*CR-Form-v3*

# CHANGE REQUEST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **24.008 CR 533** | | rev | **1** | | Current version: | **4.4.0** | |

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

| | |
|---|---|
| *Title:* | Introduction of GERAN feature indicator |
| *Source:* | Ericsson |
| *Work item code:* | GERAN improvements 2 |
| *Date:* | 2001-11-29 |
| *Category:* | **F** |
| *Release:* | Rel-4 |

Use <u>one</u> 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 <u>one</u> 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:* | An indicator is needed in the *Mobile Station Classmark 3 IE* and the *MS Radio Access Capability IE* to indicate the MS support of GERAN protocol features that are introduced in the REL-4 version of the GERAN RLC/MAC protocol specification (3GPP TS 44.060). |
| *Summary of change:* | A "GERAN Feature Package 1" field is introduced in the two IEs. One bit is allocated for this field in each IE. |
| *Consequences if not approved:* | The network is unable to determine when the GERAN protocol features in the GERAN Feature Package 1 can be applied. |

| | |
|---|---|
| *Clauses affected:* | 10.5.1.7, 10.5.5.12a |

| | | |
|---|---|---|
| *Other specs affected:* | **X** Other core specifications | 44.060 |
| | ☐ Test specifications | |
| | ☐ O&M Specifications | |

| | |
|---|---|
| *Other comments:* | |

## 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 405.002).

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 Class : bit(2) >
            < MAC Mode Support : bit >
            {0 | 1< DTM EGPRS Multi Slot 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 >
    < MS_EXT_UTBF : bit >< GERAN Feature Package 1 : bit >

    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
            < Extended DTM EGPRS Multi Slot Class : bit(2) > }

    < 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)
<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.

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
<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...)*

**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 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

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 8-PSK modulation in GSM 400, GSM700, GSM850 or GSM900.

**EDGE RF Power Capability 2 (2 bit field)**
If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for 8-PSK modulation in DCS1800 or PCS1900 if supported, and is not included otherwise.

The respective **EDGE RF Power Capability 1** and **EDGE RF Power Capability 2** fields contain the following coding of the 8-PSK modulation power class (see 3GPP TS 05.05):
Bits    2 1
     0 0    Reserved
     0 1    Power class E1
     1 0    Power class E2
     1 1    Power class E3

**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.

**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 Class** (2 bit field)
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:

Bit       2 1
   0 0    Multislot class 1 supported
   0 1    Multislot class 5 supported
   1 0    Multislot 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 DTM Multi Slot Class**  (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Class field.

**Single Band Support**
This field shall be sent if the mobile station supports UMTS and 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


~~**MS_EXT_UTBF** (1 bit field)~~
~~Bit~~
~~0        Extended uplink TBF not supported~~
~~1        Extended uplink TBF supported~~
**GERAN Feature Package 1** (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

Bit     1
    0   GERAN feature package 1 not supported.
    1   GERAN feature package 1 supported.

**Extended GPRS DTM Multi Slot Class** (2 bit field)
This field indicates the extended GPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS Multi Slot Class field:

## 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 10.5.146/3GPP 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 3GPP TS 48.018.

- 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 10.5.146/3GPP 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
-- Additions in release 99
    { 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 3.84 Mcps TDD Radio Access Technology Capability : bit >   -- 3G RAT
    < CDMA 2000 Radio Access Technology Capability : bit >           -- 3G RAT
    < UMTS 1.28 Mcps TDD Radio Access Technology Capability: bit >   -- 3G RAT
-- Additions in release 4
    < MS_EXT_UTBF : bit >< GERAN Feature Package 1 : bit >
    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
            < Extended DTM EGPRS Multi Slot Class : bit(2) > };
    -- error: struct too short, assume features do not exist
    -- error: struct too long, ignore data and jump to next Access technology
```

```
< 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) > }
-- Additions in release 99
    { 0 | 1 < ECSD multislot class : bit (5) > }
    { 0 | 1 < EGPRS multislot class : bit (5) > < EGPRS Extended Dynamic Allocation   Capability : bit > }
    { 0 | 1  < DTM GPRS Multi Slot Class : bit(2)>
            <MAC Mode Support : bit>
            { 0 | 1 <EGPRS DTM Multi Slot Class : bit(2)> } } ;
    -- error: struct too short, assume features do not exist


<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 3GPP TS 05.05 paragraph 4.1 output power and paragraph 4.1.1 Mobile Station).

