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European digital cellular telecommunications system (Phase 2); Functions related to Mobile Station (MS) in idle mode (GSM 03.22)

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS defines the functions related to Mobile Station (MS) in idle mode for the European digital cellular telecommunications system (Phase 2). This ETS corresponds to GSM Technical Specification (GSM-TS) GSM 03.22 version 4.9.0.

The specification from which this ETS has been derived was originally based on CEPT documentation, hence the presentation of this ETS may not be entirely in accordance with the ETSI/PNE rules.

Reference is made within this ETS to GSM-TSs (NOTE).

Reference is also made within this ETS to GSM xx.xx. series. The specifications in the series can be identified, with their full title, within the normative reference clause of this final draft ETS by the first two digits of their GSM reference number e.g. GSM 09.xx series, refers to GSM 09.01, GSM 09.02, etc.

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM ETSs.

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Date of adoption of this ETS:	30 September 1995
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1 General

1.1 Scope

This European Telecommunication Standard (ETS) gives an overview of the tasks undertaken by a GSM900 or DCS1800 mobile station (MS) when in idle mode, that is, switched on but not having a dedicated channel allocated, e.g. not making or receiving a call. It also describes the corresponding network functions.

This ETS outlines how the requirements of the GSM 02 series Technical Specifications (especially TS GSM 02.11) on idle mode operation shall be implemented. Further details are given in Technical Specifications GSM 04.08 and GSM 05.08.

Clause 2 of this ETS gives a general description of the idle mode process. Clause 3 outlines the main requirements and technical solutions of those requirements. Clause 4 describes the processes used in idle mode. There is inevitably some overlap between these clauses.

1.2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] GSM 01.04 (ETR 100): "European digital cellular telecommunications system (Phase 2); Abbreviations and acronyms".

[2] GSM 02.01 (ETS 300 500): "European digital cellular telecommunications system (Phase 2); Principles of telecommunications services supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.02 (ETS 300 501): "European digital cellular telecommunications system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.03 (ETS 300 502): "European digital cellular telecommunications system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[5] GSM 02.04 (ETS 300 503): "European digital cellular telecommunications system (Phase 2); General on supplementary services".

[6] GSM 02.06 (ETS 300 504): "European digital cellular telecommunications system (Phase 2); Types of Mobile Stations (MS)".

[7] GSM 02.07 (ETS 300 505): "European digital cellular telecommunications system (Phase 2); Mobile Station (MS) features".

[8] GSM 02.08 (ETR 101): "European digital cellular telecommunications system (Phase 2); Quality of service".

[9] GSM 02.09 (ETS 300 506): "European digital cellular telecommunications system (Phase 2); Security aspects".

[10] GSM 02.11 (ETS 300 507): "European digital cellular telecommunications system (Phase 2); Service accessibility".

[11] GSM 02.16 (ETS 300 508): "European digital cellular telecommunications system (Phase 2); International Mobile station Equipment Identities (IMEI)".

[12] GSM 02.17 (ETS 300 509): "European digital cellular telecommunications system (Phase 2); Subscriber identity modules Functional characteristics".

[13] GSM 02.24 (ETS 300 510): "European digital cellular telecommunications system (Phase 2); Description of Charge Advice Information (CAI)".

[14] GSM 02.30 (ETS 300 511): "European digital cellular telecommunications system (Phase 2); Man-Machine Interface (MMI) of the Mobile Station (MS)".

[15] GSM 02.40 (ETS 300 512): "European digital cellular telecommunications system (Phase 2); Procedures for call progress indications".

[16] GSM 02.41 (ETS 300 513): "European digital cellular telecommunications system (Phase 2); Operator determined barring".

[17] GSM 02.81 (ETS 300 514): "European digital cellular telecommunications system (Phase 2); Line identification supplementary services - Stage 1".

[18] GSM 02.82 (ETS 300 515): "European digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services - Stage 1".

[19] GSM 02.83 (ETS 300 516): "European digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[20] GSM 02.84 (ETS 300 517): "European digital cellular telecommunications system (Phase 2); MultiParty (MPTY) supplementary services - Stage 1".

[21] GSM 02.85 (ETS 300 518): "European digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services - Stage 1".

