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Digital cellular telecommunications system (Phase 2+) (GSM);
Functions related to Mobile Station (MS)
in idle mode and group receive mode
(3GPP TS 43.022 version 13.2.0 Release 13)

3GPP A GLOBAL INITIATIVE
GSM® GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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Contents

Foreword

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1 Scope

The present document gives an overview of the tasks undertaken by a GSM 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), when in group receive mode, that is, receiving a voice group call or voice broadcast call but not having a dedicated connection or when in broadcast/multicast receive mode, that is, receiving an MBMS session but not having a dedicated channel allocated. It also describes the corresponding network functions. The idle mode functions are also performed by a GPRS MS as long as no dedicated channel is allocated to the MS. The idle mode functions are also performed by a CTS MS as long as the CTS MS is in manual mode GSM only or in automatic mode under PLMN coverage.

NOTE: The term GSM MS is used for any type of MS supporting one, or combinations, of the frequency bands specified in 3GPP TS 45.005.

The present document outlines how the requirements of the 3GPP TS 22 series Technical Specifications (especially 3GPP TS 22.011) on idle mode operation shall be implemented. Further details are given in 3GPP TS 44.018 and 3GPP TS 45.008.

Clause 2 of the present document 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. Clause 5 describes the cell change procedures for a MS in group receive mode. Clause 5a describes the cell change procedures for a MS in broadcast/multicast receive mode.

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. 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 TS 21.905: "Vocabulary for 3GPP Specifications".

[2] (void)

[3] (void)

[4] (void)

[5] (void)

[6] (void)

[7] (void)

[8] (void)

[9] 3GPP TS 22.011: " Service accessibility".

[10] (void)

[11] (void)

[12] (void)

[13] (void)

[14] (void)

[15] (void)

[16] (void)

[17] (void)

[18] (void)

[19] (void)

[20] (void)

[21] (void)

[22] (void)

[23] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol".

[24] (void)

[25] 3GPP TS 45.008: "Radio subsystem link control".

[26] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service description; Stage 1".

[27] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[28] 3GPP TS 43.064: "General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".

[29] (void)

[30] (void)

[31] 3GPP TS 23.122: " Non-Access-Stratum functions related to Mobile Station (MS) in idle mode".

[32] 3GPP TS 24.008: " Mobile radio interface layer 3 specification; Core Network Protocols - Stage 3".

[33] 3GPP TS 31.102: "Characteristics of the USIM application".

[34] 3GPP TS 43.068: "Voice Group Call Service (VGCS); Stage 2".

[35] 3GPP TS 43.069: "Voice Broadcast service (VBS); Stage 2".

[36] 3GPP TS 45.005: "Radio transmission and reception".

[37] 3GPP TS 51.011: "Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) interface" (Release 4).

[38] 3GPP TS 43.246: "Multimedia Broadcast Multicast Service (MBMS) in the GERAN; Stage 2".

[39] 3GPP TS 22.268: "Public Warning System (PWS) requirements; Stage 1".

[40] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

1.2 Definitions and abbreviations

For the purposes of the present document, the terms and definitions given in 3GPP TS 21.905 [1] and the following apply.

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.

Home PLMN (HPLMN) See 3GPP TS 23.122 [31].

Registered PLMN (RPLMN) This is the PLMN on which certain LR outcomes have occurred (see 3GPP TS 23.122 [31]).

Equivalent PLMN A PLMN contained in the stored list of equivalent PLMNs. These PLMNs are considered equivalent to the selected PLMN regarding PLMN selection, cell selection, cell re-selection and handover (see 3GPP TS 23.122 [31]).

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

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 defined in subclause 3.2.1. For an MS in group receive mode, the suitable cell is determined by the criteria defined in subclause 5.2.3.

Acceptable Cell This is a cell that the MS may camp on to make emergency calls and to receive warning notifications. It must satisfy criteria defined in sub clause 3.2.2.

EC operation See 3GPP TS 43.064 [28].

