3GPP TSG CN Plenary **Tdoc NP-010277**
Meeting #12, Stockholm, Sweden
13th - 15th June 2001

Source: **TSG CN WG 1**

Title: **CRs to R99 (with mirror CRs) on Work Item GSM / UMTS interworking towards 24.008 and 23.122**

Agenda item: **7.14**

Document for: **APPROVAL**

Introduction:

This document contains **6** CRs on **R99 (with mirror CRs) on** Work Item **"GSM / UMTS interworking"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #12 for approval.

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Version-Current	Workitem
24.008	399		N1-010615	R99	Stored list of equivalent PLMNs and error/abnormal cases	F	3.7.0	GSM/UMTS interworking
24.008	400		N1-010616	Rel-4	Stored list of equivalent PLMNs and error/abnormal cases	A	4.2.0	GSM/UMTS interworking
23.122	023	1	N1-010668	R99	Stored list of equivalent PLMNs and error/abnormal cases	F	3.6.0	GSM/UMTS interworking
23.122	024	1	N1-010669	Rel-4	Stored list of equivalent PLMNs and error/abnormal cases	A	4.0.0	GSM/UMTS interworking
24.008	402	2	N1-010837	R99	Classmark 1,2 and 3 corrections	F	3.7.0	GSM-UMTS interworking
24.008	403	2	N1-010838	Rel-4	Classmark 1,2 and 3 corrections	A	4.2.0	GSM-UMTS interworking

3GPP TSG_CN WG1 Ad-Hoc ***Tdoc N1-01066~~813~~***
Helsinki, Finland
8 - 9 May, 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.122 CR 023** ⌘ rev **1** ⌘ Current version: **3.6.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network ☐ Core Network ☐

Title:	⌘	Stored list of equivalent PLMNs and error/abnormal cases
Source:	⌘	Telia AB
Work item code:	⌘	GSM-UMTS INTERWORKING
Date:	⌘	30 April 2001
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(essential 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)

Reason for change:	⌘	At TSG #11 the mechanism of equivalent PLMNs was introduced. In some situations the UE/MS shall delete the RPLMN. It is not explicitely stated that the stored list of equivalent PLMNs shall then also be deleted.
Summary of change:	⌘	Explicit statement that the stored list of equivalent PLMNs shall be deleted when the RPLMN is deleted.
Consequences if not approved:	⌘	Uncertainty whether to delete the list or not.

Clauses affected:	⌘	
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	Mirror CR is required for REL-4.

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

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	Indeterminate(1)	No registered PLMN (4)
c) Roaming not allowed in this LA	Indeterminate (2)	No registered PLMN (4)
Not updated	Unsuccessful	No registered PLMN (4)

1) The MS will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a cell, when registration will be unsuccessful.

2) The MS will select the HPLMN if in automatic mode and will enter Automatic Network Selection Mode Procedure of subclause 4.4.3.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of subclause 4.4.3.1.2 If the appropriate process does not result in registration, the MS will eventually enter the limited service state.

3) A 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) If there is no registered PLMN, the stored list of equivalent PLMNs is invalid.

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.

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CHANGE REQUEST

⌘ **23.122 CR 024** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Stored list of equivalent PLMNs and error/abnormal cases
Source:	⌘	Telia AB
Work item code:	⌘	GSM-UMTS INTERWORKING
Date:	⌘	30 April 2001
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
F *(essential 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)

Reason for change:	⌘	At TSG #11 the mechanism of equivalent PLMNs was introduced. In some situations the UE/MS shall delete the RPLMN. It is not explicitely stated that the stored list of equivalent PLMNs shall then also be deleted.
Summary of change:	⌘	Explicit statement that the stored list of equivalent PLMNs shall be deleted when the RPLMN is deleted.
Consequences if not approved:	⌘	Uncertainty whether to delete the list or not.

Clauses affected:	⌘	
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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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.

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	Indeterminate(1)	No registered PLMN (4)
c) Roaming not allowed in this LA	Indeterminate (2)	No registered PLMN (4)
Not updated	Unsuccessful	No registered PLMN (4)

1) The MS will eventually either enter a different state when the registration status will be determined, or fail to be able to camp on a cell, when registration will be unsuccessful.

2) The MS will select the HPLMN if in automatic mode and will enter Automatic Network Selection Mode Procedure of subclause 4.4.3.1. If in manual mode, the MS will display the list of available PLMNs and follow the Manual Network Selection Mode Procedure of subclause 4.4.3.1.2 If the appropriate process does not result in registration, the MS will eventually enter the limited service state.

3) A 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) If there is no registered PLMN, the stored list of equivalent PLMNs is invalid.

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.

3GPP TSG_CN WG1 Ad-Hoc ***Tdoc N1-010615***
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CHANGE REQUEST

⌘ **24.008** **CR** **399** ⌘ rev ⌘ Current version: **3.7.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Stored list of equivalent PLMNs and error/abnormal cases
Source:	⌘	Telia AB
Work item code:	⌘	GSM-UMTS INTERWORKING
Date:	⌘	30 April 2001
Category:	⌘	**F**
Release:	⌘	R99

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R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	In CR 390r1 (TDoc NP-010209) the list of equivalent PLMNs was introduced. Unfortunately, in a couple of error cases, where this list is to be deleted, it was forgotten to state explicetely that the list should be deleted.
Summary of change:	⌘	Explicit statement that the stored list of equivalent PLMNs shall be deleted.
Consequences if not approved:	⌘	Uncertainty whether to delete the list or not.

Clauses affected:	⌘	
Other specs affected:	⌘	☒ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	Mirror CR is required for REL-4.

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4.4.4.9 Abnormal cases on the mobile station side

The different abnormal cases that can be identified are the following:

a) Access barred because of access class control

The location updating procedure is not started. The mobile station stays in the current serving cell and applies normal cell reselection process. The procedure is started as soon as possible and if still necessary (when the barred state is ended or because of a cell change)

b) The answer to random access is an IMMEDIATE ASSIGNMENT REJECT message (A/Gb mode only)

The location updating is not started. The mobile station stays in the chosen cell and applies normal cell selection process. The waiting timer T3122 is reset when a cell change occurs. The procedure is started as soon as possible after T3122 timeout if still necessary.

c) Random access failure (A/Gb mode only)

Timer T3213 is started. When it expires the procedure is attempted again if still necessary.

NOTE: As specified in GSM 05.08, a cell reselection then takes place, with return to the cell inhibited for 5 seconds if there is at least one other suitable cell. Typically the selection process will take the mobile station back to the cell where the random access failed after 5 seconds.

If at the expiry of timer T3213 a new cell has not been selected due to the lack of valid information (see GSM 05.08), the mobile station may as an option delay the repeated attempt for up to 8 seconds to allow cell re-selection to take place. In this case the procedure is attempted as soon as a new cell has been selected or the mobile station has concluded that no other cell can be selected.

If random access failure occurs for two successive random access attempts for location updating the mobile station proceeds as specified below.

d) RR connection failure

The procedure is aborted and the mobile station proceeds as specified below.

e) T3210 timeout

The procedure is aborted, the RR connection is aborted and the MS proceeds as specified below.

f) RR release before the normal end of procedure

The procedure is aborted and the mobile station proceeds as specified below.

g) Location updating reject, other causes than those treated in section 4.4.4.7

The MS waits for release of the RR connection as specified in section 4.4.4.8, and then proceeds as specified below.

h) RR connection establishment failure (Iu mode only)

The procedure is aborted and the mobile station proceeds as specified below.

NOTE: Case h) covers all cases when the signalling connection cannot be established, including random access failure and access reject. As the RRC protocol has error specific retransmission mechanisms (see 3GPP TS 25.331), there is no need to distinguish between the different error cases within MM.

In cases d) to h) above and for repeated failures as defined in c) above the mobile station proceeds as follows. Timer T3210 is stopped if still running. The RR Connection is aborted in case of timer T3210 timeout. The attempt counter is incremented. The next actions depend on the Location Area Identities (stored and received from the BCCH of the current serving cell) and the value of the attempt counter.

– the update status is UPDATED, and the stored LAI is equal to the one received on the BCCH from the current serving cell and the attempt counter is smaller than 4:

The mobile station shall keep the update status to UPDATED, the MM IDLE sub-state after the RR connection release is NORMAL SERVICE. The mobile station shall memorize the location updating type used in the location updating procedure. It shall start timer T3211 when the RR connection is released. When timer T3211 expires the location updating procedure is triggered again with the memorized location updating type;

– either the update status is different from UPDATED, or the stored LAI is different from the one received on the BCCH from the current serving cell, or the attempt counter is greater or equal to 4:

The mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM, and list of equivalent PLMNs, set the update status to NOT UPDATED and enter the MM IDLE sub-state ATTEMPTING TO UPDATE when the RR connection is released (See section 4.2.2.2 for the subsequent actions). If the attempt counter is smaller than 4, the mobile station shall memorize that timer T3211 is to be started when the RR connection is released, otherwise it shall memorize that timer T3212 is to be started when the RR connection is released.

