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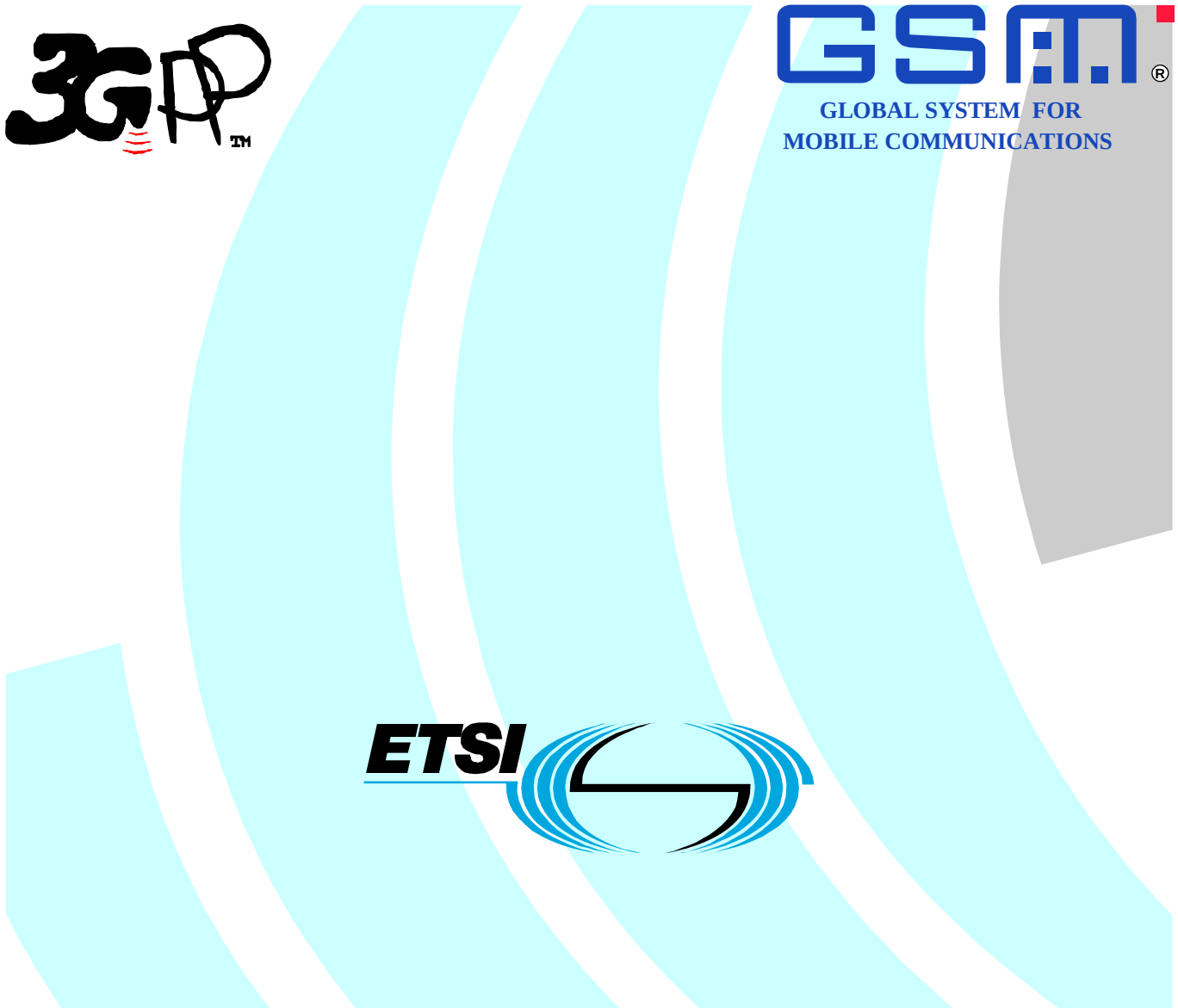
Technical Specification

Digital cellular telecommunications system (Phase 2+);
Multimedia Broadcast/Multicast Service (MBMS) in the GERAN;
Stage 2
(3GPP TS 43.246 version 8.0.0 Release 8)



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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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1 Scope

The present document is part of the Release 6 "**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in GERAN**" work item and it is linked to the corresponding 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service (MBMS); Stage 1" [3] and 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description" [5].

The purpose of the present document is to provide a stage 2 description of the changes required in existing specifications for the "**Introduction of the Multimedia Broadcast Multicast Service (MBMS) in GERAN**" feature for Release 6.

