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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Serving Mobile Location Centre - Base Station System
(SMLC-BSS) interface;
Layer 3 specification
(3GPP TS 48.071 version 5.0.1 Release 5)**



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Foreword

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1 Scope

The present document contains the coding of information necessary for support of location service operation on the SMLC-BSS interface layer 3.

Clause 2 gives the functional definitions and contents of messages for location service operations. Clause 3 gives the general format and coding for messages used for location service and the format and coding of information elements used for location service operations.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 43.059: "Functional stage 2 description of Location Services (LCS) in GERAN (Release 4)".
- [3] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".
- [4] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".
- [4a] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core network protocols; Stage 3".
- [5] 3GPP TS 45.008: "Radio subsystem link control".
- [6] 3GPP TS 48.008: "Mobile Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification".
- [7] 3GPP TS 49.031: "Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)".
- [8] 3GPP TS 44.031: "Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP)".

3 Definitions and abbreviations

For the purposes of the present document, the abbreviations, terms and definitions given in 3GPP TR 21.905 and 3GPP TS 43.059 apply.

4 Messages functional definitions and contents

4.1 General

This subclause defines the structure of the messages of the SMLC-BSS layer 3 protocol defined in 3GPP TS 43.059.

Each definition includes:

- a) a brief description of the message;
- b) a table listing the information elements in the order of their appearance in the message.

For each IE the table indicates:

- 1) the name of the IE (which gives an idea of the semantics of the element), which is used in this and other specifications as a reference to the IE within the message;
 - 2) the name of the type of the IE (which indicates the coding of the value part of the IE), and a reference to a description of the value part of the IE;
 - 3) the presence requirement indication (M, C or O) for the IE, as defined in 3GPP TS 24.007;
 - 4) the format of the IE (T, V, TV, LV, TLV) as defined in 3GPP TS 24.007;
 - 5) the length of the IE (or permissible range of lengths), in octets, in the message. The value of the length gives the number of octets in the IE following the length and element identifier. Where the length is encoded using more than one octet, the high order bit is bit 8 of the first (lowest numbered octet) and the low order bit is bit 1 of the last (highest numbered octet).
- c) subclauses specifying conditions for IEs with presence requirement C or O in the relevant message. Together with other conditions specified in 3GPP TS 43.059 this defines when the IE shall be included or not, what non-presence of such IEs means, and (for IEs with presence requirement C) the static conditions for presence and/or non-presence of the IEs (see 3GPP TS 43.059).

4.2 Messages

The following Location Services related messages are exchanged between the SMLC and the BSS:

- TA Request;
- TA Response;
- Reject;
- Reset;
- Abort;
- TA Layer3;
- MS Position Command;
- MS Position Response.

On the A interface the messages are contained in the Location Information IE which is encapsulated in the BSSMAP-LE Connection Oriented Information message as specified in 3GPP TS 48.008.

4.2.1 TA Request

The TA Request is a message from the SMLC to the BSS, requesting BSS to return the timing advance (or access delay) of the MS.

Table 4.1: TA Request message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1

4.2.2 TA Response

The TA Response is a message from the BSS to the SMLC. It is a response to TA Request message and contains the following information elements.

Table 4.2: TA Response message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Serving Cell Identity	Cell Identity IE / 5.4	M	TV	3
Timing Advance	Timing Advance IE / 5.2	M	TV	2
Measurement Report	Measurement Report IE / 5.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE / 5.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE / 5.17	O	TLV	6 to N

4.2.3 Void

4.2.4 Void

4.2.5 Reject

The Reject is a message from the BSS to the SMLC. It is a possible response to TA Request or MS Position Command and contains the following information elements.

Table 4.5: Reject message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Cause	Cause IE / 5.14	M	TV	2

The following are the expected cause values for Reject message:

- congestion;
- channel Mode not supported;
- positioning procedure not supported;
- failure for other radio related events;
- incorrect serving cell identity;
- BSSAP-LE Segmentation error.

4.2.6 Reset

The Reset is a message from the BSS to the SMLC. It is sent when the Response message contents for a positioning request are invalidated (e.g. due to handover) before the positioning procedure was completed.

Table 4.6: Reset message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Cell ID	Cell Identity IE / 5.4	M	TV	3
Timing Advance	Timing Advance IE / 5.2	M	TV	2
Channel description	Channel Description IE / 5.8	M	TV	4
Cause	Cause IE / 5.1	M	TV	2
Measurement Report	Measurement Report IE / 5.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE / 5.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE / 5.17	O	TLV	6 to N
LAC	Location Area Code IE / 5.19	O	TV	3

The following are the expected cause values for Reset message:

- intra-BSS handover;
- failure for other radio related events;
- supervision Timer Expired;
- incorrect serving cell identity.

4.2.7 Abort

The Abort is a message either from the BSS to the SMLC or SMLC to the BSS. Upon receiving this signal, either SMLC or BSS shall abort ongoing positioning procedure.

