

ETSI TS 143 013 V16.0.0 (2020-09)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Discontinuous Reception (DRX) in the GSM system
(3GPP TS 43.013 version 16.0.0 Release 16)**



Reference

RTS/TSGR-0643013vg00

Keywords

GSM

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - 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

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2020.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

| | |
|--|----------|
| Intellectual Property Rights | 2 |
| Legal Notice | 2 |
| Modal verbs terminology..... | 2 |
| Foreword..... | 4 |
| 1 Scope | 5 |
| 2 References | 5 |
| 3 Abbreviations | 5 |
| 4 Overview of discontinuous reception..... | 6 |
| 5 MSC functions..... | 6 |
| 6 BSS functions..... | 6 |
| 7 MS functions | 7 |
| 8 Support via the air interface | 7 |
| 9 Operational aspects..... | 7 |
| 10 SGSN functions..... | 7 |
| Annex A (informative): Change History | 8 |
| History | 9 |

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document provides a system wide view of the operation of discontinuous reception on the GSM system.

The support of DRX is mandatory in GSM PLMNs.

The detailed coding and procedural details are defined in the relevant Technical Specifications dealing with the specific interfaces that are involved, for instance GSM 08.08 and GSM 04.08. Reference is also made to the framing on the air interface which is defined in Technical Specification GSM 05.02.

The present document gives an overview of the implementation of discontinuous reception DRX within the GSM system, the actions required at MSC, BSS, and MS, the support of the facility via the air interface, and some operational aspects of the facility.

2 References

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

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] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [3] GSM 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".
- [4] GSM 08.02: "Digital cellular telecommunications system (Phase 2+); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface Interface principles".
- [5] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".
- [6] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) Stage 2".
- [7] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast Service (VBS) Stage 2".
- [8] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [9] 3GPP TS 45.002: "Technical Specification Group GSM/EDGE Radio Access Network; Multiplexing and multiple access on the radio path"

3 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04 [1] and in 3GPP TS 21.905 [8].

4 Overview of discontinuous reception

DRX/eDRX is a technique that allows the mobile station to power down significant amounts of its internal circuitry for a high percentage of the time when it is in the idle mode.

It also ensures that the MS is aware of exactly when page requests for it may be transmitted and it can then therefore schedule other tasks such that it avoids the problem of not decoding valid page requests transmitted by the network in the idle mode periods.

The technique works by dividing the MSs within a cell into a set of groups. The group in which an MS resides is then known locally at both the MS and the BSS. All paging requests to each group are then scheduled and sent at a particular time which is derived from the TDMA frame number in conjunction with the IMSI of the MS and some BCCH transmitted data. When a MS uses eDRX the BSS derives the precise paging time applicable to the radio interface using IMSI and the eDRX cycle length information provided within a paging request (received from the SGSN) and, when paging on PCH, some BCCH data. In addition, for an EC-EGPRS MS, when paging on EC-PCH, the downlink coverage class is also included in the paging request.

Thus both the BSS and the MS know when relevant page requests will be sent and the MS can power down for the period when it knows that page requests will not occur.

The page request can contain the IMSI and may contain the TMSI in order to identify the MS concerned. The IMSI is however always used to identify the paging population. Paging by means of the IMEI is for further study.

Mechanisms for the application of DRX for the voice group call and voice broadcast services are defined in stage 2 descriptions in GSM 03.68 [6] and GSM 03.69 [7], respectively.

5 MSC functions

The MSC is almost transparent to DRX, since it has no real time knowledge of the absolute frame numbers on the air interface (refer to Technical Specification GSM 08.02).

It should be noted, however, that the MSC does define which cells are to be paged in order to locate a particular MS. Normally this will be a location area.

The MSC therefore constructs page requests and sends them to a specific set of BSSs. Each page request always includes the IMSI. The timer to detect non receipt of a page response may require alteration depending upon the number of page groups that are involved. If this is the case, then the timer will be set by O and M command at the same time as the number of paging groups at the cell is altered.

6 BSS functions

At the BSS page requests are received. It is implicit (single cell BSSs) or explicit (multi cell BSSs) within the page requests from the MSC to which cell the page request is destined (Technical Specifications GSM 08.08 and GSM 08.02 refers).

The BSS analyses the IMSI in order to derive the page group of the MS involved. The air interface page request is then constructed and transmitted in the appropriate TDMA burst. If the page request includes a TMSI and IMSI then the IMSI is used to derive the page population and the TMSI is inserted into the actual page request message. The scheduling of the page requests is therefore completely controlled by the BSS.

The relationship between paging group and TDMA burst, and IMSI and paging group is given in Technical Specification 3GPP TS 45.002 [9].

