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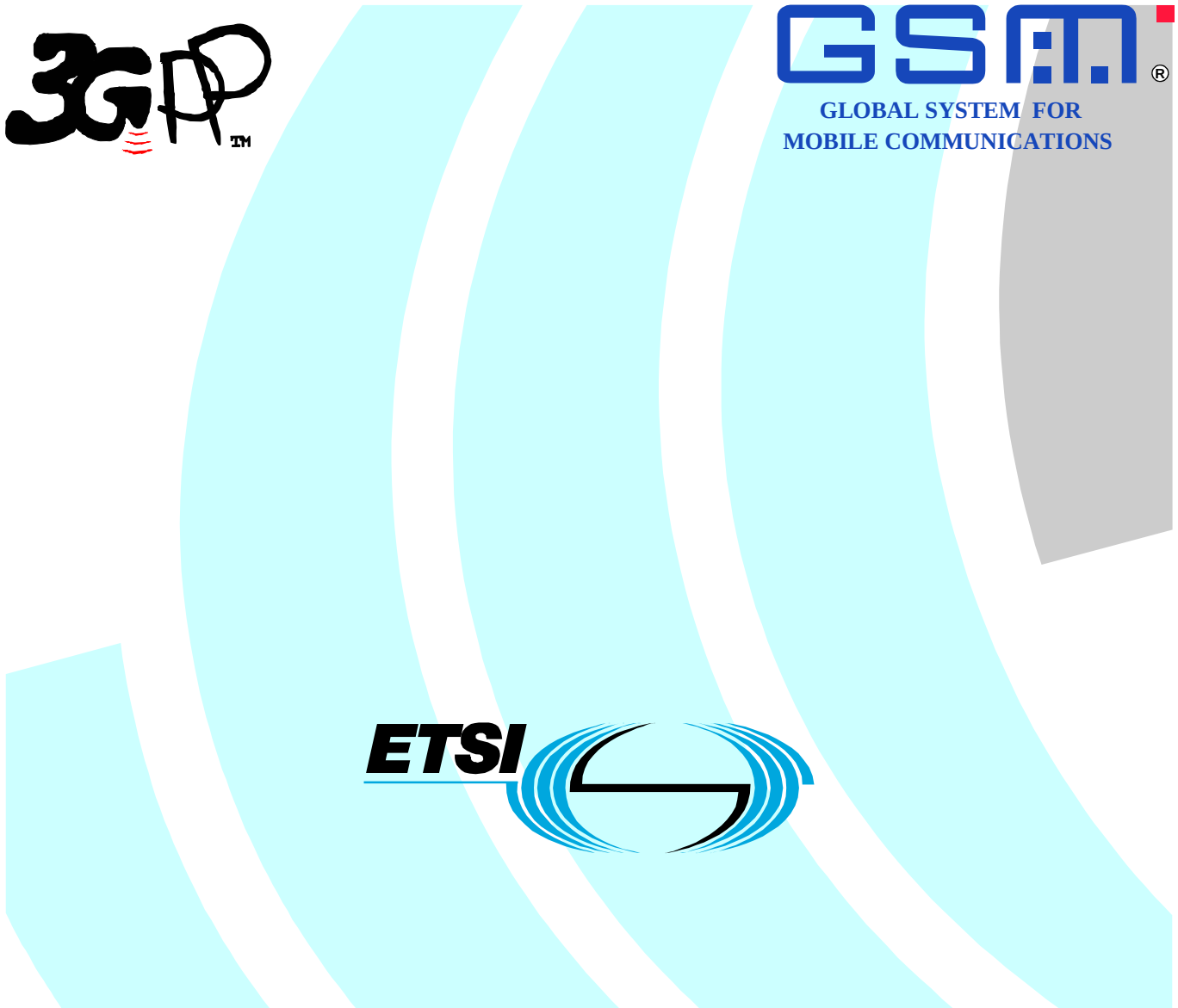
Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Short Message Service Cell Broadcast (SMSCB)
Support on the Mobile Radio Interface
(3GPP TS 44.012 version 4.0.0 Release 4)**



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Foreword

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Contents

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:

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- z the third digit is incremented when editorial only changes have been incorporated in the document.