**8PSK Power Capability**
If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 05.05):
```
Bits    2 1
        0 0    Reserved
        0 1    Power class E1
        1 0    Power class E2
        1 1    Power class E3
```

**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

**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 3GPP TS 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 3GPP TS 05.02.

-- Additions in release 99

**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 3GPP TS 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 3GPP TS 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 GPRS Multi Slot Class  (2 bit field)**
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:
Bits
2 1
0 0     Multislot class 1 supported
0 1     Multislot class 5 supported
1 0     Multislot 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 DTM Multi Slot Class  (2 bit field)**
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS multislot Class field.

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 3.84 Mcps TDD Radio Access Technology Capability** (1 bit field)
Bit
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
0       CDMA2000 not supported
1       CDMA2000 supported

**UMTS 1.28 Mcps TDD Radio Access Technology Capability** (1 bit field)
Bit
0       UMTS 1.28 Mcps TDD not supported
1       UMTS 1.28 Mcps TDD supported

~~**MS_EXT_UTBF** (1 bit field)~~
~~Bit~~
~~0       Extended uplink TBF not supported~~
~~1       Extended uplink TBF supported~~
**GERAN Feature Package 1** (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

Bit
0       GERAN feature package 1 not supported.
1       GERAN feature package 1 supported.

**Extended GPRS DTM Multi Slot Class** (2 bit field)
This field indicates the extended GPRS DTM capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS  multislot class field:

```
0 0      1 0      Multislot class 4 supported
```

*CR-Form-v3*

# CHANGE REQUEST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **24.008 CR 534** | | **rev** | **1** | Current version: | **5.1.0** | | |

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

| | |
|---|---|
| ***Title:*** | Introduction of GERAN feature indicator |
| ***Source:*** | Rapporteur |
| ***Work item code:*** | GERAN improvements 2 |
| ***Date:*** | 2001-12-12 |
| ***Category:*** | **A** |
| ***Release:*** | Rel-5 |

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:*** | An indicator is needed in the *Mobile Station Classmark 3 IE* and the *MS Radio Access Capability IE* to indicate the MS support of GERAN protocol features that are introduced in the REL-4 version of the GERAN RLC/MAC protocol specification (3GPP TS 44.060). |
| ***Summary of change:*** | A "GERAN Feature Package 1" field is introduced in the two IEs. One bit is allocated for this field in each IE. |
| ***Consequences if not approved:*** | The network is unable to determine when the GERAN protocol features in the GERAN Feature Package 1 can be applied. |

| | |
|---|---|
| ***Clauses affected:*** | 10.5.1.7, 10.5.5.12a |

| | | | |
|---|---|---|---|
| ***Other specs affected:*** | **X** Other core specifications | 44.060 | |
| | ☐ Test specifications | | |
| | ☐ O&M Specifications | | |

| | |
|---|---|
| ***Other comments:*** | |

## 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 405.002).

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 Class : bit(2) >
            < MAC Mode Support : bit >
            {0 | 1< DTM EGPRS Multi Slot 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 >
    < MS_EXT_UTBF : bit >< GERAN Feature Package 1 : bit >

    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
            < Extended DTM EGPRS Multi Slot Class : bit(2) > }

    < 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.

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 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

<u>MS based E-OTD</u>
Bit        4
   0    MS based E-OTD not supported
   1    MS based E-OTD supported

<u>MS assisted GPS</u>
Bit        3
   0    MS assisted GPS not supported
   1    MS assisted GPS supported

<u>MS based GPS</u>
Bit        2
   0    MS based GPS not supported
   1    MS based GPS supported

<u>MS conventional GPS</u>
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 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 modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 1** field indicates the radio capability for8-PSK modulation in GSM 400, GSM700, GSM850 or GSM900.

**EDGE RF Power Capability 2 (2 bit field)**
If 8-PSK modulation is supported for both uplink and downlink, the **EDGE RF Power Capability 2** field indicates the radio capability for 8-PSK modulation in DCS1800 or PCS1900 if supported, and is not included otherwise.