2 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 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[2] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

[3] 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service (MBMS); Stage 1".

[4] 3GPP TS 22.246: "Multimedia Broadcast/Multicast Service (MBMS) user services; Stage 1".

[5] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[6] 3GPP TR 25.992: "Multimedia Broadcast/Multicast Service (MBMS); UTRAN/GERAN requirements".

[7] 3GPP TS 25.346: "Introduction of Multimedia Broadcast/Multicast Service (MBMS) in the Radio Access Network (RAN); Stage 2".

[8] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[9] 3GPP TS 45.008: "Radio subsystem link control".

[10] 3GPP TS 43.022: "Functions related to Mobile Station (MS) in idle mode and group receive mode".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 22.146 [3] and the following apply.

Dedicated MBMS Notification: A mechanism in the network that allows the network to notify mobile stations in dedicated mode of starting MBMS multicast sessions.

MBMS radio bearer: In *A/Gb mode*, an MBMS radio bearer is defined as "point-to-multipoint".

MBMS channel: An MBMS channel consists of the physical resources assigned to one (several) MBMS service(s). In *A/Gb mode*, an MBMS channel carries one (several) MBMS radio bearer(s) and may be on one (several) PDCH(s) with GPRS and/or EGPRS TBF(s).

MBMS session: Defined in 3GPP TS 22.146 [3].

MBMS service: Defined in 3GPP TS 22.146 [3].

MBMS service class: An MBMS service class is defined as either Background or Streaming, according to 3GPP TS 23.107 [2].

MBMS notification: Defined in 3GPP TS 23.246 [5].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BM-SC	Broadcast/Multicast Service Centre
MBMS	Multimedia Broadcast/Multicast Service
MPRACH	MBMS Packet Random Access Channel
p-t-p	point-to-point
p-t-m	point-to-multipoint
TMGI	Temporary Mobile Group Identifier

4 MBMS GERAN Architecture

4.1 General

One new transmission mode exists to provide the MBMS service:

- Point-to-multipoint transmission (p-t-m)

Point-to-multipoint transmission is used to transfer MBMS specific information between the network and an unspecified number of mobile stations. It is used for both broadcast and multicast modes of MBMS.

4.2 GERAN A/Gb mode architecture

4.2.1 Protocol structure

No modifications are required to the GPRS protocol stack (see 3GPP TS 23.060) for MBMS. However, some of the radio protocols in the GERAN will require modifications to support MBMS p-t-m bearers.

4.2.2 void

4.2.3 MBMS reception

Table 4.2.3.1 shows whether a mobile station can support MBMS data reception according to its mode (packet idle mode, packet transfer mode, dedicated mode or dual transfer mode) at the time of the MBMS bearer establishment i.e. immediately prior to MBMS reception.

Table 4.2.3.1: MBMS radio bearer available according to initial MAC mode and MBMS service

	Packet idle mode **(GMM-Standby or GMM-Ready)**	Packet transfer mode	Dedicated mode	Dual transfer mode
MBMS multicast	**p-t-m**	**p-t-p repair**	**p-t-p repair (1)**	**p-t-p repair**
MBMS broadcast	**p-t-m**	**Not specified (2)**	**Not specified (3)**	**Not specified (3)**

1) A mobile station is moved to dual transfer mode on establishment of a TBF to request an MBMS p-t-p repair.

2) Support is optional in the mobile station.

3) Note that an MBMS broadcast service is only available on a p-t-m radio bearer.

4.3 GERAN Iu mode architecture

4.3.1 Protocol structure

No modifications are required to the GPRS protocol stack (see 3GPP TS 23.060 [1]) for MBMS. However, some of the radio protocols in the GERAN will require modifications to support MBMS p-t-m bearers.

4.3.2 void

4.3.3 MBMS reception

Table 4.3.3.1 shows which type of MBMS radio bearer shall be assigned to the mobile station according to its RRC and MAC states at the time of the MBMS bearer establishment i.e. immediately prior to MBMS reception.