Table 4.7: Abort message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Cause	Cause IE / 5.14	M	TV	2

The following are the expected cause values for Abort message:

- failure for other radio related events;
- supervision Timer Expired;
- inter BSS handover;
- loss of signalling connection to MS.

4.2.8 TA Layer3

The TA Layer3 is an optional encapsulated message from the BSS to the SMLC that adds the following information in Complete layer 3 Information as described in 3GPP TS 48.008.

Table 4.8: TA Layer3 message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Timing Advance	Timing Advance IE / 5.2	M	TV	2
Measurement Report	Measurement Report IE / 5.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE / 5.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE / 5.17	O	TLV	6 to N

4.2.9 MS Position Command

The BSSLAP MS Position Command is a message from the SMLC to BSS that contains the following information elements.

Table 4.9: MS Position Command message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
flag	RRLP flag IE / 5.15	M	TV	2
RRLP Info	RRLP IE / 5.16	M	TLV	3 to N

4.2.10 MS Position Response

The BSSLAP MS Position Response is a message from the BSS to the SMLC that contains the following information elements.

Table 4.10: MS Position Response message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
flag	RRLP flag IE / 5.15	M	TV	2
RRLP Info	RRLP IE / 5.16	M	TLV	3 to N
Timing Advance	Timing Advance IE / 5.2	O	TV	2
Measurement Report	Measurement Report IE / 5.12	O	TLV	18
Enhanced Measurement Report	Enhanced Measurement Report IE / 5.18	O	TLV	20
Measured Cell Identity List	Cell Identity List IE / 5.17	O	TLV	6 to N

5 Information element encodings

This paragraph contains the coding of the signalling elements used.

The following conventions are assumed for the sequence of transmission of bits and bytes:

- each bit position is marked as 1 to 8. Bit 1 is the least significant bit and is transmitted first;
- in an element octets are identified by number, octet 1 is transmitted first, then octet 2 etc.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

- For variable length elements a length indicator is included, this indicates the number of octets following in the element.

- All fields within Information Elements are mandatory unless otherwise specified. The Information Element Identifier shall always be included.

All spare bits are set to 0.

The elements used and their coding are:

Element Identifier Coding	Element name	Reference
0000 0001	Timing Advance	5.2
0000 1000	Reserved (note)	
0000 1001	Cell Identity	5.4
0000 1010	Reserved (note)	
0000 1011	Reserved (note)	
0000 1100	Reserved (note)	
0001 0000	Channel Description	5.8
0001 0001	Reserved (note)	
0001 0010	Reserved (note)	
0001 0011	Reserved (note)	
0001 0100	Measurement Report	5.12
0001 0101	Reserved (note)	
0001 1000	Cause	5.14
0001 1001	RRLP Flag	5.15
0001 1011	RRLP IE	5.16
0001 1100	Cell Identity List	5.17
0001 1101	Enhanced Measurement Report	5.18
0001 1110	Location Area Code	5.19
NOTE: These values of the codepoints shall not be used as they were used in an earlier version of the protocol.		

All unassigned codes are spare.

5.1 Message Type IE

Message Type uniquely identifies the message being sent. It is a single octet element, mandatory in all messages.

All unassigned codes are spare.

8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Reserved.
0 0 0 0 0 0 0 1	TA REQUEST
0 0 0 0 0 0 1 0	TA RESPONSE
0 0 0 0 0 1 0 0	Reserved (note)
0 0 0 0 0 1 0 1	Reserved (note)
0 0 0 0 1 0 1 0	REJECT
0 0 0 0 1 0 1 1	RESET
0 0 0 0 1 1 0 0	ABORT
0 0 0 0 1 1 0 1	TA LAYER3
0 0 0 0 1 1 1 1	MS Position Command
0 0 0 1 0 0 0 0	MS Position Response
NOTE: These values of the codepoints shall not be used as they were used in an earlier version of the protocol.	

5.2 Timing Advance IE

This element contains the Timing Advance measured by the BTS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Timing Advance								octet 2

The coding of the timing advance value field is the binary representation of the timing advance in bit periods; 1 bit period = 48/13 us, as described in 3GPP TS 44.018 with the difference that all 8 bits are significant (instead of the normal 6 bits), which is necessary in order to report TA from extended range cells. To be correct, values over 63 do not correspond to a TA used by the MS (maximum is 63). Instead values over 63 correspond to the access delay measured by the BTS.

5.3 Void

5.4 Cell Identity IE

This element defines the cell identity of the MS serving cell.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Cell Identity								octet 2-3

The coding of the Cell Identity field is as defined in 3GPP TS 24.008 subclause 10.5.1.1 Cell Identity (excluding IEI).

5.5 Void

5.6 Void

5.7 Void

5.8 Channel Description IE

This element defines the physical channel allocation of the MS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Channel Description								octets 2-4

The coding of Channel Description field is as defined in 3GPP TS 44.018 subclause 10.5.2.5a Channel Description (excluding IEI).