[22] GSM 02.86 (ETS 300 519): "European digital cellular telecommunications system (Phase 2); Advice of charge (AoC) supplementary services - Stage 1".

[23] GSM 02.88 (ETS 300 520): "European digital cellular telecommunications system (Phase 2); Call Barring (CB) supplementary services - Stage 1".

[24] GSM 04.08 (ETS 300 557): "European digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 specification".

[25] GSM 05.02 (ETS 300 574): "European digital cellular telecommunications system (Phase 2); Multiplexing and multiple access on the radio path".

[26] GSM 05.08 (ETS 300 578): "European digital cellular telecommunications system (Phase 2); Radio subsystem link control".

1.3 Definitons and abbreviations

Abbreviations used in this ETS are listed in GSM 01.04.

Selected PLMN — This is the PLMN that has been selected according to subclause 3.1, either manually or automatically.

Available PLMN — This is a PLMN where the MS has found a cell that satisfies conditions (ii) and (iv) of subclause 3.2.1.

Registered PLMN (RPLMN) — This is the PLMN on which certain LU outcomes have occurred (see table 1).

Allowable PLMN — This is a PLMN which is not in the list of forbidden PLMNs in the SIM.

Registration — This is the process of camping on a cell of the PLMN and doing any necessary LUs.

Camped on a cell — The MS (ME if there is no SIM) has completed the cell selection/reselection process and has chosen a cell from which it plans to receive all available services. Note that the services may be limited, and that the PLMN may not be aware of the existence of the MS (ME) within the chosen cell.

Current serving cell — This is the cell on which the MS is camped.

Suitable Cell — This is a cell on which an MS may camp. It must satisfy criteria (i) to (iv) of subclause 3.2.1.

Acceptable Cell — This is a cell that the MS may camp on to make emergency calls. It must satisfy criteria (ii) and (iv) of subclause 3.2.1.

The PLMN to which a cell belongs (PLMN identity) is given in the system information transmitted on the BCCH (MCC + MNC part of LAI).

2 General description of idle mode

When an MS is switched on, it attempts to make contact with a GSM public land mobile network (PLMN). The particular PLMN to be contacted may be selected either automatically or manually. The MS looks for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel (BCCH plus CCCH). This choosing is known as "camping on the cell". The MS will then register its presence in the location area (LA) of the chosen cell if necessary, by means of a location updating (LU) or IMSI attach procedure. If the MS loses coverage of a cell, it reselects onto the most suitable alternative cell of the selected PLMN and camps on that cell. If the new cell is in a different LA, an LU request is performed. If the MS loses coverage of a PLMN, either a new PLMN is selected automatically, or an indication of which PLMNs are available is given to the user, so that a manual selection can be made.

The purpose of camping on a cell in idle mode is threefold:

a) It enables the MS to receive system information from the PLMN.

b) If the MS wishes to initiate a call, it can do this by initially accessing the network on the CCCH of the cell on which it is camped (with the exceptions defined in subclauses 3.5.3 and 3.5.4).

c) If the PLMN receives a call for the MS, it knows (in most cases) the LA of the cell in which the MS is camped. It can then send a "paging" message for the MS on CCCHs of all the cells in the LA. The MS will then receive the paging message because it is tuned to the CCCH of a cell in that LA, and the MS can respond on that CCCH.

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or if it receives certain responses to an LU request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls.

The idle mode tasks can be subdivided into 3 processes:

- PLMN selection;
- Cell selection and reselection;
- Location updating.

The relationship between these processes is illustrated in Figure 1. The states and state transitions within each process are shown in figures 2 to 4.

3 Requirements and technical solutions

The following subclauses list the main requirements of idle mode operation and give an outline of the technical solution.

3.1 PLMN selection and roaming

The MS normally operates on its home PLMN (HPLMN). However a visited PLMN (VPLMN) may be selected, e.g., if the MS loses coverage. There are two modes for PLMN selection:

i) Automatic mode - This mode utilises a list of PLMNs in priority order. The highest priority PLMN which is available and allowable is selected.

ii) Manual mode - Here the MS indicates to the user which PLMNs are available. Only when the user makes a manual selection does the MS try to obtain normal service on the VPLMN.