Source:	**TSG CN WG 1**
Title:	**CRs to Rel-4 Work Item GERAN**
Agenda item:	**8.19**
Document for:	**APPROVAL**

Introduction:

This document contains 1 CRs on **Rel-4** Work Item **"GERAN/ "**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #10 for approval.

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
24.008	264	1	N1-001350	Rel-4	GSM 700 addition into MS classmark & radio	F	4.0.0

CR-Form-v3

CHANGE REQUEST

| ⌘ | **24.008** CR **264** | ⌘ | 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 **X** Radio Access Network **X** Core Network **X**

Title: ⌘	GSM 700 addition into MS classmark & radio access capability IE	
Source: ⌘	Nokia	
Work item code: ⌘	GERAN support for 700 MHz band	***Date:*** ⌘ 22 Nov 2000
Category: ⌘ **F**		***Release:*** ⌘ R4

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: ⌘	GSM 700 information added into MS classmark and radio access capability IE.
Summary of change: ⌘	In chapter 10.5.1.6 GSM 700 band description is added for FC Frequency Capability field. In chapter 10.5.1.7 the field GSM 700 Associated Radio Capability is added. In chapter 10.5.5.12a the code point for GSM 700 is added to field Access Technology Type.
Consequences if not approved: ⌘	24.008 is inconsistent with other specification where GSM 700 has been introduced.

Clauses affected: ⌘	10.5.1.6, 10.5.1.7, 10.5.5.12a
Other specs affected: ⌘	**X** 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.

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/TS 24.008, table 10.5.6a/TS 24.008 and table 10.5.6b/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/TS 24.008 *Mobile Station Classmark 2* information element

Table 10.5.6a/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 this version 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.

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/TS 24.008: *Mobile Station Classmark 2* information element

A5/1 algorithm supported (octet 3, bit 4)
Required for MS supporting GSM.

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):
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):
Bits
3 2 1
0 0 0   class 1
0 0 1   class 2
0 1 0   class 3

All other values are reserved.

PS capability (pseudo-synchronization capability) (octet 4)
Required for MS supporting GSM
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 TS 24.080
0 1   defined in TS 24.080
1 0   defined in TS 24.080
1 1   defined in TS 24.080

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/TS 24.008: *Mobile Station Classmark 2* information element

VBS notification reception (octet 4)
Required for MS supporting GSM.
Bit **3**
0   no VBS capability or no notifications wanted
1   VBS capability and notifications wanted

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

VGCS notification reception (octet 4)
Required for MS supporting GSM.
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 GSM 400 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 400 channel.

When GSM 700 band is used (for exceptions see 3GPP TS 04.18):
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 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/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.
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. If 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.
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.
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.
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 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/TS 24.008 and table 10.5.7/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, <u>*GSM 700 Associated Radio Capability,*</u> *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 >
    {    < 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 TDD Radio Access Technology Capability : bit >
    < CDMA 2000 Radio Access Technology Capability : bit >

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

    < 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) > }
```

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

Multiband Supported (3 bit field)

Band 1 supported (third bit of the field)
<u>Bit   3</u>
   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 all bits are set to 0.

A5/4
<u>Bit   1</u>
   0   Encryption algorithm A5/4 not available
   1   Encryption algorithm A5/4 available

A5/5
<u>Bit   1</u>
   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...)

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). 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 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

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 GSM 05.05).

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

GSM 400 Bands Supported (2 bit 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)

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)
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.

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 Multi Slot Sub-Class (2 bit field)
This field indicates the DTM capabilities of the MS. The 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'

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

EGPRS Support (1 bit field)
This field indicates whether or not the MS supports EGPRS. It is coded as follows:

Bit   1
   0   EGPRS not supported
   1   EGPRS supported

GSM 700 Associated Radio Capability (4 bit 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 GSM 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.

10.5.5.12a   MS Radio Access capability

The purpose of the *MS RA capability* information element is to provide the radio part of the network with information concerning radio aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station.

The *MS RA capability* is a type 4 information element, , with a maximum length of 52 octets.

The value part of a *MS RA capability* information element is coded a shown table 10.5.146/TS 24.008.

    – SEMANTIC RULE : Among the three Access Type Technologies GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.

    – The MS shall indicate supported Access Technology Types. e.g. [450, 480, 900, 1800, UMTS] or [700, 850, 1900] MHz bands during a single MM procedure.

    – Error handling : If a received Access Technology Type is unknown to the receiver, it shall ignore all the corresponding fields;

    – If within a known Access Technology Type a receiver recognizes an unknown field it shall ignore it.

    – See more details about error handling of MS radio access capability in TS GSM 08.18.

    - Due to shared radio frequency channel numbers between 1800 and 1900, the mobile should provide the relevant MS Radio Access capability for either 1800 band OR 1900 band, not both.

Table 10.5.146/TS 24.008 : *Mobile Station Radio Access Capability* **Information Element**