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] 3GPP TS 23.041: "Technical Realization of Short Message Service Cell Broadcast (SMSCB)"

[4] 3GPP TS 44.004: "Layer 1 General requirements".

[5] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[6] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

1.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905.

2 General description

SMSCB is a service in which short messages may be broadcast from a PLMN to Mobile Stations (MS)s. SMSCB messages come from different sources (e.g. traffic reports, weather reports). The source and subject of the SMSCB message is identified by a message identifier in the SMSCB message header. A sequence number in the SMSCB message header enables the MS to determine when a new message from a given source is available.

SMSCB messages are not acknowledged by the MS. Reception of SMSCB messages by the MS is only possible in idle mode. The geographical area over which each SMSCB message is transmitted is selected by the PLMN operator, by agreement with the provider of the information.

A SMSCB message is an end-to-end message that is formatted by/for the SMSCB application, and which is intended for customer viewing. Its format is described in detail in 3GPP TS 23.041. A CB message is any message sent on the basic or extended CBCH (see 3GPP TS 45.002). It can be an occurrence of a SMSCB message, or a schedule message.

The SMS Cell Broadcast service is designed to minimize the battery usage requirements for a MS. A MS can read the first part of a CB message and then decide whether or not to read the rest of the message. In addition, the network may broadcast Schedule Messages, providing information in advance about the CB messages that will be sent immediately afterwards. The MS may use this scheduling information to restrict reception to those messages the customer is interested in receiving. This SMSCB DRX feature is optional in the network and the MS.

2.1 Scheduling Information

The network supporting the SMSCB DRX feature transmits Schedule Messages. A Schedule Message includes information about a number of immediately following consecutive CB messages, planned for that cell. The length of time covered by the CB messages referred to in a Schedule Message is called the Schedule Period of that message. For optimum DRX, a new Schedule Message should follow the last message of a Schedule Period. When no information is known about a CB message, e.g., because no Schedule Message has been received referring to that CB message, a MS

shall read (at least) the first part of the CB message. Schedule Messages shall be sent on the basic and extended CBCH independently.

The network may override the published schedule to transmit new high-priority SMSCB messages. However, after any schedule deviation, the network shall resume the schedule, by transmitting the scheduled CB messages at the scheduled times listed in the Schedule Message.

The Schedule Message contains a Message Description for each CB message to be broadcast during the scheduling period, in order of transmission. The position of a CB message is called the "message slot number" of the CB message, and it indicates the position of the CB message within the schedule period. Each Message Description includes various information, including for SMSCB messages directly or indirectly all or part of their message identifier, and whether an occurrence is a repetition or not.

Each Schedule Message includes a Begin Slot Number field and an End Slot Number field. The End Slot Number field indicates the length of the schedule period (i.e., specifically the number of CB message slots about which information is provided). In the case where the network uses Schedule Messages to describe all message slots in advance, the first Schedule Message of the next schedule period will be transmitted in the message slot pointed by End Slot Number plus 1. The Begin Slot Number is defined to allow the network to broadcast several Schedule Messages referring to the same schedule period. The Begin Slot Number field indicates the message slot number of the CB message following the received Schedule Message.

The networks may send unscheduled Schedule Messages during empty message slots. The network need only update the Begin Slot Number in an unscheduled Schedule Message to reflect the current offset within the Schedule Message of the next message to be transmitted.

3 Message format on BTS-MS Interface

3.1 General

A CB message consists of a 88 octets of information. The 88 octet block is segmented into four 22 octet blocks. A 1 octet Block type is added as a header to each 22 octet block. The overall blocks are thus 23 octets in length.

The message blocks are sent on the channel allocated as CBCH by 3GPP TS 45.002. The timing of the messages is defined in 3GPP TS 45.002. If the network has no cell broadcast information to transmit, then it may choose to transmit a null message.