The exact scheduling mechanism used at the BSS is not defined in the present document.

However, when DRX is used the BSS may set the "page mode" bits as described in Technical Specification GSM 04.08. This can be used to optimise paging load and reduce missed page requests during system reconfiguration. An exception case is when EC-EGPRS is used in which case paging load can be optimized and missed pages can be reduced using "paging extension" information sent within EC-AGCH and EC-PCH messages (see 3GPP TS 44.018).

7 MS functions

The MS shall derive its paging group as defined in Technical Specification GSM 05.02.

The MS shall interpret all paging requests in its paging group according to the paging mode bits as described in Technical Specification GSM 04.08.

8 Support via the air interface

The BCCH and paging channel messages are defined in Technical Specification GSM 04.08. Technical Specification GSM 05.02 defines the algorithms which enable an MS to know the exact frame and burst when page requests relevant to it might be transmitted.

9 Operational aspects

There will be occasions when it is necessary to alter the parameters of cell such that the paging group of the MS may alter.

If (referring to Technical Specification GSM 05.02) any of the parameters BS_AG_BLK_RES, BS_CC_CHANS_COMB, BS_CC_CHANS or BS_PA_MFRMS have to be altered, then the period when page requests may be lost can be minimised for example by:

Firstly setting the page mode to "page reorganisation" in all page requests on the affected cell for the exact duration of one paging period (i.e. BS_PA_MFRMS multiframes). At the completion of this announcement period, the BCCH parameters are set to the new values and the BSS starts scheduling the paging messages according to the new parameters. The page mode is reset to any of the values "normal mode" or "extended mode" as required.

10 SGSN functions

The SGSN maintains knowledge of the cells that are to be paged, and when the paging group occurs in the respective cell(s), in order to locate a particular MS for packet data delivery. In addition, when eDRX is used the SGSN maintains the value of the eDRX value it has negotiated with the MS. The SGSN constructs paging requests and sends them to a specific set of BSSs. Each page request always includes the IMSI. If a MS uses eDRX then the page request also includes the negotiated eDRX value. If EC-EGPRS is used, the downlink coverage class applicable to the MS is also included in the page request.

Annex A (informative): Change History

| Change history | | | | | |
|----------------|-----------|---------|------------------|-------------|----------------------|
| SMG No. | TDoc. No. | CR. No. | Section affected | New version | Subject/Comments |
| SMG#07 | | | | 4.0.4 | ETSI Publication |
| SMG#17 | | | | 5.0.0 | Release 1996 version |
| SMG#27 | | | | 6.0.0 | Release 1997 version |
| SMG#29 | | | | 7.0.0 | Release 1998 version |
| SMG#31 | | | | 8.0.0 | Release 1999 version |

| Change history | | | | | | | |
|----------------|------------|-----------|------|-----|---------------------------------------|--------|--------|
| Date | TSG GERAN# | TSG Doc. | CR | Rev | Subject/Comment | Old | New |
| 2001-04 | 4 | | | | Release 4 version | | 4.0.0 |
| 2002-06 | 10 | | | | Release 5 version | 4.0.0 | 5.0.0 |
| 2005-01 | 23 | | | | Release 6 version | 5.0.0 | 6.0.0 |
| 2007-08 | 35 | | | | Release 7 version | 6.0.0 | 7.0.0 |
| 2008-12 | 40 | | | | Release 8 version | 7.0.0 | 8.0.0 |
| 2009-12 | 44 | | | | Release 9 version | 8.0.0 | 9.0.0 |
| 2011-03 | 49 | | | | Release 10 version | 9.0.0 | 10.0.0 |
| 2012-09 | 55 | | | | Release 11 version | 10.0.0 | 11.0.0 |
| 2014-09 | 63 | | | | Release 12 version (frozen at SP-65) | 11.0.0 | 12.0.0 |
| 2015-11 | 68 | GP-151190 | 0003 | 2 | Introduction of EC-EGPRS and PEO | 12.0.0 | 13.0.0 |
| 2017-03 | 75 | | | | Release 14 version (frozen at TSG-75) | 13.0.0 | 14.0.0 |

| Change history | | | | | | | |
|----------------|---------|------|----|-----|-----|--|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2018-06 | RP-80 | | | | | Release 15 version (frozen at TSG-80) | 15.0.0 |
| 2020-07 | RP-88e | - | - | - | - | Upgrade to Rel-16 version without technical change | 16.0.0 |

History

| Document history | | |
|-------------------------|----------------|-------------|
| V16.0.0 | September 2020 | Publication |
| | | |
| | | |
| | | |
| | | |