********** NEXT MODIFIED SECTION **********

4.7.3.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

a) Access barred because of access class control

The GPRS attach procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The GPRS attach procedure is started as soon as possible, i.e. when access is granted or because of a cell change.

b) Lower layer failure before the ATTACH ACCEPT or ATTACH REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

c) T3310 time-out

On the first expiry of the timer, the MS reset and restart timer T3310 and shall retransmit the ATTACH REQUEST message. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3310, the GPRS attach procedure shall be aborted and the MS shall proceed as described below.

d) ATTACH REJECT, other causes than those treated in section 4.7.3.1.4
The MS shall proceed as described below.

e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA when the MS is in state GMM-REGISTERED-INITIATED, then the cell update procedure shall be performed before completion of the attach procedure.

f) Change of cell into a new routing area

If a cell change into a new routing area occurs before an ATTACH ACCEPT or ATTACH REJECT message has been received, the GPRS attach procedure shall be aborted and re-initiated immediately. If a routing area border is crossed when the ATTACH ACCEPT message is received but before an ATTACH COMPLETE message is sent, the GPRS attach procedure shall be aborted and the routing area updating procedure shall be initiated. If a P-TMSI was allocated during the GPRS attach procedure, this P-TMSI shall be used in the routing area updating procedure. If a P-TMSI signature was allocated together with the P-TMSI during the GPRS attach procedure, this P-TMSI signature shall be used in the routing area updating procedure.

g) Mobile originated detach required

If the MS is in state GMM-REGISTERED-INITIATED, the GPRS attach procedure shall be aborted and the GPRS detach procedure shall be performed (see 4.7.4.1).

h) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-REGISTERED-INITIATED with type of detach 're-attach not required, the GPRS detach procedure shall be progressed and the GPRS attach procedure shall be aborted. Otherwise the GPRS attach procedure shall be progressed and the DETACH REQUEST message shall be ignored.

In cases b, c and d the MS shall proceed as follows. Timer T3310 shall be stopped if still running. The GPRS attach attempt counter shall be incremented.

If the GPRS attach attempt counter is less than 5:

- timer T3311 is started and the state is changed to GMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

If the GPRS attach attempt counter is greater than or equal to 5:

- the MS shall delete any RAI, P-TMSI, P-TMSI signature, list of equivalent PLMNs, and GPRS ciphering key sequence number, shall set the GPRS update status to GU2 NOT UPDATED, shall start timer T3302. The state is changed to GMM-DEREGISTERED..ATTEMPTING-TO-ATTACH or optionally to GMM-DEREGISTERED.PLMN-SEARCH (see 4.2.4.1.2).

- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

********** NEXT MODIFIED SECTION **********

4.7.3.2.4 Combined GPRS attach not accepted by the network

If the attach request can neither be accepted by the network for GPRS nor for non-GPRS services, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message stops timer T3310, deletes the list of equivalent PLMNs, and takes one of the following actions depending upon the reject cause:

3 (Illegal MS);

6 (Illegal ME); or

7 (GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new GMM state is GMM-DEREGISTERED; the MM state is MM IDLE. A GPRS MS operating in MS operation mode A shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure; a GPRS MS operating in MS operation mode B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

8 (GPRS services and non-GPRS services not allowed)

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

11 (PLMN not allowed);

12 (Location area not allowed); or

13 (Roaming not allowed in this location area).

The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the routing area updating attempt counter and reset the GPRS attach attempt counter and changes to state GMM-DEREGISTERED. The MS shall set the update status to U3 ROAMING NOT ALLOWED, reset the location update attempt counter and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection.

14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.2.5.

4.7.3.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.3.1.5 apply with the following modification:

If the GPRS attach attempt counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS attach attempt counter is incremented according to section 4.7.3.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the attach attempt counter:

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the attach attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE; or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the attach attempt counter is greater or equal to 5, then the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and list of equivalent PLMNs and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

********** NEXT MODIFIED SECTION **********

4.7.5.2.4 Combined routing area updating not accepted by the network

If the combined routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message stops timer T3330, deletes the list of equivalent PLMNs, and enters state MM IDLE. The MS shall then take different actions depending on the received reject cause:

3 (Illegal MS);

6 (Illegal ME);

7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

8 (GPRS services and non GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non GPRS services until switching off or the SIM is removed.

9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

10 (Implicitly detached);

A GPRS MS operating in MS operation mode A or B in network operation mode I, is IMSI detached for both GPRS and CS services in the network.

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

11 (PLMN not allowed);

12 (Location area not allowed);

13 (Roaming not allowed in this location area); or

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number GPRS ciphering key sequence number, and reset the location update attempt counter.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13. If #11 or #13 was received, the MS shall then perform a PLMN selection instead of a cell selection.

14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.2.5.

4.7.5.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.5.1.5 apply with the following modification:

If the GPRS routing area updating counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS routing area updating attempt counter is incremented according to section 4.7.5.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the routing area updating attempt counter.

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the routing area updating attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE, or

- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the routing area updating attempt counter is greater or equal to 5, the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and list of equivalent PLMNs and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

3GPP TSG_CN WG1 Ad-Hoc ***Tdoc N1-010616***
Helsinki, Finland
8 - 9 May, 2001

CR-Form-v3

CHANGE REQUEST

⌘ **24.008** **CR** **400** ⌘ rev ⌘ Current version: **4.2.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Stored list of equivalent PLMNs and error/abnormal cases
Source:	⌘	Telia AB
Work item code:	⌘	GSM-UMTS INTERWORKING
Date:	⌘	30 April 2001
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
F *(essential 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)

Reason for change:	⌘	In CR 391r1 (TDoc NP-010210) the list of equivalent PLMNs was introduced. Unfortunately, in a couple of error cases, where this list is to be deleted, it was forgotten to state explicetely that the list should be deleted.
Summary of change:	⌘	Explicit statement that the stored list of equivalent PLMNs shall be deleted.
Consequences if not approved:	⌘	Uncertainty whether to delete the list or not.

Clauses affected:	⌘	
Other specs affected:	⌘	☒ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

4.4.4.9 Abnormal cases on the mobile station side

The different abnormal cases that can be identified are the following:

a) Access barred because of access class control

The location updating procedure is not started. The mobile station stays in the current serving cell and applies normal cell reselection process. The procedure is started as soon as possible and if still necessary (when the barred state is ended or because of a cell change)

b) The answer to random access is an IMMEDIATE ASSIGNMENT REJECT message (A/Gb mode only)

The location updating is not started. The mobile station stays in the chosen cell and applies normal cell selection process. The waiting timer T3122 is reset when a cell change occurs. The procedure is started as soon as possible after T3122 timeout if still necessary.

c) Random access failure (A/Gb mode only)

Timer T3213 is started. When it expires the procedure is attempted again if still necessary.

NOTE: As specified in 3GPP TS 05.08, a cell reselection then takes place, with return to the cell inhibited for 5 seconds if there is at least one other suitable cell. Typically the selection process will take the mobile station back to the cell where the random access failed after 5 seconds.

If at the expiry of timer T3213 a new cell has not been selected due to the lack of valid information (see 3GPP TS 05.08), the mobile station may as an option delay the repeated attempt for up to 8 seconds to allow cell re-selection to take place. In this case the procedure is attempted as soon as a new cell has been selected or the mobile station has concluded that no other cell can be selected.

If random access failure occurs for two successive random access attempts for location updating the mobile station proceeds as specified below.

d) RR connection failure

The procedure is aborted and the mobile station proceeds as specified below.

e) T3210 timeout

The procedure is aborted, the RR connection is aborted and the MS proceeds as specified below.

f) RR release before the normal end of procedure

The procedure is aborted and the mobile station proceeds as specified below.

g) Location updating reject, other causes than those treated in section 4.4.4.7

The MS waits for release of the RR connection as specified in section 4.4.4.8, and then proceeds as specified below.

h) RR connection establishment failure (Iu mode only)

The procedure is aborted and the mobile station proceeds as specified below.

NOTE: Case h) covers all cases when the signalling connection cannot be established, including random access failure and access reject. As the RRC protocol has error specific retransmission mechanisms (see 3GPP TS 25.331), there is no need to distinguish between the different error cases within MM.

In cases d) to h) above and for repeated failures as defined in c) above the mobile station proceeds as follows. Timer T3210 is stopped if still running. The RR Connection is aborted in case of timer T3210 timeout. The attempt counter is incremented. The next actions depend on the Location Area Identities (stored and received from the BCCH of the current serving cell) and the value of the attempt counter.

– the update status is UPDATED, and the stored LAI is equal to the one received on the BCCH from the current serving cell and the attempt counter is smaller than 4:

The mobile station shall keep the update status to UPDATED, the MM IDLE sub-state after the RR connection release is NORMAL SERVICE. The mobile station shall memorize the location updating type used in the location updating procedure. It shall start timer T3211 when the RR connection is released. When timer T3211 expires the location updating procedure is triggered again with the memorized location updating type;

– either the update status is different from UPDATED, or the stored LAI is different from the one received on the BCCH from the current serving cell, or the attempt counter is greater or equal to 4:

The mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM, and list of equivalent PLMNs, set the update status to NOT UPDATED and enter the MM IDLE sub-state ATTEMPTING TO UPDATE when the RR connection is released (See section 4.2.2.2 for the subsequent actions). If the attempt counter is smaller than 4, the mobile station shall memorize that timer T3211 is to be started when the RR connection is released, otherwise it shall memorize that timer T3212 is to be started when the RR connection is released.