3.2 Format convention

3.2.1 Numbering convention

The basic convention used in this technical specification is illustrated in figure 1. The bits are grouped into octets. The bits of an octet are shown horizontally and are numbered from 1 to 8. Multiple octets are shown vertically and are numbered from 1 to 23.

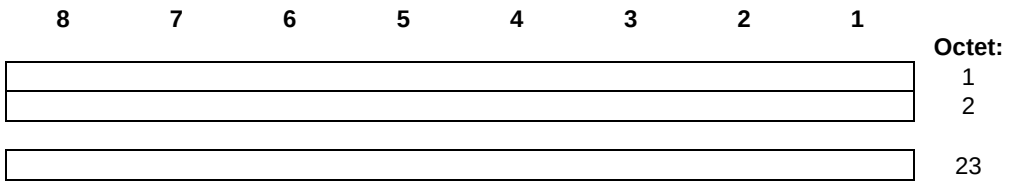

Figure 1/3GPP TS 04.12: Format convention

3.2.2 Order of bit transmission

The message blocks are sent on the CBCH as defined in 3GPP TS 45.002 using the coding defined for that channel.

The order of bit transmission is defined in 3GPP TS 44.004.

3.3 Block content

The 23 octet blocks are coded as follows:

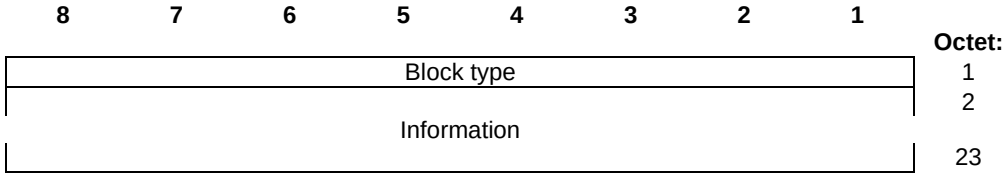

Figure 2/3GPP TS 04.12: Block content

3.3.1 Block Type

The purpose of the Block Type is to identify the function of the block and message being sent. The block type is coded as shown in figure 3/3GPP TS 04.12.

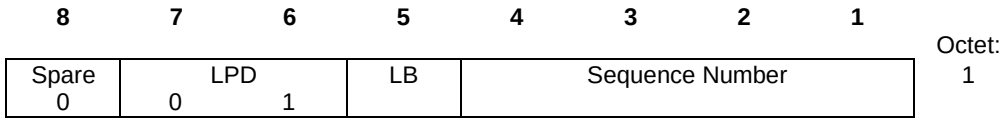

Figure 3/3GPP TS 04.12: Block type content

Bits 8 is spare and set to zero by the sender. In order to allow compatibility with future modifications to this protocol, bits 8 shall be ignored by the receiver and messages shall not be rejected because it is set to one.

The Link Protocol Discriminator (LPD) takes the value "0 1". Other values of LPD indicate other protocols which are outside the scope of 3GPP TS 04.12, and shall cause the message to be ignored when the Cell Broadcast LPD is expected instead.

NOTE: LPD = "0 0" corresponds to the data link protocol used by LAPDm (see 3GPP TS 44.006).

In an SMSCB message the last block containing SMSCB information is signalled by the Last Block (LB) bit. When the LB bit is set to "0", the next block may contain SMSCB information. When the LB bit is set to "1", the remaining block(s) do(es) not contain SMSCB information.

Table 1/3GPP TS 04.12: Sequence number coding

Bit No 4	3	2	1	
0	0	0	0	First block
0	0	0	1	Second block
0	0	1	0	Third block
0	0	1	1	Fourth block
1	0	0	0	First schedule block: Message contains SMSCB scheduling information
1	1	1	1	Null message (does not contain valid SMSCB information)

All other values of bits 4 to 1 are reserved for future use.