Table 4.3.3.1: MBMS radio bearer available according to initial MAC and RRC states and MBMS service

	RRC-Idle	**RRC-GRA_PCH**	**RRC-Cell_Shared**		**RRC-Cell_Dedicated**	
	MAC-Idle	**MAC-Idle**	**MAC-Idle**	**MAC-Shared**	**MAC-Dedicated**	**MAC-DTM**
MBMS multicast	p-t-m p-t-p (1)	Not available (2)	p-t-m p-t-p (1)	p-t-p	p-t-p (3)	p-t-p
MBMS broadcast	p-t-m	p-t-m	p-t-m	Not specified (4)	Not specified (5)	Not specified (5)

1) A mobile station is moved to MAC-Shared state on establishment of an MBMS p-t-p radio bearer

2) A mobile station is moved to RRC-Cell_Shared state on establishment of an MBMS radio bearer (p-t-m or p-t-p)

3) A mobile station is moved to MAC-DTM state on establishment of an MBMS p-t-p radio bearer if it has no other PS connections established

4) Support is optional in the mobile station

5) Note that an MBMS broadcast service is only available on a p-t-m radio bearer

5. MBMS channel structure

5.1 Logical channels

For MBMS p-t-m transmission, the traffic data is carried on PDTCH (see 3GPP TS 45.002 [8]), whereas the control data is carried on PACCH (see 3GPP TS 45.002 [8]).

A new logical channel is defined, the MPRACH, which may be used during the initial counting procedure (see sub-clause 6.1.1.3). On the MPRACH, Packet Access Bursts or Extended Packet Access Bursts can be transmitted.

5.2 Physical channels

5.2.1 General

MBMS p-t-m radio bearers are transmitted on PDCH (see 3GPP TS 45.002 [8]).

On a PDCH it shall be possible to multiplex different MBMS p-t-m radio bearers and GPRS and/or EGPRS TBFs using TFI.

5.2.2 Coding schemes

The existing GPRS and EGPRS coding schemes are used for MBMS.

An MBMS-capable mobile station shall support CS-1 to CS-4 and MCS-1 to MCS-9 in the downlink. A network supporting MBMS may support only some of the coding schemes.

5.2.3 Mapping of MPRACH onto physical channels

The MPRACH may be mapped on any uplink PDCH.

The MPRACH is dynamically allocated in groups of four MPRACH blocks By (y=4x+i, i=0 ,.., 3) corresponding to one PDCH block Bx (x=0,...,11), indicated by a USF. The value of the USF allocated to the mobile station is signalled by the network in the notification message.

6. MBMS procedures in GERAN

6.1 Resource management procedures

6.1.1 Session start

6.1.1.1 General

Upon receiving an MBMS SESSION START REQUEST message (or an MBMS SESSION UPDATE REQUEST message for an ongoing MBMS broadcast session with an updated MBMS service area) from the SGSN, if the network controls cells in the MBMS service area the network creates an MBMS Service Context (if not yet available for the ongoing MBMS broadcast session), and acknowledges the SGSN using an MBMS SESSION START RESPONSE message (or an MBMS SESSION UPDATE RESPONSE message). The network may receive an Allocation/Retention Priority associated with the MBMS session in the MBMS SESSION START REQUEST message (or in the MBMS SESSION UPDATE REQUEST message).

The network may use the Allocation/Retention Priority to prioritise between MBMS bearer services, and between MBMS bearer services and non-MBMS bearer services. The network initiates the MBMS channel establishment in each cell belonging to the MBMS service area where the network has decided to provide this MBMS service (and where the MBMS channel has not yet been established in case of an ongoing MBMS broadcast session).

The channel establishment procedure consists of the following steps:

- the optional pre-notification of the MBMS service which is starting a data transmission;
- the notification of all MBMS users in the cell of this MBMS service;
- an optional counting procedure; and
- a channel assignment message. The type of channel assigned may depend on the number of users in the cell who respond to the notification in the counting procedure.

If counting is not required, the notification and channel assignment information may be transmitted in a single (PACKET) PAGING REQUEST message in the case of an MBMS broadcast service or an MBMS multicast service.

6.1.1.1a Pre-notification

The network may indicate the incoming notification of a given MBMS service and MBMS session by sending a pre-notification of this MBMS service and MBMS session to MBMS mobile stations in packet idle mode.

A pre-notification may be sent in PAGING REQUEST TYPE 1 or 2 messages on CCCH, or if PCCCH is present, in PACKET PAGING REQUEST message and identifies the TMGI as well as, if available, the MBMS Session Identity. Upon reception of a pre-notification for an MBMS service and MBMS session, a mobile station in packet idle mode shall enter non-DRX mode and monitor notifications as described in sub-clause 6.1.1.2 in the following cases:

- the MBMS service is a broadcast service and the mobile station is required to receive this service; or
- the MBMS service is a multicast service and the mobile station has joined this service.