Group call A communication in which several MSs can receive, but at most one may be allowed to transmit on a radio channel. Examples of group calls are those established for the voice group call service (VGCS, see 3GPP TS 43.068 [34]).

Broadcast call A communication in which several MSs can receive, but only the originator of the call is allowed to transmit on the radio channel. Examples of the broadcast call are those established for the voice broadcast service (VBS, see 3GPP TS 43.069 [35]).

Group receive mode State of the MS when it is engaged in a voice group or voice broadcast call as a listener.

GPRS MS An MS capable of GPRS services is a GPRS MS.

CTS MS An MS capable of CTS services is a CTS MS.

Location Registration (LR) An MS which is IMSI attached to non-GPRS services only performs location registration by the Location Updating procedure. A GPRS MS which is IMSI attached to GPRS services or to GPRS and non-GPRS services performs location registration by the Routing Area Update procedure only when in a network of network operation mode I. Both procedures are performed independently by the GPRS MS when it is IMSI attached to GPRS and non-GPRS services in a network of network operation mode II or III (see 3GPP TS 23.060 [27]).

Localised Service Area (LSA) A localised service area consists of a cell or a number of cells. The cells constituting a LSA may not necessarily provide contiguous coverage.

Power Efficient Operation See 3GPP TS43.064 [28].

Power Saving Mode (PSM): Mode allowing the MS to reduce its power consumption, as defined in TS 24.008 [32], TS 23.060 [27], TS 23.682 [40].

SoLSA exclusive access Cells on which normal camping is allowed only for MS with Localised Service Area (LSA) subscription.

Registration Area A registration area is an area in which mobile stations may roam without a need to perform location registration. The registration area corresponds to location area (LA) for performing location updating procedure and it corresponds to routing area for performing the routing area update procedure.

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

See 3GPP TS 23.122.

When NAS indicates that PSM starts (as defined in 3GPP TS 23.682 [40]) the MS shall suspend all AS functions and consequently all idle mode tasks until when NAS indicates that PSM ends the MS shall resume all AS functions and all idle mode tasks.

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

See 3GPP TS 23.122.

3.2 Camping on a cell

3.2.1 Normal camping

For normal service, the MS has to camp on a suitable cell, tune to that cell's control channel(s), and possibly register within the PLMN so that the MS can:

a) Receive system information from the PLMN, e.g., the cell options ;

b) Receive paging messages from the PLMN, e.g., when there is an incoming call for the MS;

c) Initiate call setup for outgoing calls or other actions from the MS (where possible, see subclauses 3.5.3 and 3.5.4).

The choice of such a suitable cell for the purpose of receiving normal service is referred to as "normal camping". There are various requirements that a cell must satisfy before an MS can perform normal camping on it:

i) It should be a cell of the selected PLMN or, if the selected PLMN is equal to the last registered PLMN, an equivalent PLMN;

ii) It should not be "barred" (see subclause 3.5.1);

iii) It should not be in an LA which is in the list of "forbidden LAs for roaming";

iv) The radio path loss between MS and BTS must be below a threshold set by the PLMN operator. This is estimated as shown in subclause 3.6;

v) It should not be a SoLSA exclusive cell to which MS does not subscribe. This requirement is only valid for MSs supporting SoLSA.

Initially, the MS looks for a cell which satisfies these 5 constraints ("suitable cell") by checking cells in descending order of received signal strength. If a suitable cell is found, the MS camps on it and performs any registration necessary. Cells can have two levels of priority, suitable cells which are of low priority are only camped on if there are no other suitable cells of normal priority. (This is called "cell selection").

When camped on a cell the MS regularly looks to see if there is a better cell in terms of a cell re-selection criterion, and if there is, the better cell is selected. Also if one of the other criteria changes, (e.g., the current serving cell becomes barred), or there is a downlink signalling failure (see subclause 3.6), a new cell is selected. (This is called "cell reselection"). A MS that has enabled PEO or EC operation has relaxed requirements for how often it verifies the suitability of its serving cell and the suitability of neighbour cells for re-selection (see 3GPP TS 45.008 [25] and 3GPP TS 44.018 [23]).