The use of a reserved code point shall cause the message to be ignored.

3.4 SMSCB Message

The SMSCB message is a message with four consecutive blocks, with Block Types "first block", "second block", "third block" and "fourth block".

A null message (which is indicated by the Sequence Number 1111 (binary)) shall have octets 2 to 23, inclusive, filled with the value 2B (hex).

The SMSCB message coding is defined in 3GPP TS 23.041.

3.5 Schedule Message

The text of the Schedule Message provides information pertaining to the CB messages sent afterward.

A Schedule Message consists of 4 consecutive blocks with Block Types "first schedule block", "second block", "third block" and "fourth block".

A Schedule Message containing scheduling data which does not fill the 88 octets shall be padded with the hexadecimal value "2B" after the end of the used part of the message.

The Schedule Message comprises a 2-octet header followed by three parts, the first of them of 6 octets, and the two others of variable length, as indicated in the following figure:

8	7	6	5	4	3	2	1	Octet:
Type 0	 0			Begin Slot Number				1
Spare 0	Spare 0			End Slot Number				2
New CBSMS Message Bitmap								3 - 8
New CBSMS Message Description								9 - 2m
Other Message Descriptions								(m+1)-n

Figure 4/3GPP TS 04.12: Schedule Message coding

Octets following the last part (n+1 to 88 inclusive), if any, shall be ignored.

In the following subclauses, when bits are indicated as spare, they shall be set to the indicated value (0 or 1) by the network, and their value shall be ignored by the MS.

3.5.1 Header

Type (Octet 1): Set to 00 for messages formatted as specified in subclause 3.5. Schedule messages with another "Type" value shall be ignored by the receiver.

Begin Slot Number (octet 1): Message slot number, relative to the schedule period, of the message slot following the Schedule Message. The Begin Slot Number field is coded in binary. Value range: 1 to 48.

End Slot Number (octet 2): Last message slot number described by this Schedule Message. The End Slot Number field shall be coded in binary, and must be greater than or equal to the value of Begin Slot Number. Value range 1 to 48.

NOTE: - For a scheduled Schedule message, the Begin Slot Number is set to "1".

- For an unscheduled Schedule message, the Begin Slot Number is set in the range 2 to 48.

If either of the two preceding fields are out of range, or if the value of the End Slot Number field is less than the value of the Begin Slot Number field, the Schedule Message shall be ignored by the receiver.

3.5.2 New CBSMS Message Bitmap

This 6-octet fields encodes one bit per message slot, with the following indexation:

8	7	6	5	4	3	2	1	Octet:
NM 1	NM 2	NM 3	NM 4	NM 5	NM 6	NM 7	NM 8	1
NM 9	NM 10	NM 11	NM 12	NM 13	NM 14	NM 15	NM 16	2
NM 17	NM 18	NM 19	NM 20	NM 21	NM 22	NM 23	NM 24	3
NM 25	NM 26	NM 27	NM 28	NM 29	NM 30	NM 31	NM 32	4
NM 33	NM 34	NM 35	NM 36	NM 37	NM 38	NM 39	NM 40	5
NM 41	NM 42	NM 43	NM 44	NM 45	NM 46	NM 47	NM 48	6

Figure 5/3GPP TS 04.12: New CBSMS Message Bitmap coding

NM i: The New Message bit i refers to the content of message slot i. Its meaning is as follows:

1 The message slot contains an SMSCB message page which was either not sent during the previous schedule period, or sent unscheduled during the preceding schedule period; or, the message is indicated as of free usage, reading advised. The value is 1 both for the first transmission of a given SMSCB message page in the schedule period or a repetition of it within the schedule period.

0 The message slot is such that value 1 is not suitable.

An SMSCB message fulfilling the criterion for bit value 1 is said in the following to be "new". It should be noted that the broadcasting is not necessarily the first one. The network can choose not to send a given SMSCB message in all schedule periods. In this case it will be "new" each time it has not been sent in the previous schedule period. Another case is when a message is scheduled but its first transmission in the schedule period is pre-empted ; the next time the SMSCB message is "new".