6.1.1.2 Notification of session start

6.1.1.2.1 General

When the network is informed that an MBMS session is starting or an ongoing MBMS broadcast session has an updated MBMS service area, the network notifies mobile stations in packet idle mode or MAC-Idle state, and may notify mobile stations in packet transfer mode or MAC-Shared state, or mobile stations in dedicated mode or MAC-Dedicated state, or mobile stations in dual transfer mode or MAC-DTM state. The mobile stations in packet idle mode or MAC-Idle state are notified on the (P)PCH by the network. The mobile stations in packet transfer mode or MAC-Shared state and the mobile stations in dual transfer mode or MAC-DTM state may be notified on the PACCH by the network using a distribution message. The mobile stations in dedicated mode or MAC-Dedicated state may be notified on the main DCCH by the network.

The network may optionally initiate, on a per-cell basis, a counting mechanism (i.e. to count up to an operator-defined user threshold > 0) to ascertain the interest of users in each cell. This may be used in order to select the type of MBMS radio bearer (i.e. characterized by an uplink feedback channel or not) to establish. If counting is activated in a cell, mobile stations shall respond to the notification using the initial counting procedure, see sub-clause 6.1.1.3.

If counting is not activated, the network may allocate the MBMS bearer in a cell using the MBMS bearer establishment procedure, see sub-clause 6.1.1.4.

6.1.1.2.2 Mobile stations in packet idle mode or MAC-Idle state

If the network controls cells in the MBMS service area of a starting MBMS session (or of an ongoing MBMS broadcast session with an updated MBMS service area), the network initiates the MBMS notification procedure on each of these cells. A notification is sent in PAGING REQUEST TYPE 1 or 2 messages on CCCH, or if PCCCH is present, in PACKET PAGING REQUEST message and identifies the TMGI as well as, if available, the MBMS Session Identity.

A notification may include the uplink resource description for a PRACH dedicated to MBMS (MPRACH). If a PRACH is allocated in the cell, and no MPRACH Control Parameters are included in the notification message, the PRACH Control Parameters shall be used for the MPRACH. If the network wishes to allocate an MPRACH and no PRACH is allocated in the cell, the MBMS Notification message shall include the MPRACH Control Parameters. If present, MPRACH Control Parameters take precedence over PRACH Control Parameters.

If a mobile station has not joined the MBMS multicast service identified by the TMGI or has already received the MBMS session identified by the TMGI and MBMS Session Identity combination contained in the (PACKET) PAGING REQUEST message, the mobile station shall discard the message.

If the mobile station has not previously received the MBMS session identified by the TMGI and MBMS Session Identity (if available) combination contained in the (PACKET) PAGING REQUEST message and the message includes an indication that 'counting shall be used', then the mobile station shall initiate the initial counting procedure, see sub-clause 6.1.1.3, otherwise if such an indication is not included then the mobile station shall continue with the MBMS bearer establishment procedure, see sub-clause 6.1.1.4.

6.1.1.2.3 Mobile stations in packet transfer mode or MAC-Shared state and mobile stations in dual transfer mode or MAC-DTM state

If the network controls cells in the MBMS service area of a starting MBMS session (or of an ongoing MBMS broadcast session with an updated MBMS service area), the network may pass a PACKET MBMS ANNOUNCEMENT message to all MBMS capable mobile stations that have a PACCH. The PACKET MBMS ANNOUNCEMENT message includes the TMGI and, if available, the MBMS Session Identity of an MBMS session and may optionally include a parameter that dictates whether there is maximum reaction time for the mobile station or the MBMS session (remaining) duration, the uplink resource description for a PRACH dedicated to MBMS (MPRACH) possibly with control parameters, or the channel assignment information for the MBMS session.

If the mobile station has not previously joined the MBMS multicast service identified by the TMGI or the mobile station has already received the MBMS session identified by the TMGI and the MBMS Session Identity combination contained in the PACKET MBMS ANNOUNCEMENT message, the mobile station discards the message. If the mobile station has joined the MBMS multicast service identified by the TMGI contained in the PACKET MBMS ANNOUNCEMENT message and has not received the session, optionally identified by the MBMS Session Identity, then the mobile station stores the MBMS information contained in the PACKET MBMS ANNOUNCEMENT message, initialises timer T3222 (see 3GPP TS 44.060) if indicated to do so and the session duration timer for this MBMS session if the MBMS session (remaining) duration is included in the PACKET MBMS ANNOUNCEMENT message, and passes the received TMGI, and the MBMS Session Identity if available, to the upper layers. If timer T3222 expires the stored MBMS information associated with the timer is deleted.