```
< MS Radio Access capability IE > ::=
<MS Radio Access capability IEI :  00100100 >
<Length of MS RA capability: <octet>> -- length in octets of MS RA capability value part and spare bits
<MS RA capability  value part : < MS RA capability  value part struct >>
<spare bits>**; -- may be used for future enhancements


<MS RA capability  value part struct >::= --recursive structure allows any number of Access technologies
< Access Technology Type: bit (4) >
< Access capabilities : <Access capabilities struct> >
{ 0 | 1 <MS RA capability  value part struct> } ;



< Access capabilities struct > ::=
    < Length : bit (7) > -- length in bits of Content and spare bits
    <Access capabilities : <Content>>
    <spare bits>** ; -- expands to the indicated length
            -- may be used for future enhancements

< Content > ::=
    < RF Power Capability : bit (3) >
    { 0 | 1 <A5 bits : <A5 bits> > } -- zero means that the same values apply for parameters as in the immediately
preceeding Access capabilities field within this IE
    -- The presence of the A5 bits is mandatory in the 1st Access capabilities struct within this IE.
    < ES IND : bit >
    < PS : bit >
    < VGCS : bit >
    < VBS : bit >
    { 0 | 1 < Multislot capability : Multislot capability struct > } ;  -- zero means that the     same values for multislot
parameters as given in an earlier Access capabilities field within this IE apply also here
    { 0 | 1 < 8PSK Power Capability : bit(2) >} – '1' also means 8PSK modulation capability in uplink.   <
COMPACT Interference Measurement Capability : bit >
    < Revision Level Indicator : bit >
    < UMTS FDD Radio Access Technology Capability : bit >    -- 3G RAT
    < UMTS TDD Radio Access Technology Capability : bit >    -- 3G RAT
    < CDMA 2000 Radio Access Technology Capability : bit >    -- 3G RAT
        -- error: struct too short, assume features do not exist
        -- error: struct too long, ignore data and jump to next Access technolgy
```

```
< Multislot capability struct > ::=
    { 0 | 1 < HSCSD multislot class : bit (5) > }
    { 0 | 1 < GPRS multislot class : bit (5) > < GPRS Extended Dynamic Allocation Capability : bit > }
    { 0 | 1 < SMS_VALUE : bit (4) > < SM_VALUE : bit (4) > } ;
    { 0 | 1 < ECSD multislot class : bit (5) > }
    { 0 | 1 < EGPRS multislot class : bit (5) > < EGPRS Extended Dynamic Allocation   Capability : bit > } ;

    {0 | 1  <DTM Multi Slot Sub-Class : bit(2)>
        <MAC Mode Support : bit>
        <EGPRS Support : bit>} ;
```

<A5 bits> ::= < A5/1 : bit> <A5/2 : bit> <A5/3 : bit> <A5/4 : bit> <A5/5 : bit> <A5/6 : bit> <A5/7 : bit>; -- bits for circuit mode ciphering algorithms

Access Technology Type
This field indicates the access technology type to be associated with the following access capabilities.