3.5.3 New CBSMS Message Description

This part contains as many Message Descriptions as there are bits set to 1 in the New Message Bitmap. This part can then be empty. A message description is 1 or 2 octets long:

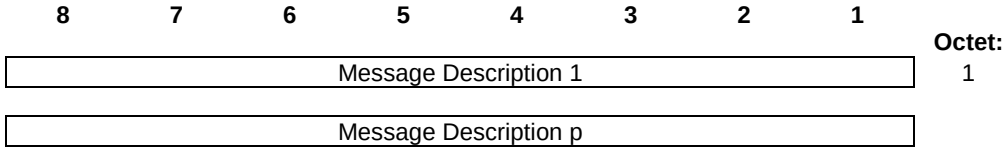

Figure 6/3GPP TS 04.12: New CBSMS Message Description coding

New Message Description j: This one or two octet long field contains information about what is sent in the j^{th} message slot for which NM i is set to 1. The different possible encodings are specified in subclause 3.5.5.

All descriptions pertaining to the first transmission of a new message shall be put at the beginning, so that mobile stations can determine rapidly where the new messages are.

3.5.4 Other Message Descriptions

This part contains a one or two octet message description for each of the remaining message slots in the schedule period, in the order of transmission. This part can be empty.

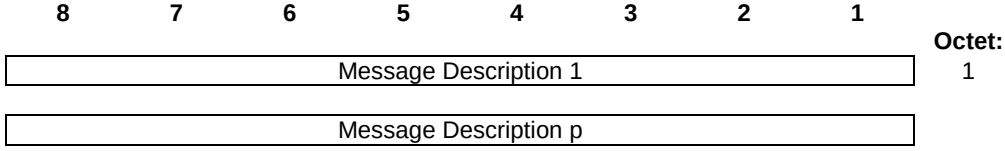

Figure 7/3GPP TS 04.12: Other Messages Part coding

The Message Slot Number for each description must be derived from the New CBSMS Message Bitmap.

The different cases are encoded as specified in subclause 3.5.5.

3.5.5 Message description encoding

Four different encoding formats are specified, respectively: 1) for the first transmission of an SMSCB message in the schedule period, 2) for the repetition of an SMSCB message, 3) for a message slot of unindicated usage that MSs can skip, and 4) for a message slot of unindicated usage that MSs should not skip. The different encoding formats are identified by the Message Description Type (MDT) field. The MDT field is of variable length.

The length of a description can be determined from the value of bit 8 of the first octet, which can then be understood as a "more" bit. Value 0 indicates a single-octet field, and value 1 a 2-octet field.

3.5.5.1 First transmission of an SMSCB within the Schedule Period

This describes the content of a message slot which contains the first transmission of an SMSCB message page within the period:

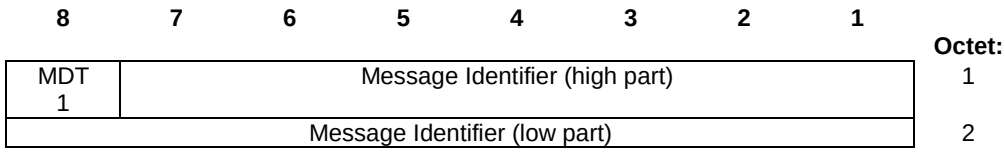

Figure 8/3GPP TS 04.12: Message Description coding, First Transmission of an SMSCB

MDT, Message Description Type (octet 1 of Message Description, bit 8): 1-bit field set to 1 for the message description of a message slot containing the first transmission during the schedule period of a given SMSCB message page.

MESSAGE IDENTIFIER (octet 1 bits 7 to 1 and octet 2 of Message Description): Consists of the low-order 15 bits of the corresponding field of the SMSCB message, as defined in 3GPP TS 23.041.