********** NEXT MODIFIED SECTION **********

4.7.3.1.5 Abnormal cases in the MS

The following abnormal cases can be identified:

a) Access barred because of access class control

The GPRS attach procedure shall not be started. The MS stays in the current serving cell and applies normal cell reselection process. The GPRS attach procedure is started as soon as possible, i.e. when access is granted or because of a cell change.

b) Lower layer failure before the ATTACH ACCEPT or ATTACH REJECT message is received

The procedure shall be aborted. The MS shall proceed as described below.

c) T3310 time-out

On the first expiry of the timer, the MS reset and restart timer T3310 and shall retransmit the ATTACH REQUEST message. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3310, the GPRS attach procedure shall be aborted and the MS shall proceed as described below.

d) ATTACH REJECT, other causes than those treated in section 4.7.3.1.4
The MS shall proceed as described below.

e) Change of cell within the same RA (GSM only)

If a cell change occurs within the same RA when the MS is in state GMM-REGISTERED-INITIATED, then the cell update procedure shall be performed before completion of the attach procedure.

f) Change of cell into a new routing area

If a cell change into a new routing area occurs before an ATTACH ACCEPT or ATTACH REJECT message has been received, the GPRS attach procedure shall be aborted and re-initiated immediately. If a routing area border is crossed when the ATTACH ACCEPT message is received but before an ATTACH COMPLETE message is sent, the GPRS attach procedure shall be aborted and the routing area updating procedure shall be initiated. If a P-TMSI was allocated during the GPRS attach procedure, this P-TMSI shall be used in the routing area updating procedure. If a P-TMSI signature was allocated together with the P-TMSI during the GPRS attach procedure, this P-TMSI signature shall be used in the routing area updating procedure.

g) Mobile originated detach required

If the MS is in state GMM-REGISTERED-INITIATED, the GPRS attach procedure shall be aborted and the GPRS detach procedure shall be performed (see 4.7.4.1).

h) Procedure collision

If the MS receives a DETACH REQUEST message from the network in state GMM-REGISTERED-INITIATED with type of detach 're-attach not required, the GPRS detach procedure shall be progressed and the GPRS attach procedure shall be aborted. Otherwise the GPRS attach procedure shall be progressed and the DETACH REQUEST message shall be ignored.

In cases b, c and d the MS shall proceed as follows. Timer T3310 shall be stopped if still running. The GPRS attach attempt counter shall be incremented.

If the GPRS attach attempt counter is less than 5:

- timer T3311 is started and the state is changed to GMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

If the GPRS attach attempt counter is greater than or equal to 5:

- the MS shall delete any RAI, P-TMSI, P-TMSI signature, list of equivalent PLMNs, and GPRS ciphering key sequence number, shall set the GPRS update status to GU2 NOT UPDATED, shall start timer T3302. The state is changed to GMM-DEREGISTERED..ATTEMPTING-TO-ATTACH or optionally to GMM-DEREGISTERED.PLMN-SEARCH (see 4.2.4.1.2).

- In UMTS, in case c the MS shall release the PS signaling connection and in case d the network shall release the PS signaling connection for this MS (see 3GPP TS 25.331).

********** NEXT MODIFIED SECTION **********

4.7.3.2.4 Combined GPRS attach not accepted by the network

If the attach request can neither be accepted by the network for GPRS nor for non-GPRS services, an ATTACH REJECT message is transferred to the MS. The MS receiving the ATTACH REJECT message stops timer T3310, deletes the list of equivalent PLMNs, and takes one of the following actions depending upon the reject cause:

3 (Illegal MS);

6 (Illegal ME);

7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new GMM state is GMM-DEREGISTERED; the MM state is MM IDLE. A GPRS MS operating in MS operation mode A shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure; a GPRS MS operating in MS operation mode B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

8 (GPRS services and non-GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The new GMM state is GMM-DEREGISTERED. The new MM state is MM IDLE.

The MS shall set the update status to U3 ROAMING NOT ALLOWED, shall delete any TMSI, LAI and ciphering key sequence number. The SIM shall be considered as invalid for GPRS and non-GPRS services until switching off or the SIM is removed.

11 (PLMN not allowed);

12 (Location area not allowed);

13 (Roaming not allowed in this location area); or

The MS shall delete any RAI, P-TMSI, P-TMSI signature and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2), shall reset the routing area updating attempt counter and reset the GPRS attach attempt counter and changes to state GMM-DEREGISTERED. The MS shall set the update status to U3 ROAMING NOT ALLOWED, reset the location update attempt counter and shall delete any TMSI, LAI and ciphering key sequence number. The new MM state is MM IDLE.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13. If cause #11 or #13 was received, the MS shall perform a PLMN selection instead of a cell selection.

14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B shall then perform an IMSI attach for non-GPRS services by use of the MM IMSI attach procedure.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is specified in section 4.7.3.2.5.

4.7.3.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.3.1.5 apply with the following modification:

If the GPRS attach attempt counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS attach attempt counter is incremented according to section 4.7.3.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the attach attempt counter:

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the attach attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE; or
- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the attach attempt counter is greater or equal to 5, then the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and list of equivalent PLMNs and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

********** NEXT MODIFIED SECTION **********

4.7.5.2.4 Combined routing area updating not accepted by the network

If the combined routing area updating cannot be accepted, the network sends a ROUTING AREA UPDATE REJECT message to the MS. An MS that receives a ROUTING AREA UPDATE REJECT message stops timer T3330, deletes the list of equivalent PLMNs, and enters state MM IDLE. The MS shall then take different actions depending on the received reject cause:

3 (Illegal MS);

6 (Illegal ME);

7 (GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. The SIM shall be considered as invalid for GPRS services until switching off or the SIM is removed. The new state is GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network. and shall then proceed with the appropriate MM specific procedure according to the MM service state

8 (GPRS services and non GPRS services not allowed);

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number and GPRS ciphering key sequence number and shall consider the SIM as invalid for GPRS and non GPRS services until switching off or the SIM is removed.

9 (MS identity cannot be derived by the network);

The MS shall set the GPRS update status to GU2 NOT UPDATED (and shall store it according to section 4.1.3.2), enter the state GMM-DEREGISTERED, and shall delete any P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number. Subsequently, the MS may automatically initiate the GPRS attach procedure.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network.

10 (Implicitly detached);

A GPRS MS operating in MS operation mode A or B in network operation mode I, is IMSI detached for both GPRS and CS services in the network.

The MS shall change to state GMM-DEREGISTERED.NORMAL-SERVICE. The MS shall then perform a new attach procedure. The MS should also activate PDP context(s) to replace any previously active PDP contexts.

NOTE: In some cases, user interaction may be required and then the MS cannot activate the PDP context(s) automatically.

11 (PLMN not allowed);

12 (Location area not allowed);

13 (Roaming not allowed in this location area); or

The MS shall set the GPRS update status to GU3 ROAMING NOT ALLOWED and the update status to U3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and enter the state GMM-DEREGISTERED. Furthermore, it shall delete any P-TMSI, P-TMSI signature, TMSI, RAI, LAI, ciphering key sequence number GPRS ciphering key sequence number, and reset the location update attempt counter.

The MS shall store the LAI or the PLMN identity in the appropriate forbidden list, i.e. in the "forbidden PLMN list" for cause #11, in the list of "forbidden location areas for regional provision of service" for cause #12 or in the list of "forbidden location areas for roaming" for cause #13. If #11 or #13 was received, the MS shall then perform a PLMN selection instead of a cell selection.

14 (GPRS services not allowed in this PLMN)

The MS shall delete any RAI, P-TMSI, P-TMSI signature, and GPRS ciphering key sequence number stored, shall set the GPRS update status to GU3 ROAMING NOT ALLOWED (and shall store it according to section 4.1.3.2) and shall change to state GMM-DEREGISTERED. If in the MS the timer T3212 is not already running, the timer shall be set to its initial value and restarted.

The MS shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list.

A GPRS MS operating in MS operation mode A or B in network operation mode I, is still IMSI attached for CS services in the network and shall then proceed with the appropriate MM specific procedure according to the MM service state.

Other values are considered as abnormal cases. The specification of the MS behaviour in those cases is described in section 4.7.5.2.5.

4.7.5.2.5 Abnormal cases in the MS

The abnormal cases specified in section 4.7.5.1.5 apply with the following modification:

If the GPRS routing area updating counter is less than 5, the MM state remains MM LOCATION UPDATING PENDING.

If the GPRS routing area updating attempt counter is incremented according to section 4.7.5.1.5 the next actions depend on the Location Area Identities (stored on SIM and the one of the current serving cell) and the value of the routing area updating attempt counter.

- if the update status is U1 UPDATED, and the stored LAI is equal to the one of the current serving cell and the routing area updating attempt counter is smaller than 5, then the mobile station shall keep the update status to U1 UPDATED, the new MM state is MM IDLE substate NORMAL SERVICE, or

- if the update status is different from U1 UPDATED, or the stored LAI is different from the one of the current serving cell, or the routing area updating attempt counter is greater or equal to 5, the mobile station shall delete any LAI, TMSI, ciphering key sequence number stored in the SIM and list of equivalent PLMNs and set the update status to U2 NOT UPDATED. The new MM state is MM IDLE substate ATTEMPTING TO UPDATE.

3GPP TSG_CN WG1 Meeting #17 **Tdoc N1-010837**
Puerto Rico, USA **(rev of N1-010810 rev of N1-010621)**
14 - 18 May, 2001

CR-Form-v3

CHANGE REQUEST

⌘ **24.008** **CR** **402** ⌘ rev **2** ⌘ Current version: 3.7.0 ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network **X**

Title:	⌘	CLASSMARK1, 2 and 3 corrections.
Source:	⌘	VODAFONE
Work item code:	⌘	GSM-UMTS interworking.
Date:	⌘	2nd May 2001.
Category:	⌘	F
Release:	⌘	R99

Use one of the following categories:
F *(essential 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)

Reason for change:	⌘	When access is performed via UMTS channels, information on GSM MS capability is *not* irrelevant as this is used by the RNC for decision on **handover from UMTS to GSM**. The required specification of the coding of CLASSMARK doesn't allow the network to distinguish unambiguously single banded GSM mobiles. This may lead to dropped calls if the network can't understand the precise implementation in the mobile. Also it is impossible for a UMTS mobile not supporting GSM to signal its capability without misleadingly indicate that it supports GSM as well.
Summary of change:	⌘	It is clarified how a single band GSM mobile and a UMTS only mobile need to code the classmarks 1, 2 and 3.
Consequences if not approved:	⌘	There will be a misunderstanding between network and mobile as to what coding schemes and handovers are supported. This can lead to the network attempting to hand the mobile some where or send information which the mobile is unable to decode.

