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Digital cellular telecommunications system (Phase 2+) (GSM); Security aspects (GSM
02.09 version 6.0.1 Release 1997)

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European Standard (Telecommunications series)

Digital cellular telecommunications system (Phase 2+); Security aspects (GSM 02.09 version 6.0.1 Release 1997)

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ETSI

Postal address

F-06921 Sophia Antipolis Cedex - FRANCE

Office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C

Association à but non lucratif enregistrée à la

Sous-Préfecture de Grasse (06) N° 7803/88

Internet

secretariat@etsi.fr

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Foreword

This European Standard (Telecommunications series) has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).

This EN defines security features within the digital cellular telecommunications system.

The contents of this standard may be subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of this standard it will then be re-submitted for formal approval procedures by ETSI with an identifying change of release date and an increase in version number as follows:

Version 6.x.y

where:

6 GSM Phase 2+ Release 1997

x the second digit is incremented for **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.

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1 Scope

Bearer and Teleservices, as respectively defined in GSM 02.02 and GSM 02.03, are the objects which the GSM PLMN operators offer to their customers. Besides these basic telecommunications services, features which aim at up-grading these basic services need also to be offered. Due to the use of radiocommunications in a PLMN, which are of a special nature compared to classical distribution transmission techniques used in the fixed networks, such a category of features is related to security aspects.

In a GSM PLMN, both the users and the network operator have to be protected against undesirable intrusion of third parties. However, measures should be provided for in order to insure maximum protection of the rights of the individuals concerns. As a consequence, a security feature is either a supplementary service to Tele or Bearer services, which can be selected by the subscriber, or a network function involved in the provision of one or several telecommunication services.

The purpose of this EN is to define the security features which are to be available in a GSM PLMN, together with the associated levels of protection. This EN is only concerned with those security features which aim at the up-grading of the security in a GSM PLMN. In particular, end-to-end security is outside the scope of this EN.

The implementation aspects of security features are described in GSM 03.20.

1.1 Normative 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.

- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".
- [3] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".
- [4] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".
- [5] GSM 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".

1.2 Abbreviations

Abbreviations used in this EN are listed in GSM 01.04.

2 General

The use of radiocommunications for transmission to the mobile subscribers makes PLMNs particularly sensitive to:

- misuse of their resources by unauthorized persons using manipulated Mobile Stations, who try to impersonate authorized subscribers; and
- eavesdropping of the various information which are exchanged on the radio path.

It can be seen that PLMNs intrinsically do not provide the same level of protection to their operators and subscribers as the traditional telecommunication networks provide. This fact leads to the need to implement security features in a GSM PLMN in order to protect:

- i) the access to the mobile services;
- ii) any relevant item from being disclosed at the radio path, mainly in order to ensure the privacy of user-related information.

Two levels of protection are therefore assumed:

- where security features are provided, as defined in clause 3, the level of protection at the radio path of the corresponding items is as good as the level of protection provided in the fixed networks;
- where no special provision is made, the level of protection at the radio path is null. All items which are not dealt with in clause 3 are therefore considered to need no protection.

3 Security features provided in a GSM PLMN

The following security features are considered:

- subscriber identity (IMSI) confidentiality;
- subscriber identity (IMSI) authentication;
- user data confidentiality on physical connections;
- connectionless user data confidentiality;
- signalling information element confidentiality.

The implementation of these five security features is mandatory on both the fixed infrastructure side and the MS side. This means that all GSM PLMNs and all MSs shall be able to support every security feature. Use of these five security features is at the discretion of the operator for its own subscribers while on the HPLMN. For roaming subscribers, use of these five security features is mandatory unless otherwise agreed by all the affected PLMN operators (see also subclause 3.3.3).

3.1 Subscriber identity confidentiality

3.1.1 Definition

The subscriber identity confidentiality feature is the property that the IMSI is not made available or disclosed to unauthorized individuals, entities or processes.

3.1.2 Purpose

This feature provides for the privacy of the identities of the subscribers who are using GSM PLMN resources (e.g. a traffic channel or any signalling means). It allows for the improvement of all other security features (e.g. user data confidentiality) and provides for the protection against tracing the location of a mobile subscriber by listening to the signalling exchanges on the radio path.

3.1.3 Functional requirements

This feature necessitates the confidentiality of the subscriber identity (IMSI) when it is transferred in signalling messages (see subclause 3.5) together with specific measures to preclude the possibility to derive it indirectly from listening to specific information, such as addresses, at the radio path.

The means used to identify a mobile subscriber on the radio path consists of a local number called Temporary Mobile Subscriber Identity (TMSI), described in GSM 03.20.

When used, the subscriber identity confidentiality feature shall apply for all signalling sequences on the radio path. However, in the case of location register failure, or in case the MS has no TMSI available, open identification is allowed on the radio path.

3.2 Subscriber identity authentication

3.2.1 Definition

International Mobile Subscriber identity (IMSI) authentication is the corroboration by the land-based part of the system that the subscriber identity (IMSI or TMSI), transferred by the mobile subscriber within the identification procedure at the radio path, is the one claimed.

3.2.2 Purpose

The purpose of this authentication security feature is to protect the network against unauthorized use. It enables also the protection of the GSM PLMN subscribers by denying the possibility for intruders to impersonate authorized users.

3.2.3 Functional requirements

The authentication of the GSM PLMN subscriber identity may be triggered by the network when the subscriber applies for:

- a change of subscriber-related information element in the VLR or HLR (including some or all of: location updating involving change of VLR, registration or erasure of a supplementary service); or
- an access to a service (including some or all of: set-up of mobile originating or terminated calls, activation or deactivation of a supplementary service); or
- first network access after restart of MSC/VLR;

or in the event of cipher key sequence number mismatch.

Physical security means must be provided to preclude the possibility to obtain sufficient information to impersonate or duplicate a subscriber in a GSM PLMN, in particular by deriving sensitive information from the mobile station equipment.

If, on an access request to the GSM PLMN, the subscriber identity authentication procedure fails and this failure is not due to network malfunction, then the access to the GSM PLMN shall be denied to the requesting party.

3.2.4 Authentication during a malfunction of the network

If an MS is registered and has been successfully authenticated, whether active or not active on a call, calls are permitted (including continuation and hand-over).

If an MS has already been registered (and therefore been already authenticated) and can not be successfully reauthenticated due to the network malfunction (e.g. the HPLMN was not able to provide authentication pairs RAND, SRES), calls are permitted.

If an MS attempts to register and can not be successfully authenticated due to the network malfunction, calls are not permitted.