If the mobile station returns to packet idle mode or MAC-Idle state when MBMS information is stored, then:

- if the channel assignment information for the MBMS session was not included in the PACKET MBMS ANNOUNCEMENT message, the mobile station initiates the initial counting procedure using the stored MBMS information, (see sub-clause 6.1.1.3), once the Transfer non-DRX mode period has elapsed;

- if the channel assignment information for the MBMS session was included in the PACKET MBMS ANNOUNCEMENT message, the mobile station starts listening to the MBMS p-t-m radio bearer.

6.1.1.2.4 Mobile stations in dedicated mode or MAC-Dedicated state

If the network controls cells in the MBMS service area of a starting MBMS session (or of an ongoing MBMS broadcast session with an updated MBMS service area), the network may pass an MBMS ANNOUNCEMENT message to all mobile stations that have previously requested to be notified on the main DCCH. The MBMS ANNOUNCEMENT message includes the TMGI and, if available, the MBMS Session Identity of an MBMS session and may optionally include a parameter that dictates whether there is maximum reaction time for the mobile station or the MBMS session (remaining) duration, the uplink resource description for a PRACH dedicated to MBMS (MPRACH) possibly with control parameters, or the channel assignment information for the MBMS session.

If the mobile station has not previously joined the MBMS multicast service identified by the TMGI or the mobile station has already received the MBMS session identified by the TMGI and the MBMS Session Identity combination contained in the MBMS ANNOUNCEMENT message, the mobile station discards the message. If the mobile station has joined the MBMS Service identified by the TMGI and has not received the session, optionally identified by the MBMS Session Identity, then the mobile station stores the MBMS information contained in the MBMS ANNOUNCEMENT message, initialises timer T3222 (see 3GPP TS 44.060) if indicated to do so and the session duration timer for this MBMS session if the MBMS session (remaining) duration is included in the MBMS ANNOUNCEMENT message, and passes the received TMGI, and the MBMS Session Identity if available, to the upper layers. If timer T3222 expires the stored MBMS information associated with the timer is deleted.

If the mobile station returns to packet idle mode or MAC-Idle state when MBMS information is stored, then:

- if the channel assignment information for the MBMS session was not included in the MBMS ANNOUNCEMENT message, the mobile station initiates the initial counting procedure using the stored MBMS information, see sub-clause 6.1.1.3;

- if the channel assignment information for the MBMS session was included in the MBMS ANNOUNCEMENT message, the mobile station starts listening to the MBMS p-t-m radio bearer.

6.1.1.3 Initial counting procedure

The mechanism in the requirements 11 and 12 in A.1.1 implies that an MBMS channel should not be established if no interested users are in the cell at the time of the notification of the MBMS session. The network using such a mechanism would therefore wait for at least one response from an MBMS user in each cell before assigning the MBMS bearer. The initial counting procedure can also be used to count the number of mobile stations when starting a broadcast session.

If the notification message or the (PACKET) MBMS ANNOUNCEMENT message contains the uplink resource description for an MPRACH, packet access for counting is initiated by the mobile station by sending on such MPRACH a PACKET CHANNEL REQUEST message with access cause "Single Block MBMS Access" requesting a single uplink block. The mobile station acts on any response sent by the network to that mobile station.

If the notification message or the (PACKET) MBMS ANNOUNCEMENT message does not contain any uplink resource description for an MPRACH, packet access for counting is initiated by the mobile station by sending a (PACKET) CHANNEL REQUEST message on the common (P)RACH, with access cause "Single Block MBMS Access" requesting a single uplink block.

Upon reception by the network of a (PACKET) CHANNEL REQUEST message with access cause "Single Block MBMS Access", the network sends an IMMEDIATE ASSIGNMENT message on CCCH (or a PACKET UPLINK ASSIGNMENT message on PAGCH) allocating one uplink block to the mobile station.

Upon reception by the mobile station of an IMMEDIATE ASSIGNMENT (respectively PACKET UPLINK ASSIGNMENT) message corresponding to one of its (PACKET) CHANNEL REQUEST messages and allocating one uplink radio block for MBMS access, the mobile station sends in this radio block an MBMS SERVICE REQUEST message on PACCH to the network including its TLLI, the TMGI and, if available, the MBMS Session Identity of the session, and enters non-DRX mode. In case the MBMS SERVICE REQUEST message is not correctly received on the network side, the network may repeat the IMMEDIATE ASSIGNMENT message on CCCH (or PACKET UPLINK ASSIGNMENT message on PAGCH), allowing the mobile station to re-send the MBMS SERVICE REQUEST message. The reception by the network of the MBMS SERVICE REQUEST message from a number of mobile stations allows the network to estimate in a given cell the number of mobile stations interested in a given session.

