is proposed to delete the RAT as criteria for the PLMN selection process completely.
Consequences if not approved:	⌘	If the RAT is used in the "in VPLMN" scan there is the serious risk of endless PLMN reselection within between two or more PLMNs. This would lead to significant additional CN signaling load and a significant reduction of the MS standby time.

	Furthermore the inclusion of the RAT in the PLMN selection process has significant potential drawbacks for the radio network planning on the network.

Clauses affected:	⌘	1.2; 4.4.3; 4.4.3.1.1; 4.4.3.1.2, 4.4.3.2.1				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	22.011
		X		Test specifications		34.123, 51.010
			X	O&M Specifications		
Other comments:	⌘					

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 GSM system. For multi system case this is determined by the current serving radio access network.

(Iu mode only): Indicates this clause applies only to UMTS system. 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. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022 and for Iu mode in 3GPP TS 25.304.

Access Technology: The access technology associated with a PLMN. ~~The MS uses this information to determine what type of radio carrier to search for when attempting to select a specific PLMN (e.g., GSM, UMTS or GSM COMPACT).~~ A PLMN may support more than one access technology.

Allowable PLMN: In the case of a MS operating in MS operation mode A or B, **t**his is a PLMN which is not in the list of "forbidden PLMNs" in the MS. In the case of a MS operating in MS operation mode C, this is a PLMN which is not in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service" in the MS

Available PLMN: For A/Gb mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 43.022. For Iu mode this is a PLMN where the MS has found a cell that satisfies certain conditions specified in 3GPP TS 25.304.

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 may not be aware of the existence of the MS (ME) within the chosen cell.

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.

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 for the GSM radio access technology, 3GPP TS 25.304 for the UMTS radio access technology (FDD or TDD mode).

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 GSM System. For multi system case this is determined by the current serving radio access network.

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

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 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 or III (see 3GPP TS 23.060).

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

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

Registered PLMN (RPLMN): This is the PLMN on which certain LR outcomes have occurred (see table 1).

Registration: This is the process of camping on a cell of the PLMN 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 and it corresponds to routing area for performing the routing area update procedure.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

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

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

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

Suitable Cell: This is a cell on which an MS may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP TS 43.022 and for Iu mode in 3GPP TS 25.304.

Visited PLMN of home country: This is a PLMN, different from the home PLMN, where the MCC part of the PLMN identity is the same as the MCC of the IMSI.

Visited PLMN: This is a PLMN, different from the home PLMN.

4.4.3 PLMN selection

The registration on the selected PLMN and the location registration are only necessary if the MS is capable of services which require registration. Otherwise, the PLMN selection procedures are performed without registration.

The "HPLMN Selector with Access Technology", "User Controlled PLMN Selector with Access Technology" and "Operator Controlled PLMN Selector with Access Technology" data fields in the SIM include associated access technologies for each PLMN entry, see 3GPP TS 31.102. A MS which does not support GSM COMPACT shall not use the associated access technologies in these SIM data fields. The PLMNs~~/access technology combinations~~ are listed in priority order. ~~If an entry includes more than one access technology, then no priority is defined for the preferred access technology and the priority is an implementation issue.~~

The Mobile Equipment stores a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. All PLMNs in the stored list are regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover.

The MS shall not use the PLMN codes contained in the "HPLMN Selector with Access Technology" data field.

NOTE 1: To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. This version of the specification does not support multiple HLPMN codes and the "HPLMN Selector with Access Technology" data field is only used by the MS to get the HPLMN access technologies. The HPLMN code is the PLMN code included in the IMSI.

NOTE 2: Different GSM frequency bands (eg. 900, 1800, 1900, 400) are all considered GSM access technology. An MS supporting more than one band should scan all the bands it's supports when scanning for GSM frequencies. However GSM COMPACT systems which use GSM frequency bands but with the CBPCCH broadcast channel are considered as a separate access technology from GSM.

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.

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 operating mode.

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

NOTE: A MS attached to GPRS services should use the above exception only if one or more PDP contexts are currently active.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

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

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

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

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

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 fields are not present) shall ~~instead~~ use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of ~~and shall assume GSM access technology as the highest priority radio access technology~~.

d) In ii, iii, iv and v, 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 fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, 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. The MS shall start its search using the access technologies stored in the "HPLMN Selector with Access Technology" data field on the SIM in priority order as defined in clause 4.4.3 (i.e. the PLMN/access technology combinations are listed in priority order, if an entry includes more than one access technology then no priority is defined for the preferred access technology and the priority is an implementation issue).

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data field is not present) shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology. 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.

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 1: 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 2: 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 field on the SIM.

NOTE 3: High quality signal is defined in the appropriate AS specification.

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

If registration cannot be achieved because no PLMNs are available and allowable, 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 LAs for roaming", or "forbidden LAs for regional provision of service" prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.

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 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)- HPLMN;

ii)- PLMNs contained in the " User Controlled PLMN Selector with Access Technology " data field in the SIM (in priority order);

iii)- PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

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

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 fields are not present) shall instead present the PLMNs contained in the "PLMN Selector" data field in the SIM (in priority order).