The respective **EDGE RF Power Capability 1** and **EDGE RF Power Capability 2** fields contain the following coding of the 8-PSK modulation power class (see 3GPP TS 05.05):
Bits      2 1
     0 0        Reserved
     0 1        Power class E1
     1 0        Power class E2
     1 1        Power class E3

**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.

**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 Class** (2 bit field)
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:

Bit     2 1
    0 0     Multislot class 1 supported
    0 1     Multislot class 5 supported
    1 0     Multislot 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 DTM Multislot Class** (2 bit field)
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS Multi Slot Class field.

**Single Band Support**
This field shall be sent if the mobile station supports UMTS and 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


**MS_EXT_UTBF** (1 bit field)
Bit
0        Extended uplink TBF not supported
1        Extended uplink TBF supported
**GERAN Feature Package 1** (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

Bit      1
   0   GERAN feature package 1 not supported.
   1   GERAN feature package 1 supported.

**Extended GPRS DTM Multi Slot Class** (2 bit field)
This field indicates the extended GPRS DTM multislot capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS Multi Slot Class field:


## 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 10.5.146/3GPP 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 3GPP TS 48.018.

- 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 10.5.146/3GPP 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
-- Additions in release 99
    { 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 3.84 Mcps TDD Radio Access Technology Capability : bit >    -- 3G RAT
    < CDMA 2000 Radio Access Technology Capability : bit >             -- 3G RAT
    < UMTS 1.28 Mcps TDD Radio Access Technology Capability: bit >   -- 3G RAT
-- Addition in release 4
    < GERAN Feature Package 1 : bit >< MS_EXT_UTBF : bit >
    { 0 | 1 < Extended DTM GPRS Multi Slot Class : bit(2) >
            < Extended DTM EGPRS Multi Slot Class : bit(2) > };
    -- error: struct too short, assume features do not exist
    -- error: struct too long, ignore data and jump to next Access technology
```

< 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) > }
-- Additions in release 99
    { 0 | 1 < **ECSD multislot class** : bit (5) > }
    { 0 | 1 < **EGPRS multislot class** : bit (5) > < **EGPRS Extended Dynamic Allocation   Capability** : bit > }
    {0 | 1  < **DTM GPRS Multi Slot Class**: bit(2)>
        <MAC Mode Support : bit>
        {0 | 1 <**EGPRS DTM Multi Slot Class** : bit(2)> } } ;
    -- error: struct too short, assume features do not exist


<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 3GPP TS 05.05 paragraph 4.1 output power and paragraph 4.1.1 Mobile Station).

**8PSK Power Capability**
If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 05.05):
Bits    2 1
        0 0    Reserved
        0 1    Power class E1
        1 0    Power class E2
        1 1    Power class E3

**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

**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 3GPP TS 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 3GPP TS 05.02.

-- Additions in release 99

**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 3GPP TS 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 3GPP TS 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 GPRS Multi Slot Class  (2 bit field)**
This field indicates the GPRS DTM multislot capabilities of the MS. It is coded as follows:
Bits
2 1
0 0     Multislot class 1 supported
0 1     Multislot class 5 supported
1 0     Multislot 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 DTM Multi Slot Class  (2 bit field)**
This field indicates the EGPRS DTM multislot capabilities of the MS. This field shall be included only if the mobile station supports EGPRS DTM. This field is coded as the DTM GPRS multislot Class field.

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 3.84 Mcps TDD Radio Access Technology Capability** (1 bit field)
Bit
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
0       CDMA2000 not supported
1       CDMA2000 supported

**UMTS 1.28 Mcps TDD Radio Access Technology Capability** (1 bit field)
Bit
0       UMTS 1.28 Mcps TDD not supported
1       UMTS 1.28 Mcps TDD supported

~~**MS_EXT_UTBF** (1 bit field)~~
~~Bit~~
~~0       Extended uplink TBF not supported~~
~~1       Extended uplink TBF supported~~
**GERAN Feature Package 1** (1 bit field)
This field indicates whether the MS supports the GERAN Feature Package 1 (see 3GPP TS 44.060). It is coded as follows:

Bit
0       GERAN feature package 1 not supported.
1       GERAN feature package 1 supported.

**Extended GPRS DTM Multi Slot Class** (2 bit field)
This field indicates the extended GPRS DTM capabilities of the MS and shall be interpreted in conjunction with the GPRS DTM Multi Slot Class field. It is coded as follows, where 'DGMSC' denotes the DTM GPRS  multislot class field:

0 0     **1 0**    Multislot class 4 supported