3.5.5.2 Retransmission indication

When a message slot contains the repetition of a SMSCB message page within the schedule period, the corresponding message description is coded on one octet, as follows:

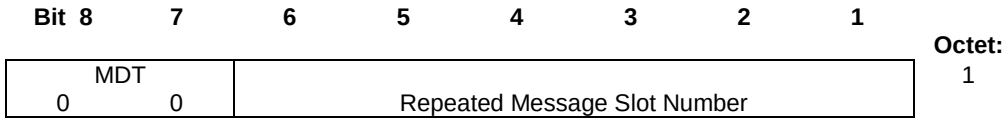

Figure 9/3GPP TS 04.12: Message Description coding, Retransmission of an SMSCB

MDT, Message Description Type (octet 1 of Message Description, bits 8 and 7): 2-bit field set to "00" for the message description of a message slot containing the repetition of a SMSCB message page.

Repeated Message Slot Number (octet 1 of Message Description, bits 6 to 1): This field encodes the message slot number of the first transmission during the schedule period of the repeated SMSCB message page. The field is encoded in binary, range 1 to 47.

3.5.5.3 Free Message Slot, optional reading

When no specific information about a message slot is provided, and MSs need not read its contents, the Message Description is coded as follows:

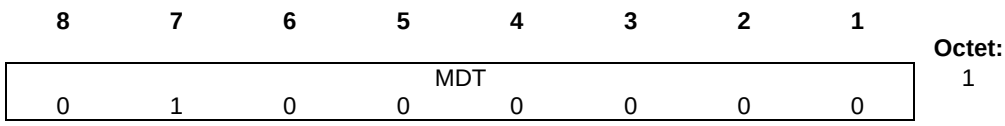

Figure 10/3GPP TS 04.12: Message Description coding, Free Message Slot, optional reading

MDT, Message Description Type (octet 1 of Message Description): 8-bit field set to "01000000". The network can use such a message slot as needed, e.g., for unscheduled messages or for unscheduled Schedule Messages.

3.5.5.4 Free Message Slot, reading advised

When no specific information about a message slot is provided, and MSs should read its contents, the Message Description is coded as follows:

8	7	6	5	4	3	2	1	Octet:
MDT								1
0	1	0	0	0	0	0	1	

Figure 11/3GPP TS 04.12: Message Description coding, Free Message Slot, reading advised

MDT, Message Description Type (octet 1 of Message Description): 8-bit field set to "01000001". The network can use such a message slot as needed, e.g., for sending high-priority messages.

3.5.5.5 Reserved Codepoints

The values of MDT other than those specified in the previous sections are reserved for future use. They shall be treated as encoding a one octet message description, and understood as specified in subclause 3.5.5.3.

Annex A (informative): Sample Implementation of SMSCB DRX Mode

This informative annex describes an implementation of SMSCB DRX functions, both on the network side and on the MS side.

The network includes Schedule Messages to provide the MSs with information about the contents of the message slots following the Schedule Messages. The simplest implementation consists in sending Schedule Messages regularly, in a way all message slots are part of the schedule period of some Schedule Message.

For the MS, there may be 3 main reception modes for the CBCH:

1) No DRX. The MS reads the first block of all message slots, and reads the remaining blocks when the message header indicates this is useful. A MS operates in this mode either when it does not support the other modes, or when it has not received a schedule message applicable to the next message slot.

2) First DRX mode. The MS has received a schedule message applicable to the next message slot, but either did not receive the first schedule message of the schedule period previous to the current one, or has not received all messages sent in that period (during that period or before).

3) Second DRX mode. The MS knows all the messages of interest sent in the schedule period previous to the current one, and has received the first schedule message of the current period.

More information about these modes is given below.

When a MS first enters a cell, or more generally when it knows no information pertaining to a message slot, it should read the first block of each message slot. According to the information found in this first block the MS can choose to read the rest of the message slot. Typically it will do so when it is a Schedule Message, or when it is an SMSCB message that it has not received before, in that cell or in a another.