5.9 Void

5.10 Void

5.11 Void

5.12 Measurement Report IE

This element contains the measurement report from the BSS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Measurement Results								octet 3-18

The Measurement Results field is encoded as in 3GPP TS 44.018 subclause 10.5.2.20 Measurement Result (excluding IEI).

5.13 Void

5.14 Cause IE

This element contains the cause value.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Cause value								octet 2

The cause field is coded as follows:

0000 0000	Congestion
0000 0001	Channel Mode not supported
0000 0010	Positioning procedure not supported
0000 0011	Failure for other radio related events
0000 0100	Intra-BSS handover
0000 0101	Supervision Timer Expired
0000 0110	Inter-BSS handover
0000 0111	Loss of signalling connection to MS
0000 1000	Incorrect serving cell identity
0000 1001	BSSAP-LE Segmentation error
All unassigned codes are spare.	

5.15 RRLP Flag IE

This element is coded as:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
SPARE							Flag1	octet 2

The fields are coded as follows:

Flag 1 (Octet 2, bit 1):

- 0 Position Command (SMLC to BSC) or final response (BSC to SMLC).
- 1 Not a Positioning Command or final response.

5.16 RRLP IE

RRLP IE is coded as:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2-3
RRLP APDU (3GPP TS 44.031)								octet 4-N

5.17 Cell Identity List IE

This element defines the list of cell identities of neighbour cells, for which measurements are reported. The Cell Identities are listed in the same order than the corresponding measurements in the (Enhanced) Measurement Report IE.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Spare				Cell identification Discriminator 1				octet 3
Cell Identification 1								octet 4-4+p
...								
Spare				Cell identification Discriminator N				octet n-1
Cell Identification N								octet n-n+q

The coding of octet 2 is a binary number indicating the Length of the remaining element. The Length depends on the Cell identification discriminator *i* as well as the number of cells to be identified.

The Cell identification discriminator *i* is coded as follows:

- 0000 The whole Cell Global Identification, CGI, is used to identify the 2G cells.
- 0001 Location Area Code, LAC, and Cell Identify, CI, are used to identify the 2G cells.
- 0010 3G Cell identification container 1.
- 0011 3G Cell identification container 2.

All other values are reserved.

The coding of the Cell Identification *i* depends on the Cell identification discriminator *i*. Below the coding of the *i*-th Cell Identification is shown for each Cell identification discriminator (with "i" in the range 1 to n):

Coding of the *i*-th Cell Identification for Cell identification discriminator = 0000.

8	7	6	5	4	3	2	1	
MCC dig 2				MCC dig 1				octet x+1
MNC dig 3				MCC dig 3				octet x+2
MNC dig 2				MNC dig 1				octet x+3
LAC								octet x+4
LAC cont.								octet x+5
CI value								octet x+6
CI value cont								octet x+7

The octet (x+2) bits 5-8 are filled by '1111' if 2 digit MNC is used.

The octets (x+1)-(x+5) are coded as the value part shown in 3GPP TS 24.008, Table 'Location Area Identification information element'.

The octets (x+6)-(x+7) are coded as the value part shown in 3GPP TS 24.008, Table 'Cell Identity information element'.

Coding of i-th Cell Identification for Cell identification discriminator = 0001.

8	7	6	5	4	3	2	1	
LAC								octet x+1
LAC cont.								octet x+2
CI value								octet x+3
CI value cont								octet x+4

The octets (x+1)-(x+2) are coded as the value part shown in 3GPP TS 24.008, Table 'Location Area Identification information element'.

The octets (x+3)-(x+4) are coded as the value part shown in 3GPP TS 24.008, Table 'Cell Identity information element'.

Coding of the Target ID for Cell identification discriminator = 0010.

Octets (x+1) to (x+9) shall be ignored by the receiver.

NOTE: in the 3G Cell identification container 1, the transmitter may send PLMN-ID, LAC, RNC-ID and C-ID to identify a 3G cell.

Coding of the Target ID for Cell identification discriminator = 0011.

Octets (x+1) to (x+6) shall be ignored by the receiver.

NOTE: In the 3G Cell identification container 2, the transmitter may send LAC, RNC-ID and C-ID to identify a 3G cell.

5.18 Enhanced Measurement Report IE

This element contains the measurement report from the BSS.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Enhanced Measurement Results								octet 3-18

The Enhanced Measurement Results field is encoded as in 3GPP TS 44.018 subclause 9.1.55, containing the Enhanced Measurement Report message.

5.19 Location Area Code IE

This element defines the cell identity of the MS serving cell.

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Location Area Code								octet 2-3

The coding of the Location Area Code field is as defined in 3GPP TS 24.008 subclause 10.5.1.3 Location Area Identification (excluding IEI, MCC, and MNC).

Annex A (informative): Change history

Meeting	Tdoc	CR	Rev	Subject/Comment	New version
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