3GPP TSG-CN Meeting #25 **NP-040376**
8th – 10th September 2004. Palm Springs, USA.

Source: **TSG CN WG1**

Title: **CR to Rel-6 WI DARP towards TS 24.008**

Agenda item: **9.22**

Document for: **APPROVAL**

This document contains **1 CR on Rel-6 Work Item "DARP"**, that has been agreed by TSG CN WG1 CN#35 meeting and forwarded to TSG CN Plenary meeting #25 for approval.

TDoc #	Tdoc Title	Spec	CR #	Rev	CAT	Current version	WI	Rel
N1-041512	Introduction of Downlink Advanced Receiver Performance (DARP) capability	24.008	905		B	6.5.0	DARP	Rel-6

3GPP TSG-CN1 Meeting #35 **Tdoc N1-041512**
Sophia Antipolis, France, 16-20 August 2004

3GPP TSG-GERAN #20 ***Tdoc GP-041713***⌘
Bilbao, Spain, 21-25 June, 2004

CR-Form-v7

CHANGE REQUEST

⌘ **24.008** **CR** **905** ⌘ **rev** **-** ⌘ Current version: **6.5.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Introduction of Downlink Advanced Receiver Performance (DARP) capability
Source:	⌘	Nortel Networks, Nokia
Work item code:	⌘	DARP
Date:	⌘	24/06/2004
Category:	⌘	**B**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	Introduction of Downlink Advanced Receiver Performance (DARP) capability
Summary of change:	⌘	DARP capability bits are added in MS Classmark 3 and MS RAC.
Consequences if not approved:	⌘	Network RRM would not be able to fully exploit the capabilities of a DARP MS.

Clauses affected:	⌘	10.5.1.7, 10.5.5.12a

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

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 GSM 1900 Associated Radio Capability* fields in the MS Classmark 3. Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the mobile should indicate support for either GSM 1800 band OR GSM 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 45.002 [32]).

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 < HSCSD Multi Slot Capability > }
    < UCS2 treatment: bit >
    < Extended Measurement Capability : bit >
    { 0 | 1 < MS measurement capability > }
    { 0 | 1 < MS Positioning Method Capability > }
    { 0 | 1 < ECSD Multi Slot Capability > }
    { 0 | 1 < ECSD 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 <GSM 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) >
             < Single Slot DTM : 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 >
    < GERAN Feature Package 1 : bit >

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

    { 0 | 1 < High Multislot Capability : bit(2) > }---Release 5 starts here.

    { 0 | 1 < GERAN Iu Mode Capabilities > }   -- '1' also means support of GERAN Iu mode
    < GERAN Feature Package 2 : bit >

    < GMSK Multislot Power Profile : bit (2) >
    < 8-PSK Multislot Power Profile : bit (2) >

    { 0 | 1 < T-GSM 400 Bands Supported : { 01 | 10 | 11 } >
             < T-GSM 400 Associated Radio Capability: bit(4) > }

    { 0 | 1 < T-GSM 900 Associated Radio Capability: bit(4) > }

    < Downlink Advanced Receiver Performance : 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) > ;

< HSCSD Multi Slot Capability > ::=
    < HSCSD 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) > ;

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

 < ECSD 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) > ;