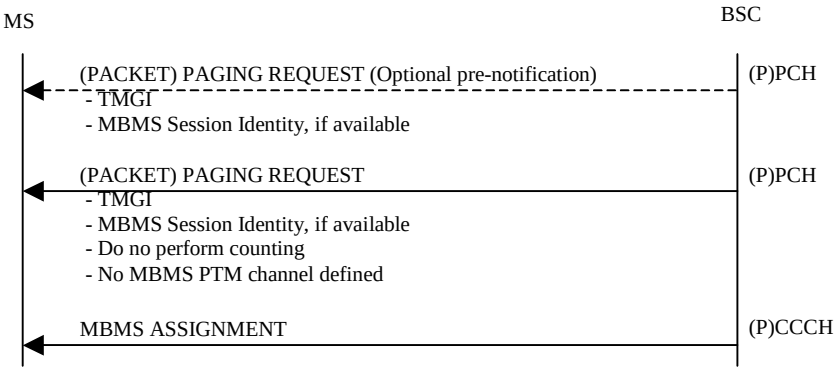


FIGURE 6.1.1.3.a: No counting and no PTM Bearer defined

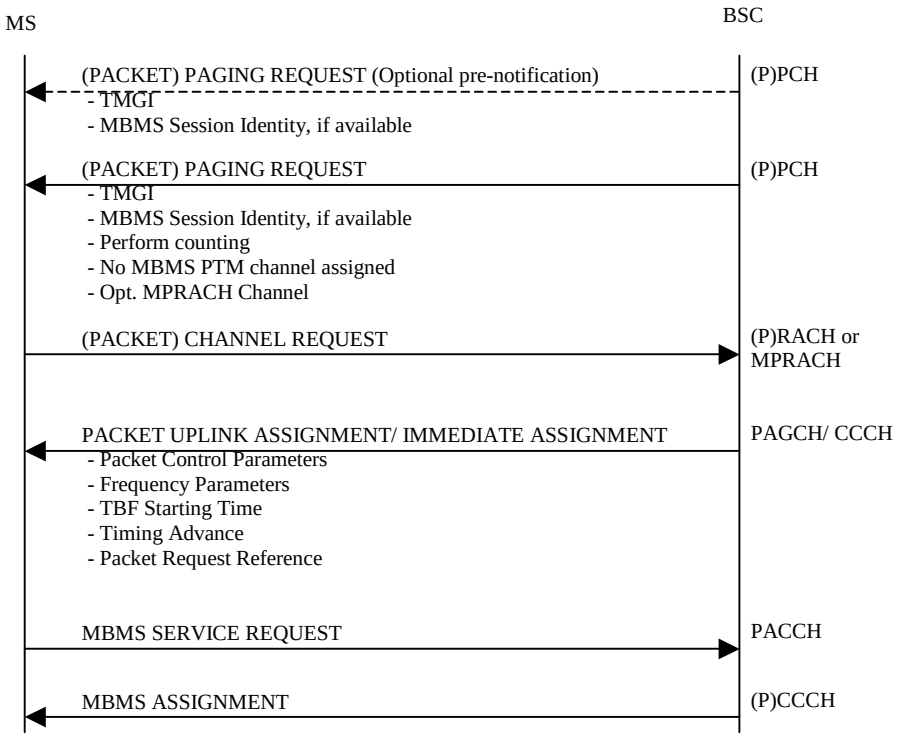


FIGURE 6.1.1.3.b: Counting used

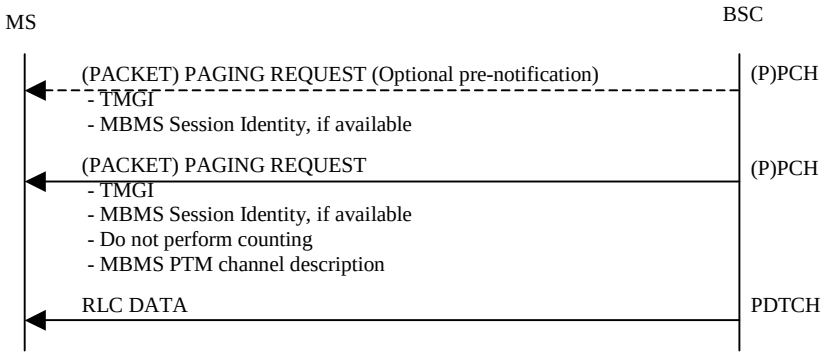


FIGURE 6.1.1.3.c: PTM Bearer established

This estimate may be used by the network to establish a point-to-multipoint channel for a given session, possibly characterized by an uplink feedback channel, or to notify the mobile stations that no point-to-multipoint channel will be established.

