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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
International Mobile station Equipment Identities (IMEI)
(GSM 02.16 version 7.1.0 Release 1998)**

GSM®

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS



Reference

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document defines the principal purpose and use of International Mobile station Equipment Identities (IMEI).

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

- 7 indicates Release 1998 of GSM Phase 2+
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document defines the principal purpose and use of International Mobile station Equipment Identities (IMEI).

GSM 03.03 describes the technical manner of numbering, addressing and identification.

1.1 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

- [1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 02.17: "Digital cellular telecommunications system (Phase 2+); Subscriber Identity Modules (SIM) Functional characteristics".
- [3] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".
- [4] ISO/IEC 7812 (1989): "Identification cards - Numbering system and registration procedure for issuer identifiers".

1.2 Definitions and abbreviations

In addition to the following, abbreviations used in the present document are listed in GSM 01.04.

International Mobile Station Equipment Identity (IMEI): "International Mobile Station Equipment Identity" is a unique number which shall be allocated to each individual mobile station equipment in the GSM system and shall be unconditionally implemented by the MS manufacturer.

2 General

As described in GSM 02.17, an MS can only be operated if a valid "International Mobile Subscriber Identity" (IMSI) is present. An IMSI is primarily intended for obtaining information on the use of the GSM network by subscribers for individual charging purposes.

Besides the IMSI, the implementation of IMEI is found necessary in order to obtain knowledge about the presence of specific mobile station equipment in the network, disregarding whatever subscribers are making use of these equipments.

The main objective is to be able to take measures against the use of stolen equipment or against equipment of which the use in the GSM system can not or no longer be tolerated for technical reasons.

The IMEI is incorporated in an MS module which is contained within the MS equipment. The IMEI shall not be changed after the ME's final production process. It shall resist tampering, i.e. manipulation and change, by any means (e.g. physical, electrical and software).

NOTE: This requirement is valid for new GSM Phase 2 and Release 96, 97, 98 and 99 MEs type approved after 1st June 2002.

This implementation of each individual module should be carried out by the manufacturer who is also responsible for ascertaining that each IMEI is unique and keeping detailed records of produced and delivered MS.

3 Composition of IMEI

The composition of the IMEI shall be such that each individual mobile station equipment can be separately identified.

Information is contained in the IMEI by which the GSM PLMN, after requesting it, can immediately decide whether or not to accept calls made by means of this equipment.

Secondly, the IMEI shall directly or indirectly contain all information which is necessary for the network operator to make relations through its administrative system to trace the equipment to its origin of production. GSM 03.03 describes the structure of the IMEI in detail.

The IMEI (14 digits) is complemented by a check digit. The check digit is not part of the digits transmitted at IMEI check occasions, as described below. The Check Digit shall avoid manual transmission errors, e.g. when customers register stolen MEs at the operators customer care desk. The Check Digit is defined according to the Luhn formula, as defined in annex A.

NOTE: The Check Digit is not applied to the Software Version Number.

4 Use of the equipment identity register

A network operator can make administrative use of the IMEI in the following manner:

Three registers are defined, known as "white lists", "grey lists" and "black lists". The use of such lists is at the operators' discretion.

The **white list** is composed of all **number series** of equipment identities that are permitted for use.

The **black list** contains all equipment identities that belong to equipment that need to be barred.

Besides the black and white list, administrations have the possibility to use a **grey list**. Equipments on the grey list are not barred (unless on the black list or not on the white list), but are tracked by the network (for evaluation or other purposes).

5 Procedure

It shall be possible to perform the IMEI check at any access attempt, except IMSI detach, and during an established call at any time when a dedicated radio resource is available, in accordance with the security policy of the PLMN operator.

The network shall terminate any access attempt or ongoing call when receiving any of the answers "black-listed" (i.e., on the black list) or "unknown" equipment (i.e., not on the white list) from the EIR. An indication of "illegal ME" shall in these cases be given to the user. Furthermore this is equivalent to an authentication failure hence any call establishment or any location updating is forbidden for the MS, it cannot answer to paging, it is just allowed to perform Emergency Calls. Emergency calls must never be terminated as a result of the IMEI check procedure.

6 Use of IMEI in case of emergency calls

Emergency calls can in some PLMNs be made without having to send the subscriber identity (IMSI) to the network. In this case the misuse of MS equipments after placing invalid emergency calls can be restrained by using the equipment identity.