Clauses affected:	⌘	10.5.1.5, 10.5.1.6 & 10.5.1.7
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	This CR is a copy of that found within Tdoc N1-010620 (GP-010847). It has been created using the most recent reference version of 24.008, but the changes are the same as those identified in N1-010620 (GP-010847). A CR proposing almost

identical changes for Release 4 appears in CR403.

10.5.1.5 Mobile Station Classmark 1

The purpose of the *Mobile Station Classmark 1* information element is to provide the network with information concerning aspects of high priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 1* information element is coded as shown in figure 10.5.5/3GPP TS 24.008 and table 10.5.5/3GPP TS 24.008.

The *Mobile Station Classmark 1* is a type 3 information element with 2 octets length.

8	7	6	5	4	3	2	1	
Mobile Station Classmark 1 IEI								octet 1
0 spare	Revision level		ES IND	A5/1	RF power capability			octet 2

Figure 10.5.5/3GPP TS 24.008 *Mobile Station Classmark 1* information element

~~A MS supporting GSM shall always encode all fields relevant for GSM radio access technology, even when accessing UMTS radio access technology. A UMTS MS which does not support GSM shall encode fields relevant only for GSM radio access tecnology using any value which has been defined for this version of the protocol and is not reserved.~~

Table 10.5.5/3GPP TS 24.008: *Mobile Station Classmark 1* information element

Revision level (octet 2)
~~Required for MS supporting GSM and UMTS.~~
Bits

7	**6**	
0	0	Reserved for GSM phase 1
0	1	Used by GSM phase 2 mobile stations
1	0	Used by mobile stations supporting R99 or later versions of the protocol
1	1	Reserved for future use

ES IND (octet 2, bit 5) "Controlled Early Classmark Sending" option implementation
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0	"Controlled Early Classmark Sending" option is not implemented in the MS
1	"Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value.

A5/1 algorithm supported (octet 2, bit4)
~~Required for mobile station supporting GSM.~~
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0	encryption algorithm A5/1 available
1	encryption algorithm A5/1 not available

RF power capability (octet 2)
~~Required for mobile stations supporting GSM.~~
When GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see GSM 04.18), the MS shall indicate the RF power capability of the band used (see table);
When UMTS is used, a single band GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5

All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see 3GPP TS 04.18, sub-clause 3.4.18), the MS shall indicate the RF power capability of the band used (see table) ;~~:~~
When UMTS is used, a single band DCS1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3

All other values are reserved.
~~All other values are reserved.~~
When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):
Bits

3	**2**	**1**	
1	1	1	~~Shall be sent;~~ RF Power capability is irrelevant in this information element

All other values are reserved.

10.5.1.6 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 2* information element is coded as shown in figure 10.5.6/3GPP TS 24.008, table 10.5.6a/3GPP TS 24.008 and table 10.5.6b/3GPP TS 24.008.
The *Mobile Station Classmark 2* is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	Mobile station classmark 2 IEI							octet 1
Length of mobile station classmark 2 contents								octet 2
0 spare	Revision Level		ES IND	A5/1	RF power capability			octet 3
0 spare	PS capa.	SS Screen. Indicator		SM ca Pabi.	VBS	VGCS	FC	octet 4
CM3	0 spare	LCSVA CAP	UCS2	SoLSA	CMSP	A5/3	A5/2	octet 5

NOTE: Owing to backward compatibility problems, bit 8 of octet 4 should not be used unless it is also checked that the bits 8, 7 and 6 of octet 3 are not "0 0 0".

Figure 10.5.6/3GPP TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

Revision level (octet 3)
~~Required for MS supporting GSM and UMTS.~~
Bits

7	**6**	
0	0	Reserved for GSM phase 1
0	1	Used by GSM phase 2 mobile stations
1	0	Used by mobile stations supporting R99 or later versions of the protocol
1	1	Reserved for future use

ES IND (octet 3, bit 5) "Controlled Early Classmark Sending" option implementation
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0	"Controlled Early Classmark Sending" option is not implemented in the MS
1	"Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

A5/1 algorithm supported (octet 3, bit 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF Power Capability (Octet 3)
~~Required for MS supporting GSM.~~
When GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see GSM 04.18)~~:~~, the MS shall indicate the RF power capability of the band used (see table);
When UMTS is used, a single band GSM 450, GSM 480, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.

Bits
3 2 1
0 0 0 Class 1
0 0 1 Class 2
0 1 0 Class 3
0 1 1 Class 4
1 0 0 Class 5
All other values are reserved.
~~All other values are reserved.~~

When the DCS 1800 or PCS 1900 band is used (for exceptions see GSM 04.18~~3~~)~~:~~, the MS shall indicate the RF power capability of the band used (see table) ;
When UMTS is used, a single band DCS1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table); in this case information on which single band is supported is found in classmark 3.
Bits
3 2 1
0 0 0 Class 1
0 0 1 Class 2
0 1 0 Class 3
All other values are reserved.
~~All other values are reserved.~~
When UMTS is used, an MS not supporting any GSM ban d or a multiband GSM MS shall code this field as follows (see table):
Bits
3 2 1
1 1 1 ~~Shall be sent;~~ RF Power capability is irrelevant in this information element
All other values are reserved.
~~All other values are reserved.~~

PS capability (pseudo-synchronization capability) (octet 4)
~~Required for MS supporting GSM~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **7**
0 PS capability not present
1 PS capability present

SS Screening Indicator (octet 4)
~~Required for MS supporting GSM and UMTS~~
Bits
6 5
0 0 defined in 3GPP TS 24.080
0 1 defined in 3GPP TS 24.080
1 0 defined in 3GPP TS 24.080
1 1 defined in 3GPP TS 24.080

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

SM capability (MT SMS pt to pt capability) (octet 4)
~~Required for MS supporting GSM.~~
Bit **4**
0 Mobile station does not support mobile terminated point to point SMS
1 Mobile station supports mobile terminated point to point SMS

~~Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element~~

VBS notification reception (octet 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **3**
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

VGCS notification reception (octet 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
Bit **2**
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted

FC Frequency Capability (octet 4)
~~Required for MS supporting GSM.~~
When the GSM 400 or GSM 850 or DCS 1800 or PCS 1900 band or UMTS is used (for exceptions see GSM 04.18, for definitions of frequency band see GSM 05.05), this bit shall be sent with the value '0'.~~:~~
~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see GSM 05.05)~~
Note: This bit conveys no information about support or non support of the E-GSM or R-GSM bands when ~~transmitted on a~~ GSM 400, GSM 850, DCS1800, PCS1900 band or UMTS is used~~channel~~.

~~When GSM 850 band is used (for exceptions see GSM 04.18:~~
~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see GSM 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a GSM 850 channel.~~

When a GSM 900 band is used (for exceptions see GSM 04.18):
Bit **1**
0 The MS does not support the E-GSM or R-GSM band (For definition of frequency bands see GSM 05.05)
1 The MS does support the E-GSM or R-GSM (For definition of frequency bands see GSM 05.05)
Note: For mobile station supporting the R-GSM band further information can be found in MS Classmark 3.

~~When the DCS 1800 band is used (for exceptions see GSM 04.18:~~
~~Bit 1~~
~~0 Reserved for future use (for definition of frequency bands see GSM 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a DCS 1800 channel.~~

~~When the PCS 1900 band is used (for exceptions see GSM 04.18:~~
~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see GSM 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a PCS 1900 channel.~~

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

CM3 (octet 5, bit 8)
~~Required for MS supporting GSM.~~
0 The MS does not support any options that are indicated in CM3
1 The MS supports options that are indicated in classmark 3 IE

LCS VA capability (LCS value added location request notification capability) (octet 5,bit 6)
~~Required for MS supporting GSM.~~and UMTS
0 LCS value added location request notification capability not supported
1 LCS value added location request notification capability supported

UCS2 treatment (octet 5, bit 5)
~~Required for MS suppporting UMTS.~~
This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. For backward compatibility reasons, ~~i~~if this field is not included, the value 0 shall be assumed by the receiver.
0 The ME has a preference for the default alphabet (defined in GSM 03.38) over UCS2.
1 The ME has no preference between the use of the default alphabet and the use of UCS2.

SoLSA (octet 5, bit 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 The ME does not support SoLSA.
1 The ME supports SoLSA.

CMSP: CM Service Prompt (octet 5, bit 3) $(CCBS)$
~~Required for MS supporting GSM and UMTS.~~
0 "Network initiated MO CM connection request" not supported.
1 "Network initiated MO CM connection request" supported for at least one CM protocol.

A5/3 algorithm supported (octet 5, bit 2)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 encryption algorithm A5/3 not available
1 encryption algorithm A5/3 available

A5/2 algorithm supported (octet 5, bit 1)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):
0 encryption algorithm A5/2 not available
1 encryption algorithm A5/2 available

~~A MS supporting GSM shall always encode all fields relevant for GSM radio access technology, even when accessing UMTS radio access technology. A UMTS MS which does not support GSM shall encode fields relevant only for GSM radio access tecnology using any value which has been defined for this version of the protocol and is not reserved.~~

NOTE: Additional mobile station capability information might be obtained by invoking the classmark interrogation procedure when GSM is used~~the mobile station is accessing the GSM radio access technology~~.

10.5.1.7 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.
The *MS Classmark 3* is a type 4 information element with a maximum of 14 octets length.

The value part of a *MS Classmark 3* information element is coded as shown in figure 10.5.7/3GPP TS 24.008 and table 10.5.7/3GPP TS 24.008.

NOTE: The 14 octet limit is so that the CLASSMARK CHANGE message will fit in one layer 2 frame.

SEMANTIC RULE : a multiband mobile station shall provide information about all frequency bands it can support. A single band mobile station shall not indicate the band it supports in the *Multiband Supported, GSM 400 Bands Supported, GSM 850 Associated Radio Capability* or PCS *1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between DCS 1800 and PCS 1900, the mobile should indicate support for either DCS 1800 band OR PCS 1900 band.