< GERAN Iu Mode Capabilities > ::=
    < Length : bit (4) >        -- length in bits of Iu mode only capabilities and spare bits
-- Additions in release 6
    < FLO Iu Capability : bit >
    <spare bits>** ;        -- expands to the indicated length
                            -- may be used for future enhancements
```

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

Band 2 supported
Bit 2
0 E-GSM or R-GSM not supported
1 E-GSM or R-GSM supported

Band 3 supported
Bit 3
0 GSM 1800 not supported
1 GSM 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 GSM 1800 bands, all bits are set to 0.

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

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 GSM 1800 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 GSM 1800, 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 3GPP TS 45.005 [33]).

(continued...)

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

R-GSM band Associated Radio Capability (3 bit field)

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 3GPP TS 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 GSM 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.

HSCSD Multi Slot Class (5 bit field)

In case the MS supports the use of multiple timeslots for HSCSD then the HSCSD Multi Slot Class field is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

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.

0 the ME has a preference for the default alphabet (defined in 3GPP TS 23.038 [8b]) 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

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 (5 bit field)
This field indicates the Positioning Method(s) supported by the mobile station for the provision of location services (LCS) via the CS domain in A-mode.
MS assisted E-OTD
Bit 5

0 MS assisted E-OTD not supported
1 MS assisted E-OTD supported

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

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

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

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

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

ECSD Multi Slot class (5 bit field)

In case the **ECSD** 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 **ECSD** Multi Slot class field is included and is coded as the binary representation of the multislot class defined in 3GPP TS 45.002 [32].

Modulation Capability

The Modulation Capability field indicates the modulation scheme the MS supports in addition to GMSK.
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 for 8-PSK modulation in GSM 400, GSM 700, GSM 850 or GSM 900.

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 GSM 1800 or GSM 1900 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 45.005 [33]):

Bits		
2	1	
0	0	Reserved
0	1	Power class E1
1	0	Power class E2
1	1	Power class E3

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

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

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

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

The radio capability contains the binary coding of the power class associated with the band indicated in GSM 400 Bands Supported bits (see 3GPP TS 45.005 [33]).

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 45.005 [33]).

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.

GSM 1900 Associated Radio Capability (4 bit field)
See the semantic rule for the sending of this field.
This field indicates whether GSM 1900 band is supported and its associated radio capability.

The radio capability contains the binary coding of the power class associated with the GSM 1900 band (see 3GPP TS 45.005 [33]).

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

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

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

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

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

DTM GPRS Multi Slot Class (2 bit field)
This field indicates the DTM GPRS multislot capabilities of the MS. It is coded as follows:
Bit
2 1
0 0 Unused. If received, the network shall interpret this as '01'
0 1 Multislot class 5 supported
1 0 Multislot class 9 supported
1 1 Multislot class 11 supported

Single Slot DTM (1 bit field)
This field indicates whether the MS supports single slot DTM operation (see 3GPP TS 43.055 [87]). It is coded as follows:

0 Single Slot DTM not supported
1 Single Slot DTM supported

An MS indicating support for Extended DTM GPRS multislot class or Extended DTM EGPRS multislot class shall set this bit to '1'. The network may ignore the bit in this case.

DTM EGPRS Multi Slot Class (2 bit field)
This field indicates the DTM EGPRS 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 GSM 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 GSM 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 45.005 [33]).

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)

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

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

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

DGMSC Bit	2 1	Bit	2 1	
	0 0		0 0	Unused. If received, it shall be interpreted as '01 00'
	0 0		0 1	Unused. If received, it shall be interpreted as '01 00'
	0 0		1 0	Unused. If received, it shall be interpreted as '01 00'
	0 0		1 1	Unused. If received, it shall be interpreted as '01 00'
	0 1		0 0	Multislot class 5 supported
	0 1		0 1	Multislot class 6 supported
	0 1		1 0	Unused. If received, it shall be interpreted as '01 00'
	0 1		1 1	Unused. If received, it shall be interpreted as '01 00'
	1 0		0 0	Multislot class 9 supported
	1 0		0 1	Multislot class 10 supported
	1 0		1 0	Unused. If received, it shall be interpreted as '10 00'
	1 0		1 1	Unused. If received, it shall be interpreted as '10 00'
	1 1		0 0	Multislot class 11 supported
	1 1		0 1	Unused. If received, it shall be interpreted as '11 00'
	1 1		1 0	Unused. If received, it shall be interpreted as '11 00'