```
Bits
4 3 2 1
0 0 0 0    GSM P
0 0 0 1    GSM E  --note that GSM E covers GSM P
0 0 1 0    GSM R  --note that GSM R covers GSM E and GSM P
0 0 1 1    GSM 1800
0 1 0 0    GSM 1900
0 1 0 1    GSM 450
0 1 1 0    GSM 480
0 1 1 1    GSM 850
1 0 0 0    GSM 700
```
All other values are treated as unknown by the receiver.

RF Power Capability
This field is coded as radio capability in Classmark 3 for the indicated band: it contains the binary coding of he power class associated (see GSM 05.05 paragraph 4.1 output power and paragraph 4.1.1 Mobile Station).

8PSK Power Capability
This field is coded according to the definition in GSM 05.05. The presence of this field indicates also 8PSK modulation capability in uplink.

A5/1
0   encryption algorithm A5/1 not available
1   encryption algorithm A5/1 available
A5/2
0   encryption algorithm A5/2 not available
1   encryption algorithm A5/2 available
A5/3
0   encryption algorithm A5/3 not available
1   encryption algorithm A5/3 available
A5/4
0   encryption algorithm A5/4 not available
1   encryption algorithm A5/4 available
A5/5
0   encryption algorithm A5/5 not available
1   encryption algorithm A5/5 available
A5/6
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

ES IND – (Controlled early Classmark Sending)
0   "controlled early Classmark Sending" option is not implemented
1   "controlled early Classmark Sending" option is implemented

```
```

Table 10.5.146/TS 24.008 (concluded): *Mobile Station Radio Access Capability* Information Element

PS – (Pseudo Synchronisation)
0   PS capability not present
1   PS capability present

VGCS – (Voice Group Call Service)
0   no VGCS capability or no notifications wanted
1   VGCS capability and notifications wanted.

VBS – (Voice Broadcast Service)
0   no VBS capability or no notifications wanted
1   VBS capability and notifications wanted

HSCSD Multi Slot Class
The Multi Slot Class field is coded as the binary representation of the multislot class defined in TS GSM 05.02.
Range 1 to 18, all other values are reserved.

GPRS Multi Slot Class
The GPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in TS GSM 05.02.

ECSD Multi Slot Class
The presence of this field indicates ECSD capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The Multi Slot Class field is coded as the binary representation of the multislot class defined in TS GSM 05.02.
Range 1 to 18, all other values are reserved.

EGPRS Multi Slot Class
The presence of this field indicates EGPRS capability. Whether the MS is capable of 8-PSK modulation in uplink is indicated by the presence of 8-PSK Power Capability field. The EGPRS Multi Slot Class field is coded as the binary representation of the multislot class defined in TS GSM 05.02.

GPRS Extended Dynamic Allocation Capability
0   Extended Dynamic Allocation Capability for GPRS is not implemented
1   Extended Dynamic Allocation Capability for GPRS is implemented
EGPRS Extended Dynamic Allocation Capability
0   Extended Dynamic Allocation Capability for EGPRS is not implemented
1   Extended Dynamic Allocation Capability for EGPRS is implemented

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 neighbor 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)

DTM Multi Slot Sub-Class (2 bit field)
This field indicates the DTM capabilities of the MS. The DTM Multi Slot Sub-Class is independent from the Multi Slot Capabilities field.
Bits
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'
MAC Mode Support (1 bit field)
This field indicates whether the MS supports Dynamic and Fixed Allocation or only supports Exclusive Allocation
Bits
1
0   Dynamic and Fixed Allocation not supported
1   Dynamic and Fixed allocation supported
EGPRS Support (1 bit field)
This field indicates whether or not the MS supports EGPRS
Bit
1
0   EGPRS not supported
1   EGPRS supported

COMPACT Interference Measurement Capability
    0 COMPACT Interference Measurement Capability is not implemented
    1 COMPACT Interference Measurement Capability is implemented

Revision Level Indicator(1 bit field)
Bit
0   The ME is Release '98 or older
1   The ME is Release '99 onwards

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

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

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