SEMANTIC RULE : a mobile station shall include the MS Measurement Capability field if the *Multi Slot Class* field contains a value of 19 or greater (see GSM 05.02).

Typically, the number of spare bits at the end is the minimum to reach an octet boundary. The receiver may add any number of bits set to "0" at the end of the received string if needed for correct decoding.

<Classmark 3 Value part> ::=
< spare bit > [These 2 lines added are to be removed at the incorporation of CR]
{ < Multiband supported : { 000 } > bitmap indicating DCS 1800; EGSM/RGSM; PGSM.
< A5 bits >
| < Multiband supported : { 101 | 110 } >
< A5 bits >
< Associated Radio Capability 2 : bit(4) >
< Associated Radio Capability 1 : bit(4) >
| < Multiband supported : { 001 | 010 | 100 } >
< A5 bits >
< spare bit >(4)
< Associated Radio Capability 1 : bit(4) > }
{ 0 | 1 < R Support > }
{ 0 | 1 < Multi Slot Capability > }
< UCS2 treatment: bit >
< Extended Measurement Capability : bit >
{ 0 | 1 < MS measurement capability > }
{ 0 | 1 < MS Positioning Method Capability > }
{ 0 | 1 < EDGE Multi Slot Capability > }
{ 0 | 1 < EDGE Struct > }
{ 0 | 1 < GSM 400 Bands Supported : { 01 | 10 | 11 } >
< GSM 400 Associated Radio Capability: bit(4) > }

{ 0 | 1 <GSM 850 Associated Radio Capability : bit(4) > }
{ 0 | 1 <PCS 1900 Associated Radio Capability : bit(4) > }
< UMTS FDD Radio Access Technology Capability : bit >
< UMTS TDD Radio Access Technology Capability : bit >
< CDMA 2000 Radio Access Technology Capability : bit >

{ 0 | 1 < DTM GPRS Multi Slot Sub-Class : bit(2) >
< MAC Mode Support : bit >
{ 0 | 1< ~~EGPRS Support : bit~~ DTM EGPRS Multi Slot Sub-Class : bit(2) > ~~}~~ }
~~{ 0 | 1 < Single Band Support > }~~
< spare bit >** ;

< A5 bits > ::=
< A5/7 : bit > < A5/6 : bit > < A5/5 : bit > < A5/4 : bit > ;

<R Support>::=
< R-GSM band Associated Radio Capability : bit(3) > ;

< Multi Slot Capability > ::=
< Multi Slot Class : bit(5) > ;

< MS Measurement capability > ::=
< SMS_VALUE : bit (4) >
< SM_VALUE : bit (4) > ;

< MS Positioning Method Capability > ::=
< MS Positioning Method : bit(5) > ;

< EDGE Multi Slot Capability > ::=
< EDGE Multi Slot Class : bit(5) > ;

<EDGE Struct> ::=
< Modulation Capability : bit >
{ 0 | 1 < EDGE RF Power Capability 1: bit(2) > }
{ 0 | 1 < EDGE RF Power Capability 2: bit(2) > } ;

< Single Band Support > ::=
< GSMBand : bit(4) > ;

Figure 10.5.7/3GPP TS 24.008 *Mobile Station Classmark 3* information element

Table 10.5.7/3GPP TS 24.008: *Mobile Station Classmark 3* information element

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)

Bit	3
0	P-GSM not supported
1	P-GSM supported

Band 2 supported (second bit of the field)

BIT	2
0	E-GSM or R-GSM not supported
1	E-GSM or R-GSM supported

Band 3 supported (first bit of the field)

Bit	1
0	DCS 1800 not supported
1	DCS 1800 supported

The indication of support of P-GSM band or E-GSM or R-GSM band is mutually exclusive.

When the 'Band 2 supported' bit indicates support of E-GSM or R-GSM, the presence of the <R Support> field, see below, indicates if the E-GSM or R-GSM band is supported.

In this version of the protocol, the sender indicates in this field either none, one or two of these 3 bands supported. ~~If only one band is indicated, the receiver shall ignore the Associated Radio Capability 2.~~

For single band mobile station or a mobile station supporting none of the GSM 900 bands(P-GSM, E-GSM and R-GSM)~~P-GSM (and hence none of E-GSM and R-GSM)~~ and DCS1800 bands, all bits are set to 0.

A5/4

Bit	1
0	Encryption algorithm A5/4 not available
1	Encryption algorithm A5/4 available

A5/5

Bit	1
0	Encryption algorithm A5/5 not available
1	Encryption algorithm A5/5 available

A5/6

Bit	1
0	Encryption algorithm A5/6 not available
1	Encryption algorithm A5/6 available

A5/7

0	Encryption algorithm A5/7 not available
1	Encryption algorithm A5/7 available

Associated Radio capability 1 and 2 (4 bit fields)

If either of P-GSM or E-GSM or R-GSM is supported, the radio capability 1 field indicates the radio capability for P-GSM, E-GSM or R-GSM, and the radio capability 2 field indicates the radio capability for DCS1800 if supported, and is spare otherwise.

If none of P-GSM or E-GSM or R-GSM are supported, the radio capability 1 field indicates the radio capability for DCS1800, and the radio capability 2 field is spare.

The radio capability contains the binary coding of the power class associated with the band indicated in multiband support bits (see GSM ~~ß~~05.05).

(continued...)

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

R Support

In case where the R-GSM band is supported the R-GSM band associated radio capability field contains the binary coding of the power class associated (see GSM 05.05) (regardless of the number of GSM bands supported). A mobile station supporting the R-GSM band shall also when appropriate, (see 10.5.1.6) indicate its support in the 'FC' bit in the Mobile Station Classmark 2 information element.

Note: the coding of the power class for P-GSM, E-GSM, R-GSM and DCS 1800 in radio capability 1 and/or 2 is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots then the Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS GSM 05.02.

UCS2 treatment (1 bit field)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. If not included, the value 0 shall be assumed by the receiver.

Bit 1

0 the ME has a preference for the default alphabet (defined in GSM 03.38) over UCS2.

1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Extended Measurement Capability (1 bit field)

This bit indicates whether the mobile station supports 'Extended Measurements' or not

Bit 1

0 the MS does not support Extended Measurements

1 the MS supports Extended Measurements

SMS_VALUE (Switch-Measure-Switch) (4 bit field)

The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel.

Bits

4 3 2 1

0 0 0 0 1/4 timeslot (~144 microseconds)

0 0 0 1 2/4 timeslot (~288 microseconds)

0 0 1 0 3/4 timeslot (~433 microseconds)

. . .

1 1 1 1 16/4 timeslot (~2307 microseconds)

SM_VALUE (Switch-Measure) (4 bit field)

The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement.

Bits

4 3 2 1

0 0 0 0 1/4 timeslot (~144 microseconds)

0 0 0 1 2/4 timeslot (~288 microseconds)

0 0 1 0 3/4 timeslot (~433 microseconds)

. . .

1 1 1 1 16/4 timeslot (~2307 microseconds)

MS Positioning Method Capability (1 bit field)

This bit indicates whether the MS supports Positioning Method or not for the provision of Location Services.

MS Positioning Method (5 bit field)

This field indicates the Positioning Method(s) supported by the mobile station.

MS assisted E-OTD

Bit 5

0 MS assisted E-OTD not supported

1 MS assisted E-OTD supported

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

MS based E-OTD
Bit 4
0 MS based E-OTD not supported
1 MS based E-OTD supported

MS assisted GPS
Bit 3
0 MS assisted GPS not supported
1 MS assisted GPS supported

MS based GPS
Bit 2
0 MS based GPS not supported
1 MS based GPS supported

MS conventional GPS
Bit 1
0 conventional GPS not supported
1 conventional GPS supported

EDGE Multi Slot class (5 bit field)

In case the EDGE MS supports the use of multiple timeslots and the number of supported time slots is different from number of time slots supported for GMSK then the EDGE Multi Slot class field is included and is coded as the binary representation of the multislot class defined in 3GPP TS GSM 05.02.

Modulation Capability

Modulation Capability field indicates the supported modulation scheme by MS in addition to GMSK
Bit 1
0 8-PSK supported for downlink reception only
1 8-PSK supported for uplink transmission and downlink reception

EDGE RF Power Capability 1 (2 bit field)

If 8-PSK is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for GSM900.

The radio capability contains the binary coding of the EDGE power class(see GSMß05.05).

EDGE RF Power Capability 2 (2 bit field)
If 8-PSK is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for DCS1800 or PCS1900 if supported, and is not included otherwise.
The radio capability contains the binary coding of the EDGE power class (see GSM 05.05).

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

GSM 400 Bands Supported (2 bit field)
See the semantic rule for the sending of this field.
Bits
2 1
0 1 GSM 480 supported, GSM 450 not supported
1 0 GSM 450 supported, GSM 480 not supported
1 1 GSM 450 supported, GSM 480 supported

GSM 400 Associated Radio Capability (4 bit field)
If either GSM 450 or GSM 480 or both is supported, the GSM 400 Associated Radio Capability field indicates the radio capability for GSM 450 and/or GSM 480.

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see GSM 05.05).

Note: the coding of the power class for GSM 450 and GSM 480 in GSM 400 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

GSM 850 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field. This field indicates whether GSM 850 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 850 band (see GSM 05.05).

Note: the coding of the power class for GSM 850 in GSM 850 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

PCS 1900 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field. This field indicates whether PCS 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the PCS 1900 band (see GSM 05.05).