	1 1		1 1	Unused. If received, it shall be interpreted as '11 00'

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink.When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class field*.

Extended DTM EGPRS Multi Slot Class (2 bit field)
This field is not considered when the DTM EGPRS Multi Slot Class field is not included. This field indicates the extended DTM EGPRS multislot capabilities of the MS and shall be interpreted in conjunction with the DTM EGPRS Multi Slot Class field. This field is coded as the Extended DTM GPRS Multi Slot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM EGPRS Multi Slot Class* field.

High Multislot Capability (2 bit field)
This field indicates the support of multislot classes 30 to 45, see 3GPP TS 45.002.
The High Multislot Capability is individually combined with each multislot class field sent by the MS (the possible multislot class fields are: HSCSD multislot class, ECSD multislot class, GPRS multislot class, EGPRS multislot class, DTM GPRS multislot class, DTM EGPRS multislot class, extended DTM GPRS multislot class and extended DTM EGPRS multislot class) to extend the related multislot class with the rule described in the MS Radio Access Capability IE.

GERAN Iu Mode Capabilities
This field indicates if the mobile station supports GERAN Iu mode. Furthermore, it indicates the GERAN Iu mode capabilities of the mobile station. The field shall be included if the mobile station supports GERAN Iu mode. If the field is not present, the mobile station does not support GERAN Iu mode.

1 GERAN feature package 2 supported.

Next modified section

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.

For the indication of the radio access capabilities the following conditions shall apply:

- Among the three Access Type Technologies GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.
- Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the mobile station should provide the relevant radio access capability for either GSM 1800 band OR GSM 1900 band, not both.
- The MS shall indicate its supported Access Technology Types during a single MM procedure.
- If the alternative coding by using the Additional access technologies struct is chosen by the mobile station, the mobile station shall indicate its radio access capability for the serving BCCH frequency band in the first included Access capabilities struct, if this information element is not sent in response to an Access Technologies Request from the network or if none of the requested Access Technology Types is supported by the MS. Otherwise, the mobile station shall include the radio access capabilities for the frequency bands it supports in the order of priority requested by the network (see 3GPP TS 44.060).
- The first Access Technology Type shall not be set to "1111".

For error handling the following shall apply:

- 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.
- For more details about error handling of MS radio access capability see 3GPP TS 48.018 [86].

Table 10.5.146/3GPP TS 24.008: *Mobile Station Radio Access Capability* Information Element

<**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) > exclude 1111
< **Access capabilities** : <Access capabilities struct> > }

| { < **Access Technology Type**: bit (4) == 1111 > -- *structure adding Access technologies with same capabilities*
< **Length** : bit (7) > -- *length in bits of list of Additional access technologies and spare bits*
{ 1 < **Additional access technologies**: < Additional access technologies struct > > } ** 0
<spare bits>** } }

{ 0 | 1 <MS RA capability value part struct> } ;

< Additional access technologies struct > ::=
< **Access Technology Type** : bit (4) >
< **GMSK Power Class** : bit (3) >
< **8PSK Power Class** : bit (2) > ;

< 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 preceding Access capabilities field 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*
-- *Additions in release 4*
< **UMTS 1.28 Mcps TDD Radio Access Technology Capability**: bit > -- *3G RAT*
< **GERAN Feature Package 1** : bit >
{ 0 | 1 < **Extended DTM GPRS Multi Slot Class** : bit(2) >
< **Extended DTM EGPRS Multi Slot Class** : bit(2) > }
< Modulation based multislot class support : bit >
-- *Additions in release 5*
{ 0 | 1 < **High Multislot Capability** : bit(2) > }
{ 0 | 1 < **GERAN Iu Mode Capabilities** > } -- *'1' also means support of GERAN Iu mode*
< **GMSK Multislot Power Profile** : bit (2) >
< **8-PSK Multislot Power Profile** : bit (2) >
-- *Additions in release 6*
< **Multiple TBF Capability** : bit >
< **Downlink Advanced Receiver Performance** : bit(2) >;
-- error: struct too short, assume features do not exist
-- error: struct too long, ignore data and jump to next Access technology

Table 10.5.146/3GPP TS 24.008 (continued): *Mobile Station Radio Access Capability* IE

< 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)>
<Single Slot DTM : bit>
{0 | 1 <**DTM EGPRS Multi Slot Class** : bit(2)> } } ;
-- error: struct too short, assume features do not exist

< **GERAN Iu Mode Capabilities** > ::=
< **Length** : bit (4) > -- *length in bits of Iu mode-only capabilities and spare bits*
-- *Additions in release 6*
< **FLO Iu Capability** : bit >
<spare bits>** ; -- *expands to the indicated length*
-- *may be used for future enhancements*

<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. These fields are not used by the network and may be excluded by the MS.

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
1 0 0 1 GSM T 380
1 0 1 0 GSM T 410
1 0 1 1 GSM T 900
1 1 1 1 Indicates the presence of a list of Additional access technologies
All other values are treated as unknown by the receiver.

A MS which does not support any GSM access technology type shall set this field to '0000'.

RF Power Capability, GMSK Power Class (3 bit field)
This field contains the binary coding of the power class used for GMSK associated with the indicated Access Technology Type (see 3GPP TS 45.005).

A MS which does not support any GSM access technology type shall set this field to '000'.