The network request for the equipment identity is sent to the MS after the emergency call has been set-up. The procedure is the same as for normal call set-up.

7 MS Software Version Number (SVN)

A Software Version Number (SVN) field shall be provided. This allows the ME manufacturer to identify different software versions of a given type approved mobile.

The SVN is a separate field from the IMEI, although it is associated with the IMEI, and when the network requests the IMEI from the MS, the SVN (if present) is also sent towards the network. It comprises 2 decimal digits.

The white list shall use the IMEI, The Black and Grey Lists may also use the SVN.

Annex A (normative): IMEI Check Digit computation

A.1 Representation of IMEI

The International Mobile station Equipment Identity and Software Version Number (IMEISV), as defined in TS GSM 03.03, is a 16 digit decimal number composed of four distinct elements:

- a 6 digit Type Approval Code (TAC);
- a 2 digit Final Assembly Code (FAC);
- a 6 digit Serial Number (SNR); and
- a 2 digit Software Version Number (SVN).

The IMEISV is formed by concatenating these four elements as illustrated below:



Figure A.1: Composition of the IMEISV

The IMEI is complemented by a check digit as defined in section 3. The Luhn Check Digit (CD) is computed on the 14 most significant digits of the IMEISV, that is on the value obtained by ignoring the SVN digits.

The method for computing the Luhn check is defined in Annex B of the International Standard "Identification cards - Numbering system and registration procedure for issuer identifiers" (ISO/IEC 7812).

In order to specify precisely how the CD is computed for the IMEI, it is necessary to label the individual digits of the IMEISV, excluding the SVN. This is done as follows:

The (14 most significant) digits of the IMEISV are labelled D14 D13 ... D1, where:

- TAC = D14 D13 ... D9 (with D9 the least significant digit of TAC);
- FAC = D8 D7 (with D7 the least significant digit of FAC); and
- SNR = D6 D5 ... D1 (with D1 the least significant digit of SNR).

A.2 Computation of CD for an IMEI

Computation of CD from the IMEI proceeds as follows:

- Step 1: Double the values of the odd labelled digits D1, D3, D5 ... D13 of the IMEI.
- Step 2: Add together the individual digits of all the seven numbers obtained in Step 1, and then add this sum to the sum of all the even labelled digits D2, D4, D6 ... D14 of the IMEI.
- Step 3: If the number obtained in Step 2 ends in 0, then set CD to be 0. If the number obtained in Step 2 does not end in 0, then set CD to be that number subtracted from the next higher number which does end in 0.

A.3 Example of computation

IMEI (14 most significant digits):

TAC						FAC		SNR					
D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1
2	6	0	5	3	1	7	9	3	1	1	3	8	3

Step 1:

2	6	0	5	3	1	7	9	3	1	1	3	8	3
	x2		x2		x2		x2		x2		x2		x2
	12		10		2		18		2		6		6

Step 2:

$$2 + 1 + 2 + 0 + 1 + 0 + 3 + 2 + 7 + 1 + 8 + 3 + 2 + 1 + 6 + 8 + 6 = 53$$

Step 3:

$$CD = 60 - 53 = 7$$

Annex B (informative): Change history

SMG#	VERS	NEW_VERS	CR	SUBJECT
S01	3.0.1	4.0.0	001	Removal of MoU-parts
S02	4.0.0	4.1.0	002	IMEI check
S03	4.1.0	4.2.0	005	Clarifications
S03	4.1.0	4.2.0	004	Result of IMEI checking
S05	4.2.0	4.3.0	006	EIR
S12	4.3.0	4.4.0	A001	MS Software Version Number
S12	4.3.0	4.4.0	A001	MS Software Version Number
S13	4.4.0	4.5.0	A002	Description of the IMEI Check Digit
S13	4.4.0	4.5.0	A003	IMEI Check Digit computation
S13	4.4.0	4.5.0	A003	IMEI Check Digit computation
S13	4.4.0	4.5.0	A002	Description of the IMEI check digit
S20	4.5.0	5.0.0		Specification upgrade to Phase2+ version 5.0.0
S27	5.0.0	6.0.0		Specification upgrade to Release 1997 version 6.0.0
S29		7.0.0		Specification upgrade to Release 1998 version 7.0.0
SA#05	7.0.0	7.1.0	A008r1	Modification of section 2 to enhance IMEI security

History

Document history		
V7.0.0	August 1999	Publication
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