Note: the coding of the power class for PCS 1900 in PCS 1900 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

UMTS FDD Radio Access Technology Capability (1 bit field)

Bit 1

0 UMTS FDD not supported

1 UMTS FDD supported

UMTS TDD Radio Access Technology Capability (1 bit field)

Bit 1

0 UMTS TDD not supported

1 UMTS TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)

Bit 1

0 CDMA2000 not supported

1 CDMA2000 supported

DTM GPRS Multi Slot Sub-Class (2 bit field)

This field indicates the GPRS DTM capabilities of the MS. The DTM GPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. It is coded as follows:

Bit 2 1

0 0 Sub-Class 1 supported

0 1 Sub-Class 5 supported

1 0 Sub-Class 9 supported

1 1 Reserved for future extension. If received, the network shall interpret this as '00'

DTM EGPRS Multi Slot Sub-Class (2 bit field)

This field indicates the EGPRS DTM capabilities of the MS. The DTM EGPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Sub-Class field.

MAC Mode Support (1 bit field)

This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation. It is coded as follows:

Bit 1

0 Dynamic and Fixed Allocation not supported

1 Dynamic and Fixed allocation supported

Single Band Support

This field shall be sent if the mobile station supports one and only one GSM band with the exception of R-GSM; this field shall not be sent otherwise.

GSMBand (4 bit field)

Bits

4 3 2 1

0 0 0 0 E-GSM is supported

0 0 0 1 P-GSM is supported

0 0 1 0 DCS 1800 is supported

0 0 1 1 GSM 450 is supported

0 1 0 0 GSM 480 is supported

0 1 0 1 GSM 850 is supported

0 1 1 0 PCS 1900 is supported

All other values are reserved for future use.

NOTE: When this field is received, the associated RF Power capability is found in Classmark1 or 2.

***** Extract of TS 04.18 Version 8.8.0 for information *****

9.1.11 Classmark change

This message is sent on the main DCCH by the mobile station to the network to indicate a classmark change or as a response to a classmark enquiry. See Table 9.1.11.1/3GPP TS 04.18.

Message type: CLASSMARK CHANGE

Significance: dual

Direction: mobile station to network

Table 9.1.11.1/3GPP TS 04.18: CLASSMARK CHANGE message content

IEI	Information element	Type / Reference	Presence	Format	length
	RR management Protocol Discriminator	Protocol Discriminator 10.2	M	V	1/2
	Skip Indicator	Skip Indicator 10.3.1	M	V	1/2
	Classmark Change Message Type	Message Type 10.4	M	V	1
	Mobile Station Classmark	Mobile Station Classmark 2 10.5.1.6	M	LV	4
20	Additional Mobile Station Classmark Information	Mobile Station Classmark 3 10.5.1.7	C	TLV	3-14

9.1.11.1 Additional Mobile Station Classmark Information

This IE shall be included if and only if the CM3 bit in the *Mobile Station Classmark* IE is set to 1.

9.1.11.2 Mobile Station Classmark

This IE shall include for multiband MS the Classmark 2 corresponding to the frequency band in use.

3GPP TSG_CN WG1 Meeting #17 **Tdoc N1-010838**
Puerto Rico, USA **(Rev of N1-010811 rev of N1-010622)**
14 - 18 May, 2001

CR-Form-v3

CHANGE REQUEST

⌘ **24.008 CR 403** ⌘ rev **2** ⌘ Current version: **4.2.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☒ Core Network ☒

Title:	⌘	CLASSMARK1, 2 and 3 corrections.
Source:	⌘	Vodafone
Work item code:	⌘	GSM/UMTS interworking
Date:	⌘	2nd May 2001
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential 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)

Reason for change:	⌘	When access is performed via UMTS channels, information on GSM MS capability is *not* irrelevant as this is used by the RNC for decision on **handover from UMTS to GSM**. The required specification of the coding of CLASSMARK doesn't allow the network to distinguish unambiguously single banded GSM mobiles. This may lead to dropped calls if the network can't understand the precise implementation in the mobile. Also it is impossible for a UMTS mobile not supporting GSM to signal its capability without misleadingly indicate that it supports GSM as well.
Summary of change:	⌘	It is clarified how a single band GSM mobile and a UMTS only mobile need to code the classmarks 1, 2 and 3.
Consequences if not approved:	⌘	There will be a misunderstanding between network and mobile as to what coding schemes and handovers are supported. This can lead to the network attempting to hand the mobile some where or send information which the mobile is unable to decode.

Clauses affected:	⌘	10.5.1.5, 10.5.1.6 & 10.5.1.7
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	An almost identical CR against Release 99 appears in CR402

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

10.5.1.5 Mobile Station Classmark 1

The purpose of the *Mobile Station Classmark 1* information element is to provide the network with information concerning aspects of high priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 1* information element is coded as shown in figure 10.5.5/3GPP TS 24.008 and table 10.5.5/3GPP TS 24.008.

The *Mobile Station Classmark 1* is a type 3 information element with 2 octets length.

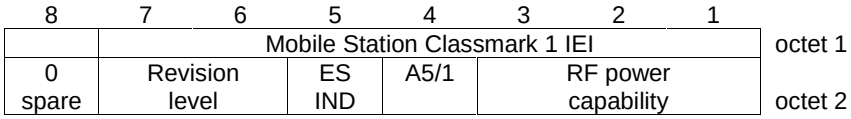

Figure 10.5.5/3GPP TS 24.008 *Mobile Station Classmark 1* information element

~~A MS supporting GSM shall always encode all fields relevant for GSM radio access technology, even when accessing UMTS radio access technology. A UMTS MS which does not support GSM shall encode fields relevant only for GSM radio access tecnology using any value which has been defined for this version of the protocol and is not reserved.~~

Table 10.5.5/3GPP TS 24.008: *Mobile Station Classmark 1* information element

Revision level (octet 2)
~~Required for MS supporting GSM and UMTS.~~
Bits

7	**6**	
0	0	Reserved for GSM phase 1
0	1	Used by GSM phase 2 mobile stations
1	0	Used by mobile stations supporting R99 or later versions of the protocol
1	1	Reserved for future use

ES IND (octet 2, bit 5) "Controlled Early Classmark Sending" option implementation
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0	"Controlled Early Classmark Sending" option is not implemented in the MS
1	"Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value.

A5/1 algorithm supported (octet 2, bit4)
~~Required for mobile station supporting GSM.~~
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0	Encryption algorithm A5/1 available
1	Encryption algorithm A5/1 not available

RF power capability (octet 2)
~~Required for mobile stations supporting GSM.~~
When GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see 04.18), the MS shall indicate the RF power capability of the band used (see table):
When UMTS is used, a single band GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case information on which single band is supported is found in classmark 3.

Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5

All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see 3GPP TS 44.018, sub-clause 3.4.18), the MS shall indicate the RF power capability of the band used (see table):
When UMTS is used, a single band DCS 1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3.

Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3

All other values are reserved.

When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):

Bits
3 2 1
1 1 1 RF power capability is irrelevant in this information element.
All other values are reserved.

10.5.1.6 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *Mobile Station Classmark 2* information element is coded as shown in figure 10.5.6/3GPP TS 24.008, table 10.5.6a/3GPP TS 24.008 and table 10.5.6b/3GPP TS 24.008.

The *Mobile Station Classmark 2* is a type 4 information element with 5 octets length.

8	7	6	5	4	3	2	1	
	Mobile station classmark 2 IEI							octet 1
Length of mobile station classmark 2 contents								octet 2
0 spare	Revision level		ES IND	A5/1	RF power Capability			octet 3
0 spare	PS capa.	SS Screen. Indicator		SM ca pabi.	VBS	VGCS	FC	octet 4
CM3	0 spare	LCSVA CAP	UCS2	SoLSA	CMSP	A5/3	A5/2	octet 5

NOTE: Owing to backward compatibility problems, bit 8 of octet 4 should not be used unless it is also checked that the bits 8, 7 and 6 of octet 3 are not "0 0 0".

Figure 10.5.6/3GPP TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

Revision level (octet 3)
~~Required for MS supporting GSM and UMTS.~~
Bits
7 6
0 0 Reserved for GSM phase 1
0 1 Used by GSM phase 2 mobile stations
1 0 Used by mobile stations supporting R99 or later versions of the protocol
1 1 Reserved for future use

ES IND (octet 3, bit 5) "Controlled Early Classmark Sending" option implementation
~~Required for MS supporting GSM.~~
AN MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

0 "Controlled Early Classmark Sending" option is not implemented in the MS
1 "Controlled Early Classmark Sending" option is implemented in the MS

NOTE: The value of the ES IND gives the implementation in the MS. It's value is **not** dependent on the broadcast SI 3 Rest Octet <Early Classmark Sending Control> value

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

A5/1 algorithm supported (octet 3, bit 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '1'.
An MS supporting GSM shall indicate the associated GSM capability (see table)

0 encryption algorithm A5/1 available
1 encryption algorithm A5/1 not available

RF Power Capability (Octet 3)
~~Required for MS supporting GSM.~~
When GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] band is used (for exceptions see 3GPP TS 44.018), the MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band GSM 450, GSM 480, GSM 700, GSM 850, GSM 900 P, E [or R] MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3.~~:~~

Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3
0	1	1	class 4
1	0	0	class 5

All other values are reserved.

When the DCS 1800 or PCS 1900 band is used (for exceptions see ~~3~~44.018)~~:~~. The MS shall indicate the RF power capability of the band used (see table).
When UMTS is used, a single band DCS 1800 or PCS 1900 MS shall indicate the RF power capability corresponding to the (GSM) band it supports (see table). In this case, information on which single band is supported is found in classmark 3.

Bits

3	**2**	**1**	
0	0	0	class 1
0	0	1	class 2
0	1	0	class 3

All other values are reserved.
When UMTS is used, an MS not supporting any GSM band or a multiband GSM MS shall code this field as follows (see table):

Bits

3	**2**	**1**	
1	1	1	RF Power capability is irrelevant in this information element

All other values are reserved.