8PSK Power Capability (2 bit field)
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 45.005 [33]):
Bits 2 1
0 0 Reserved
0 1 Power class E1
1 0 Power class E2
1 1 Power class E3

8PSK Power Class (2 bit field)
This field indicates the radio capability for 8-PSK modulation. The following coding is used (see 3GPP TS 45.005):
Bits 2 1
0 0 8PSK modulation not supported for uplink
0 1 Power class E1
1 0 Power class E2

1 1 Power class E3

Additional access technologies struct
This structure contains the GMSK Power Class and 8PSK Power Class for an additional Access Technology. All other capabilities for this indicated Access Technology are the same as the capabilities indicated by the preceding Access capabilities struct.

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 10.5.146/3GPP TS 24.008 (concluded): *Mobile Station Radio Access Capability* IE

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 45.002 [32]. This field is not used by the network and may be excluded by the MS.
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 45.002 [32].

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 45.002 [32]. This field is not used by the network and may be excluded by the MS.
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 45.002 [32].

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. This field is not used by the network and may be excluded by the MS.
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. This field is not used by the network and may be excluded by the MS.
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 DTM GPRS multislot capabilities of the MS. It is coded as follows:

Bits	
2 1	
0 0	Unused. If received, the network shall interpret this as '01'
0 1	Multislot class 5 supported
1 0	Multislot class 9 supported
1 1	Multislot class 11 supported

Single Slot DTM (1 bit field)
This field indicates whether the MS supports single slot DTM operation (see 3GPP TS 43.055 [87]).

Bit	
0	Single Slot DTM not supported
1	Single Slot DTM supported

An MS indicating support for Extended DTM GPRS multislot class or Extended DTM EGPRS multislot class shall set this bit to '1'. The network may ignore the bit in this case.

DTM EGPRS Multi Slot Class (2 bit field)
This field indicates the DTM EGPRS 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 (1 bit field)

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	CDMA 2000 not supported
1	CDMA 2000 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

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:

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

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

DGMSC Bit	2 1	**Bit 2 1**	
	0 0	**0 0**	Unused. If received, it shall be interpreted as '01 00'
	0 0	**0 1**	Unused. If received, it shall be interpreted as '01 00'
	0 0	**1 0**	Unused. If received, it shall be interpreted as '01 00'
	0 0	**1 1**	Unused. If received, it shall be interpreted as '01 00'
	0 1	**0 0**	Multislot class 5 supported

0 1	**0 1**	Multislot class 6 supported
0 1	**1 0**	Unused. If received, it shall be interpreted as ‘01 00’
0 1	**1 1**	Unused. If received, it shall be interpreted as ‘01 00’
1 0	**0 0**	Multislot class 9 supported
1 0	**0 1**	Multislot class 10 supported
1 0	**1 0**	Unused. If received, it shall be interpreted as ’10 00’
1 0	**1 1**	Unused. If received, it shall be interpreted as ’10 00’
1 1	**0 0**	Multislot class 11 supported
1 1	**0 1**	Unused. If received, it shall be interpreted as ’11 00’
1 1	**1 0**	Unused. If received, it shall be interpreted as ’11 00’
1 1	**1 1**	Unused. If received, it shall be interpreted as ’11 00’

The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the *DTM GPRS Multi Slot Class* field.

Extended DTM EGPRS Multislot Class (2 bit field)
This field is not considered when the DTM EGPRS Multislot Class field is not included. This field indicates the extended DTM EGPRS multislot capabilities of the MS and shall be interpreted in conjunction with the DTM EGPRS Multislot Class field. This field is coded as the Extended DTM GPRS Multislot Class field. The presence of this field indicates that the MS supports combined fullrate and halfrate GPRS channels in the downlink. When this field is not present, the MS supports the multislot class indicated by the DTM EGPRS Multi Slot Class field.

Modulation based multislot class support (1 bit field)
Bit
0 "Modulation based multislot class" not supported
1 "Modulation based multislot class" supported

High Multislot Capability (2 bit field)
The High Multislot Capability is individually combined with each multislot class field sent by the MS (the possible multislot class fields are: HSCSD multislot class, ECSD multislot class, GPRS multislot class, EGPRS multislot class, DTM GPRS multislot class, DTM EGPRS multislot class, extended DTM GPRS multislot class and extended DTM EGPRS multislot class) to extend the related multislot class to multislot classes 30 to 45, see 3GPP TS 45.002.
For each multislot class, the following mapping is done:
Bits

2 1	coded multislot class field	actual multislot class
0 0	8	30
0 0	10, 23, 28, 29	39
0 0	11, 20, 25	32
0 0	12, 21, 22, 26, 27	33
0 0	Any other	Multislot Class field value
0 1	8	35
0 1	10, 19, 24	36
0 1	11, 23, 28, 29	45
0 1	12, 21, 22, 26, 27	38
0 1	Any other	Multislot Class field value
1 0	8	40
1 0	10, 19, 24	41
1 0	11, 20, 25	42
1 0	12, 23, 28, 29	44
1 0	Any other	Multislot Class field value
1 1	12, 21, 22, 26, 27	43
1 1	11, 20, 25	37
1 1	10, 19, 24	31
1 1	9, 23, 28, 29	34
1 1	Any other	Multislot Class field value

GERAN Iu Mode Capabilities
This field indicates if the mobile station supports GERAN Iu mode. Furthermore, it indicates the GERAN Iu mode capabilities of the mobile station. The field shall be included if the mobile station supports GERAN Iu mode. If the field is not present, the mobile station does not support GERAN Iu mode.

GMSK Multislot Power Profile (2 bit field)
For detailed definitions, see the Mobile Station Classmark 3 information element.