In v, requirement h) in clause 4.4.3.1.1 applies.

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

The user may select his desired PLMN and the MS then initiates registration on this PLMN 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 LAs for roaming", "forbidden LAs for regional provision of service", "forbidden PLMNs for GPRS service" and "forbidden PLMNs" lists.

NOTE 1: 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 used should be the access technology chosen by the user for that PLMN. If the MS does not display access technologies, then the access technology chosen for a particular PLMN is implementation dependent ~~should be the highest priority available access technology for that PLMN, if the associated access technologies have a priority order~~.

If the user does not select a PLMN, 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.

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2 User reselection

At any time the user may request the MS to initiate reselection and registration onto an available PLMN, according to the following procedures, dependent upon the operating mode.

4.4.3.2.1 Automatic Network Selection Mode

The MS selects and attempts registration on PLMNs, if available and allowable, in all of its bands of operation in accordance with the following order:

i) HPLMN;

ii) PLMNs contained in the " User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iii) PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iv) other PLMN~~/access technology combinations~~ with the received high quality signal in random order excluding the previously selected PLMN;

v) other PLMN~~/access technology combinations~~, excluding the previously selected PLMN in order of decreasing signal quality or, alternatively, the previously selected PLMN may be chosen ignoring its signal quality;

vi) The previously selected PLMN.

The previously selected PLMN is the PLMN which the MS has selected prior to the start of the user reselection procedure.

NOTE 1: If the previously selected PLMN is chosen, and registration has not been attempted on any other PLMNs, then the MS is already registered on the PLMN, and so registration is not necessary.

The equivalent PLMNs list shall not be applied to the user reselection in Automatic Network Selection Mode.

When following the above procedure the requirements a), b), c), e), f), g), h) in clause 4.4.3.1.1 apply: Requirement d) shall apply as shown below:

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

NOTE 2: High quality signal is defined in the appropriate AS specification.

4.4.3.2.2 Manual Network Selection Mode

The Manual Network Selection Mode Procedure of clause 4.4.3.1.2 is followed.

4.4.3.3 In VPLMN

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN or higher priority PLMN 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 T minutes may be stored in the SIM, T is either in the range 6 minutes to 8 hours in 6 minute steps or it indicates that no periodic attempts shall be made. If no value is stored in the SIM, a default value of 60 minutes is used.

The attempts to access the HPLMN 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;

b) After switch on, a period of at least 2 minutes and at most T minutes shall elapse before the first attempt is made;

c) The MS shall make an attempt 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;

e) If the HPLMN or higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) the MS shall limit its attempts to access higher priority PLMNs to PLMNs of the same country as the current serving VPLMN.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN shall be taken into account to compare with the priority level of a selected PLMN.

4.4.3.4 Investigation Scan for higher prioritized PLMN

The support of this procedure is mandatory if the ME supports GSM COMPACT and otherwise optional.

A MS capable of both GSM voice and packet service shall, when indicated in the SIM, investigate if there is service from a higher prioritized PLMN not offering GSM voice service, either HPLMN or a PLMN in a "PLMN Selector with Access Technology " data field on the SIM.

The MS shall scan for PLMNs in accordance with the requirements described for automatic network selection mode in clause 4.4.3.1.1 that are applicable to i), ii) and iii) with the exception of requirement a) and b) in clause 4.4.3.1. Requirement a) and b) that are specified for automatic network selection mode in clause 4.4.3.1 shall be ignored during the investigation scan.

If indicated on the SIM, the investigation scan shall be performed:

i) After each successful PLMN selection and registration is completed, when the MS is in idle mode. This investigation scan may rely on the information from the already performed PLMN selection and may not necessarily require a rescan

ii) When the MS is unable to obtain normal service from a PLMN, (limited service state) see clause 3.5.

The investigation scan is restricted to automatic selection mode and shall only be performed by an MS that is capable of both voice and packet data. It shall only be performed if the selected PLMN is not already the highest prioritized PLMN in the current country. (HPLMN in home country, otherwise according to PLMN selector lists)

The MS shall return to RPLMN after the investigation scan is performed.

If a higher prioritized PLMN not offering GSM voice service is found, this shall be indicated to the user. The MS shall not select the PLMN unless requested by the user.

4.4.4 Abnormal cases

If there is no SIM in the MS, if there is an authentication failure, or if the MS receives an "IMSI unknown in HLR", "illegal ME" or "illegal MS" response to an LR request, then effectively there is no selected PLMN ("No SIM" state). In these cases, the states of the cell selection process are such that no PLMN selection information is used. No further attempts at registration on any PLMN are made until the MS is switched off and on again, or a SIM is inserted.

When in Automatic Network Selection mode and the MS is in the "not updated" state with one or more suitable cells to camp on; then after the maximum allowed unsuccessful LR requests (controlled by the specific attempt counters) the MS may continue (or start if it is not running) the user reselection procedure of 4.4.3.2 1.

4.4.5 Roaming not allowed in this LA

If in either PLMN selection mode the LR response "Roaming not allowed in this LA" is received:

The PLMN Automatic or Manual Mode Selection Procedure of clause 4.4.3.1 are followed, depending on whether the MS is in automatic or manual mode.