PS capability (pseudo-synchronization capability) (octet 4)
~~Required for MS supporting GSM~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

Bit **7**

0 PS capability not present
1 PS capability present

SS Screening Indicator (octet 4)
~~Required for MS supporting GSM and UMTS~~
Bits

6	**5**	
0	0	defined in 3GPP TS 24.080
0	1	defined in 3GPP TS 24.080
1	0	defined in 3GPP TS 24.080
1	1	defined in 3GPP TS 24.080

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

SM capability (MT SMS pt to pt capability) (octet 4)
~~Required for MS supporting GSM.~~
Bit **4**
0 Mobile station does not support mobile terminated point to point SMS
1 Mobile station supports mobile terminated point to point SMS

~~Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element~~

VBS notification reception (octet 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

Bit **3**
0 no VBS capability or no notifications wanted
1 VBS capability and notifications wanted

VGCS notification reception (octet 4)
~~Required for MS supporting GSM.~~
An MS not supporting GSM shall set this bit to '0'.
An MS supporting GSM shall indicate the associated GSM capability (see table):

Bit **2**
0 no VGCS capability or no notifications wanted
1 VGCS capability and notifications wanted

FC Frequency Capability (octet 4)
~~Required for MS supporting GSM.~~
When the GSM 400, or GSM 700, or GSM 850, or DCS 1800, or PCS 1900 band or UMTS ~~band~~ is used (for exceptions see 3GPP TS 44.018, for definitions of frequency band see 3GPP TS 45.005), this bit shall be sent with the value '0'.~~:~~

~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see 3GPP TS 05.05)~~

Note: This bit conveys no information about support or non support of the E-GSM or R-GSM bands when ~~transmitted on a~~ GSM 400, GSM 700, GSM 850, DCS 1800, PCS 1900 band or UMTS is used ~~channel~~.

~~When GSM 700 band is used (for exceptions see 3GPP TS 44.018):~~
~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see 3GPP TS 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a GSM 700 channel.~~

~~When GSM 850 band is used (for exceptions see 3GPP TS 44.018):~~
~~Bit **1**~~
~~0 Reserved for future use (for definition of frequency bands see 3GPP TS 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a GSM 850 channel.~~

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

When a GSM 900 band is used (for exceptions see 3GPP TS 44.018):
Bit **1**

0 The MS does not support the E-GSM or R-GSM band (For definition of frequency bands see 3GPP TS 05.05)

1 The MS does support the E-GSM or R-GSM (For definition of frequency bands see 3GPP TS 05.05)

Note: For mobile station supporting the R-GSM band further information can be found in MS Classmark 3.

~~When the DCS 1800 band is used (for exceptions see 3GPP TS 44.018):~~
~~Bit **1**~~

~~0 Reserved for future use (for definition of frequency bands see 3GPP TS 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a DCS 1800 channel.~~

~~When the PCS 1900 band is used (for exceptions see 3GPP TS 44.018):~~
~~Bit **1**~~

~~0 Reserved for future use (for definition of frequency bands see 3GPP TS 05.05)~~

~~Note: This bit conveys no information about support or non support of the E-GSM or R-GSM band when transmitted on a PCS 1900 channel.~~

CM3 (octet 5, bit 8)
~~Required for MS supporting GSM.~~

0 The MS does not support any options that are indicated in CM3

1 Classmark 3 information is available

LCS VA capability (LCS value added location request notification capability) (octet 5,bit 6)
~~Required for MS supporting GSM and UMTS.~~

0 LCS value added location request notification capability not supported

1 LCS value added location request notification capability supported

UCS2 treatment (octet 5, bit 5)
~~Required for MS suppporting UMTS.~~
This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. For backward compatibility reasons, i~~I~~f this field is not included, the value 0 shall be assumed by the receiver.

0 the ME has a preference for the default alphabet (defined in 3GPP TS 03.38) over UCS2.

1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Table 10.5.6a/3GPP TS 24.008: *Mobile Station Classmark 2* information element

SoLSA (octet 5, bit 4) ~~Required for MS supporting GSM.~~ An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 The ME does not support SoLSA. 1 The ME supports SoLSA.
CMSP: CM Service Prompt (octet 5, bit 3) $(CCBS)$ ~~Required for MS supporting GSM and UMTS.~~ 0 "Network initiated MO CM connection request" not supported. 1 "Network initiated MO CM connection request" supported for at least one CM protocol.
A5/3 algorithm supported (octet 5, bit 2) ~~Required for MS supporting GSM.~~ An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/3 not available 1 encryption algorithm A5/3 available
A5/2 algorithm supported (octet 5, bit 1) ~~Required for MS supporting GSM.~~ An MS not supporting GSM shall set this bit to '0'. An MS supporting GSM shall indicate the associated GSM capability (see table): 0 encryption algorithm A5/2 not available 1 encryption algorithm A5/2 available

~~A MS supporting GSM shall always encode all fields relevant for GSM radio access technology, even when accessing UMTS radio access technology. A UMTS MS which does not support GSM shall encode fields relevant only for GSM radio access tecnology using any value which has been defined for this version of the protocol and is not reserved.~~

NOTE: Additional mobile station capability information might be obtained by invoking the classmark interrogation procedure when GSM is used~~the mobile station is accessing the GSM radio access technology~~.

10.5.1.7 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The *MS Classmark 3* is a type 4 information element with a maximum of 14 octets length.

The value part of a *MS Classmark 3* information element is coded as shown in figure 10.5.7/3GPP TS 24.008 and table 10.5.7/3GPP TS 24.008.

NOTE: The 14 octet limit is so that the CLASSMARK CHANGE message will fit in one layer 2 frame.

SEMANTIC RULE : a multiband mobile station shall provide information about all frequency bands it can support. A single band mobile station shall not indicate the band it supports in the *Multiband Supported, GSM 400 Bands Supported, GSM 700 Associated Radio Capability, GSM 850 Associated Radio Capability* or PCS *1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between DCS 1800 and PCS 1900, the mobile should indicate support for either DCS 1800 band OR PCS 1900 band.

SEMANTIC RULE : a mobile station shall include the MS Measurement Capability field if the *Multi Slot Class* field contains a value of 19 or greater (see 3GPP TS 05.02).

Typically, the number of spare bits at the end is the minimum to reach an octet boundary. The receiver may add any number of bits set to "0" at the end of the received string if needed for correct decoding.

```
<Classmark 3 Value part> ::=
    < spare bit >
    {    < Multiband supported : { 000 } >
             < A5 bits >
    |    < Multiband supported : { 101 | 110 } >
             < A5 bits >
             < Associated Radio Capability 2 : bit(4) >
             < Associated Radio Capability 1 : bit(4) >
    |    < Multiband supported : { 001 | 010 | 100 } >
             < A5 bits >
             < spare bit >(4)
             < Associated Radio Capability 1 : bit(4) > }
    { 0 | 1 < R Support > }
    { 0 | 1 < Multi Slot Capability > }
    < UCS2 treatment: bit >
    < Extended Measurement Capability : bit >
    { 0 | 1 < MS measurement capability > }
    { 0 | 1 < MS Positioning Method Capability > }
    { 0 | 1 < EDGE Multi Slot Capability > }
    { 0 | 1 < EDGE Struct > }
    { 0 | 1 < GSM 400 Bands Supported : { 01 | 10 | 11 } >
             < GSM 400 Associated Radio Capability: bit(4) > }

    { 0 | 1 <GSM 850 Associated Radio Capability : bit(4) > }
    { 0 | 1 <PCS 1900 Associated Radio Capability : bit(4) > }
    < UMTS FDD Radio Access Technology Capability : bit >
    < UMTS 3.84 Mcps TDD Radio Access Technology Capability : bit >
    < CDMA 2000 Radio Access Technology Capability : bit >

    { 0 | 1  < DTM GPRS Multi Slot Sub-Class : bit(2) >
             < MAC Mode Support : bit >
             {0 | 1< DTM EGPRS Multi Slot Sub-Class : bit(2) > } }
    { 0 | 1 < Single Band Support > } -- Release 4 starts here:
    {0 | 1 <GSM 700 Associated Radio Capability : bit(4)>}

    < UMTS 1.28 Mcps TDD Radio Access Technology Capability : bit >
    < spare bit > ;

< A5 bits > ::=
    < A5/7 : bit > < A5/6 : bit > < A5/5 : bit > < A5/4 : bit >  ;

<R Support>::=
    < R-GSM band Associated Radio Capability : bit(3) > ;

< Multi Slot Capability > ::=
    < Multi Slot Class : bit(5) >  ;

< MS Measurement capability > ::=
    < SMS_VALUE : bit (4) >
    < SM_VALUE : bit (4) > ;

< MS Positioning Method Capability > ::=
    < MS Positioning Method : bit(5) > ;

< EDGE Multi Slot Capability > ::=
    < EDGE Multi Slot Class : bit(5) > ;

 <EDGE Struct> : :=
    < Modulation Capability : bit >
    { 0 | 1 < EDGE RF Power Capability 1: bit(2) > }
    { 0 | 1 < EDGE RF Power Capability 2: bit(2) > }

< Single Band Support > ::=
    < GSM Band : bit (4) > ;
```

Figure 10.5.7/3GPP TS 24.008 *Mobile Station Classmark 3* information element

Table 10.5.7/3GPP TS 24.008: *Mobile Station Classmark 3* information element

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)
Bit 3
0 P-GSM not supported
1 P-GSM supported

Band 2 supported (second bit of the field)
BIT 2
0 E-GSM or R-GSM not supported
1 E-GSM or R-GSM supported

Band 3 supported (first bit of the field)
Bit 1
0 DCS 1800 not supported
1 DCS 1800 supported

The indication of support of P-GSM band or E-GSM or R-GSM band is mutually exclusive.