The complete reading of a first schedule message allows the MS to enter a first DRX mode for the rest of the schedule period. In this mode the MS reads the first block of each message slot for which the "message identifier", as indicated in the Schedule Message, is of interest to the user until the end of the schedule period, except that the MS may ignore retransmissions of messages it has already received during the same schedule period.

When the MS has correctly read during a Schedule Period all messages of interest for its user, it can enter a second DRX mode. In this mode, it reads the first block of the CB message immediately after the end of the schedule period. If it is not a schedule message, or if the reception fails, it reads all first blocks until it receives a schedule message. In case of missed reception of the very first block, it enters the second DRX mode only if the first block of the next received schedule message shows that there is no gap between the corresponding schedule period and the previous one (it is the only way to be sure that there was no intervening schedule period). In the second DRX mode, the MS can understand from the first block of the schedule message how many new messages there are, when they will be transmitted, their message identifiers if there are less than 6 new messages, and possibly the positions of their repetitions. If the first block indicates that there are no new messages, or sufficiently few so that their message identifiers and the positions of their repetitions are known, the MS can refrain from reading the other blocks of the Schedule Message. Otherwise it reads the next block, and so on, until all the information pertaining to new messages is known. Then the MS reads only the new messages with a message identifier of interest for its user, and possibly corresponding repetitions in case of reception failures.

Free message slots can be used for different purposes by the network. MSs wanting to save as much battery as possible at the expense of the delay for receiving messages can skip those message slots. As a trade-off, MSs can implement DRX with reception of the free messages slots with reading advised: this will speed up reception of new messages, with a higher battery consumption in proportion to the use of such messages slots by the network. Free message slots with optional reading should be used typically for unscheduled schedule messages, and can be skipped by mobile stations implementing DRX.

The network can broadcast unscheduled SMSCB messages. The different possibilities are as follows:

- The network can send a new message in a free-usage message slot with reading advised. MSs implementing DRX but reading the first block of message slots so indicated will receive the message. The message must still be indicated as "new" the first time it is sent scheduled in a schedule period.

- The network can pre-empt a "new" message with a more recent "new" message of the same message identifier if it happens that its first transmission has not yet happened; this is the only case where all MSs will read the unscheduled message. The network should repeat the pre-empting message instead of the pre-empted one in the messages slots scheduled for the repetitions of this message. If the pre-empted message is to be transmitted later, it has to be sent as "new" in the next schedule period within which it is sent.

- If a message has been sent in the previous schedule period, the network can pre-empt the first transmission in the schedule period with a more recent message of the same message identifier. In this case, the MSs in second DRX mode will not receive immediately the message, but will receive it in the next schedule period if the message is repeated afterward (the network will indicate it as a "new" message even if it has been sent in the previous schedule period, since it would not have been scheduled during that period). If the pre-empted message is to be transmitted again, it has to be sent as "new" in the next schedule period within which it is sent.

- If a message has been sent in the previous schedule period, the network can pre-empt the first transmission in the schedule period with a more recent message of a different message identifier. In this case, it is unlikely that a mobile station implementing DRX will immediately receive the message, it will receive it in the next schedule period if the message is repeated afterward (the network will indicate it as a "new" message even if it has been sent in the previous schedule period, since it would not have been scheduled during that period). The pre-empted message has to be sent as "new" in the next schedule period within which it is sent.

- The network can pre-empt a retransmission (of the same message identifier or not), or send the new message in a free message slot of optional reading. In these cases it is unlikely that a MS implementing DRX will receive it at that moment.

In free message slots the network can broadcast for instance unscheduled Schedule Messages. These messages hasten the entry into DRX mode of fast-moving MSs.

Annex B (informative): Change history

Meeting/Date	Tdoc	CR	New Version	Subject/Comment
April 2001	-	-	44.012 v4.0.0	Transferred to 3GPP GERAN. Base upon wrongly created 24.012 v3.0.0.

History

Document history		
V4.0.0	April 2001	Publication