In case an uplink feedback channel is established, to receive MBMS DOWNLINK ACK/NACK messages from the mobile stations addressing of mobile stations is required. This procedure is described in sub-clause 6.1.1.5. The network may address (i.e. distribute MS_ID identifiers to) only a subset of the counted mobile stations. In this case, mobile stations without an allocated MS_ID shall only listen to the MBMS p-t-m radio bearer and will not send any feedback.

6.1.1.4 MBMS bearer establishment

The network may allocate the MBMS bearer by including the bearer description and the MBMS session duration in the notification message. An MBMS bearer allocated via the notification message will initially operate without ARQ at the RLC/MAC layer (see sub-clause 6.3.1.1).

The network may send the MBMS ASSIGNMENT message as a distribution message on PAGCH or, if PCCCH is not present in the cell, the IMMEDIATE ASSIGNMENT message including the *Multiple Blocks Packet Downlink Assignment* construction on AGCH followed by the MBMS ASSIGNMENT message sent on the PDCH specified by the *Packet Channel Description* IE in the IMMEDIATE ASSIGNMENT message (see 3GPP TS 44.060 and 3GPP TS 44.018) to all interested mobile stations in packet idle mode.

The network either assigns a point-to-multipoint bearer for the transmission of the MBMS session in a cell, or notifies the mobile stations that a p-t-m bearer will not be established in the cell. The decision of whether to allocate resources in a cell is implementation dependent.

The MBMS ASSIGNMENT message may be sent as a non-distribution message to a specific mobile station that performs an access.

The MBMS ASSIGNMENT message includes the TMGI, the Session Id when available, the MBMS session duration, the MBMS_BEARER_ID, the MBMS In-band Signalling Indicator (see sub-clause 6.6) and the p-t-m channel description to assign the p-t-m bearer in the cell, or, if the p-t-m bearer is not assigned in the cell, a cause value indicating one of the following reasons:

1. Further MBMS access allowed for the current MBMS session in the current cell; or
2. No further MBMS access allowed for the current MBMS session in the current cell (e.g. the cell is outside the MBMS Service Area for the requested MBMS service); or
3. No further MBMS access allowed for the current MBMS session in the Routeing Area (e.g. the network does not have any information about the requested session); or
4. No further MBMS access allowed for the current MBMS session in any cell of the PLMN.

If the mobile station detects:

Cause 1. above, the mobile station may perform additional access attempts for the current MBMS session in this cell. If the mobile station moves cell whilst the session duration timer in the mobile station is running, the mobile station may request the session in any cell that supports MBMS.

Cause 2. above, the mobile station shall not perform any further access attempts for the current MBMS session whilst the mobile station remains in this cell. If the mobile station moves cell whilst the session duration timer in the mobile station is running, the mobile station may request the session in any other cell that supports MBMS.

Cause 3. above, the mobile station shall not perform any further access attempts for the current MBMS session in the current Routeing Area. If the mobile station moves Routeing Area whilst the session duration timer in the mobile station is running, the mobile station may request the session in any other cell that supports MBMS.

Cause 4. above, the mobile station shall not perform any further access attempts for the current MBMS session.

When the session duration timer in the mobile station expires the mobile station shall no longer attempt to request this MBMS session in any cell and indicates to the upper layers that the multicast/broadcast delivery of this MBMS session is complete.

Note that a mobile station is allowed to perform a new access attempt if it has received a new (repeated) notification, irrespective of a reception of a previous reject cause (i.e. cause 1 to 4 defined above) and of the expiry of the session duration timer for the MBMS session in the mobile station.

NOTE: The session duration timer in the mobile station is initialised with a value equal to the estimated session duration which may be included in the notification or in the (PACKET) MBMS ANNOUNCEMENT message or in the MBMS ASSIGNMENT message.

The MBMS ASSIGNMENT message may be repeated by the network, in order to overcome potential radio impairments on the PDCH on which it is transmitted.