When the 'Band 2 supported' bit indicates support of E-GSM or R-GSM, the presence of the <R Support> field, see below, indicates if the E-GSM or R-GSM band is supported.

In this version of the protocol, the sender indicates in this field either none, one or two of these 3 bands supported. ~~If only one band is indicated, the receiver shall ignore the Associated Radio Capability 2.~~

For single band mobile station or a mobile station supporting none of the GSM 900 bands(P-GSM, E-GSM and R-GSM) and DCS 1800 bands, all bits are set to 0.

A5/4
Bit 1
0 Encryption algorithm A5/4 not available
1 Encryption algorithm A5/4 available

A5/5
Bit 1
0 Encryption algorithm A5/5 not available
1 Encryption algorithm A5/5 available

A5/6
Bit 1
0 Encryption algorithm A5/6 not available
1 Encryption algorithm A5/6 available

A5/7
0 Encryption algorithm A5/7 not available
1 Encryption algorithm A5/7 available

Associated Radio capability 1 and 2 (4 bit fields)

If either of P-GSM or E-GSM or R-GSM is supported, the radio capability 1 field indicates the radio capability for P-GSM, E-GSM or R-GSM, and the radio capability 2 field indicates the radio capability for DCS1800 if supported, and is spare otherwise.

If none of P-GSM or E-GSM or R-GSM are supported, the radio capability 1 field indicates the radio capability for DCS1800, and the radio capability 2 field is spare.

The radio capability contains the binary coding of the power class associated with the band indicated in multiband support bits (see GSMß05.05).

(continued...)

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

R Support

In case where the R-GSM band is supported the R-GSM band associated radio capability field contains the binary coding of the power class associated (see GSM ~~0~~45.005) (regardless of the number of GSM bands supported). A mobile station supporting the R-GSM band shall also when appropriate, (see 10.5.1.6) indicate its support in the 'FC' bit in the Mobile Station Classmark 2 information element.

Note: the coding of the power class for P-GSM, E-GSM, R-GSM and DCS 1800 in radio capability 1 and/or 2 is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots then the Multi Slot Class field is coded as the binary representation of the multislot class defined in TS GSM 05.02.

UCS2 treatment (1 bit field)

This information field indicates the likely treatment by the mobile station of UCS2 encoded character strings. If not included, the value 0 shall be assumed by the receiver.
Bit 1
0 the ME has a preference for the default alphabet (defined in 3GPP TS 03.38) over UCS2.
1 the ME has no preference between the use of the default alphabet and the use of UCS2.

Extended Measurement Capability (1 bit field)

This bit indicates whether the mobile station supports 'Extended Measurements' or not
Bit 1
0 the MS does not support Extended Measurements
1 the MS supports Extended Measurements

SMS_VALUE (Switch-Measure-Switch) (4 bit field)
The SMS field indicates the time needed for the mobile station to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

SM_VALUE (Switch-Measure) (4 bit field)
The SM field indicates the time needed for the mobile station to switch from one radio channel to another and perform a neighbour cell power measurement.
Bits
4 3 2 1
0 0 0 0 1/4 timeslot (~144 microseconds)
0 0 0 1 2/4 timeslot (~288 microseconds)
0 0 1 0 3/4 timeslot (~433 microseconds)
. . .
1 1 1 1 16/4 timeslot (~2307 microseconds)

MS Positioning Method Capability (1 bit field)
This bit indicates whether the MS supports Positioning Method or not for the provision of Location Services.

MS Positioning Method (5 bit field)
This field indicates the Positioning Method(s) supported by the mobile station.
MS assisted E-OTD
Bit 5
0 MS assisted E-OTD not supported
1 MS assisted E-OTD supported

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

MS based E-OTD
Bit 4
0 MS based E-OTD not supported
1 MS based E-OTD supported

MS assisted GPS
Bit 3
0 MS assisted GPS not supported
1 MS assisted GPS supported

MS based GPS
Bit 2
0 MS based GPS not supported
1 MS based GPS supported

MS conventional GPS
Bit 1
0 conventional GPS not supported
1 conventional GPS supported

EDGE Multi Slot class (5 bit field)

In case the EDGE MS supports the use of multiple timeslots and the number of supported time slots is different from number of time slots supported for GMSK then the EDGE Multi Slot class field is included and is coded as the binary representation of the multislot class defined in TS GSM 05.02.

Modulation Capability

Modulation Capability field indicates the supported modulation scheme by MS in addition to GMSK
Bit 1
0 8-PSK supported for downlink reception only
1 8-PSK supported for uplink transmission and downlink reception

EDGE RF Power Capability 1 (2 bit field)

If 8-PSK is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for GSM700, GSM850 or GSM900.

The radio capability contains the binary coding of the EDGE power class(see GSMß05.05).

EDGE RF Power Capability 2 (2 bit field)
If 8-PSK is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for DCS1800 or PCS1900 if supported, and is not included otherwise.
The radio capability contains the binary coding of the EDGE power class (see 3GPP TS 05.05).

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

GSM 400 Bands Supported (2 bit field)
See the semantic rule for the sending of this field.

Bits
2 1
0 1 GSM 480 supported, GSM 450 not supported
1 0 GSM 450 supported, GSM 480 not supported
1 1 GSM 450 supported, GSM 480 supported

GSM 400 Associated Radio Capability (4 bit field)
If either GSM 450 or GSM 480 or both is supported, the GSM 400 Associated Radio Capability field indicates the radio capability for GSM 450 and/or GSM 480.

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see 3GPP TS 05.05).

Note: the coding of the power class for GSM 450 and GSM 480 in GSM 400 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

GSM 850 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.

This field indicates whether GSM 850 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 850 band (see 3GPP TS 05.05).

Note: the coding of the power class for GSM 850 in GSM 850 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

PCS 1900 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field. This field indicates whether PCS 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the PCS 1900 band (see 3GPP TS 05.05).

Note: the coding of the power class for PCS 1900 in PCS 1900 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

Table 10.5.1.7/3GPP TS 24.008 (continued): *MS Classmark 3* information element

UMTS FDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS FDD not supported
1 UMTS FDD supported

UMTS 3.84 Mcps TDD Radio Access Technology Capability (1 bit field)
Bit 1
0 UMTS 3.84 Mcps TDD not supported
1 UMTS 3.84 Mcps TDD supported

CDMA 2000 Radio Access Technology Capability (1 bit field)
Bit 1
0 CDMA2000 not supported
1 CDMA2000 supported

DTM GPRS Multi Slot Sub-Class (2 bit field)
This field indicates the GPRS DTM capabilities of the MS. The GPRS DTM Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. It is coded as follows:

Bit 2 1
0 0 Sub-Class 1 supported
0 1 Sub-Class 5 supported
1 0 Sub-Class 9 supported
1 1 Reserved for future extension. If received, the network shall interpret this as '00'

DTM EGPRS Multi Slot Sub-Class (2 bit field)
This field indicates the EGPRS DTM capabilities of the MS. The DTM EGPRS Multi Slot Sub-Class is independent from the Multi Slot Capabilities field. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Sub-Class field.

MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation. It is coded as follows:

Bit 1
0 Dynamic and Fixed Allocation not supported
1 Dynamic and Fixed allocation supported

Single Band Support
This field shall be sent if the mobile station supports one and only one GSM band with the exception of R-GSM; this field shall not be sent otherwise.

GSM Band (4 bit field)
Bits
4 3 2 1
0 0 0 0 E-GSM is supported
0 0 0 1 P-GSM is supported
0 0 1 0 DCS 1800 is supported
0 0 1 1 GSM 450 is supported
0 1 0 0 GSM 480 is supported
0 1 0 1 GSM 850 is supported
0 1 1 0 PCS 1900 is supported
0 1 1 1 GSM 700 is supported
All other values are reserved for future use.

NOTE: When this field is received, the associated RF power capability is found in Classmark 1 or 2.

GSM 700 Associated Radio Capability (4 bit field)

See the semantic rule for the sending of this field.

This field indicates whether GSM 700 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 700 band (see 3GPP TS 05.05).

Note: the coding of the power class for GSM 700 in GSM 700 Associated Radio Capability is different to that used in the Mobile Station Classmark 1 and Mobile Station Classmark 2 information elements.

UMTS 1.28 Mcps TDD Radio Access Technology Capability (1 bit field)

Bit 1
0 UMTS 1.28 Mcps TDD not supported
1 UMTS 1.28 Mcps TDD supported

***** Extract of TS 44.018 for information *****

9.1.11 Classmark change

This message is sent on the main DCCH by the mobile station to the network to indicate a classmark change or as a response to a classmark enquiry. See Table 9.1.11.1/3GPP TS 44.018.

Message type: CLASSMARK CHANGE

Significance: dual

Direction: mobile station to network

Table 9.1.11.1/3GPP TS 04.18: CLASSMARK CHANGE message content

IEI	Information element	Type / Reference	Presence	Format	length
	RR management Protocol Discriminator	Protocol Discriminator 10.2	M	V	1/2
	Skip Indicator	Skip Indicator 10.3.1	M	V	1/2
	Classmark Change Message Type	Message Type 10.4	M	V	1
	Mobile Station Classmark	Mobile Station Classmark 2 10.5.1.6	M	LV	4
20	Additional Mobile Station Classmark Information	Mobile Station Classmark 3 10.5.1.7	C	TLV	3-14

9.1.11.1 Additional Mobile Station Classmark Information

This IE shall be included if and only if the CM3 bit in the *Mobile Station Classmark* IE is set to 1.

9.1.11.2 Mobile Station Classmark

This IE shall include for multiband MS the Classmark 2 corresponding to the frequency band in use.