The network may send the MBMS ASSIGNMENT message at any time during the counting procedure and before a maximum time limit after notification elapses (see Annex A.1.1).

Upon reception of an MBMS ASSIGNMENT message including the MBMS_BEARER_ID and the p-t-m channel description for a given session, a mobile station that requires the reception of this session, does not perform any further access attempts (see sub-clause 6.1.1.3) and switches to the assigned p-t-m channel.

Upon reception of an MBMS ASSIGNMENT message not including the MBMS_BEARER_ID and the p-t-m channel description for a given session, all interested mobile stations in packet idle mode perform as specified above depending on the cause indication why no p-t-m bearer was established.

6.1.1.5 Address assignment procedure

The assignment of an MS_ID address to a counted mobile station is performed by the network sending an MBMS MS_ID ASSIGNMENT message on the PACCH/D of the point-to-multipoint radio bearer addressed via the MBMS_BEARER_ID. If an MBMS ASSIGNMENT message is sent as a non-distribution message it can contain MS_ID and then no MBMS MS_ID ASSIGNMENT message needs to be sent. On a given point-to-multipoint bearer there is a one-to-one relationship between an MBMS_BEARER_ID + MS_ID combination and the TLLI of the mobile station. The MBMS MS_ID ASSIGNMENT message also includes the timing advance parameters for the addressed mobile station.

The network may request an addressed mobile station to acknowledge, with a PACKET CONTROL ACKNOWLEDGEMENT message, the reception of the MBMS MS_ID ASSIGNMENT message.

The mobile stations are identified with an MBMS_BEARER_ID + MS_ID combination, which is provided within the TFI field. Both the MBMS_BEARER_ID and the MS_ID are variable length fields inside the TFI field. The MBMS_BEARER_ID may range from a 1-bit field up to a 5-bit field (in the latter case no mobile station may be addressed). The MS_ID may range from a 1-bit field up to a 4-bit field. At any time the overall size of the MBMS_BEARER_ID + MS_ID combination is a 5-bit field, i.e. the size of the TFI field. On a PDCH an MBMS bearer is identified by the MBMS_BEARER_ID contained in the most significant bit(s) part of the TFI field; all TFI values whose most significant bits are equal to a given MBMS_BEARER_ID are reserved for this MBMS bearer and shall not be used for any other (E)GPRS TBFs or p-t-m radio bearer on that PDCH. All the mobile stations receiving the MBMS p-t-m radio bearer identified by a given MBMS_BEARER_ID shall try to decode all the RLC/MAC blocks where the TFI field contains this MBMS_BEARER_ID.

The network may modify the lengths of the MBMS_BEARER_ID and the MS_ID fields during an ongoing MBMS session in order to dynamically change the multiplexing of different MBMS p-t-m radio bearers and/or (E)GPRS TBFs on the same PDCH(s). The network performs such identity reassignment of an MBMS radio bearer by sending an MBMS ASSIGNMENT message as a non-distribution message on the PACCH/D, containing the old and the new MBMS_BEARER_ID and optionally the starting time of the validity of the new MBMS_BEARER_ID.

The network may reallocate or delete the MS_ID value assigned to a specific MS with an MBMS MS_ID ASSIGNMENT message.

6.1.1.6 Repetition of notifications of an on-going MBMS session

The network may repeat notifications of an ongoing session (repeated notifications). The same procedures as in sub-clause 6.1.1.2 shall be used with the exception that the network shall provide the estimated remaining duration of the MBMS session.

A mobile station that is receiving an MBMS session shall ignore repeated (pre-)notifications of that session.

6.1.2 MBMS channel reconfiguration

The network may modify the channel allocation for an MBMS bearer by sending an MBMS ASSIGNMENT message as a non-distribution message including the relevant MBMS_BEARER_ID. The MS shall use the same MS_ID on the new resource.

The MBMS ASSIGNMENT message includes the new MBMS bearer description, the session duration value indicating the remaining duration of the MBMS session and the MBMS In-band Signalling Indicator (see sub-clause 6.6).

6.1.3 MBMS channel release

When the GERAN receives an MBMS SESSION STOP REQUEST message from the SGSN indicating that the MBMS session can be released, the network acknowledges this request by sending the MBMS SESSION STOP RESPONSE message to the SGSN. The network removes all radio resources allocated for the MBMS session, identified in the MBMS SESSION STOP REQUEST message.

During the MBMS session the network may decide that the bearer supporting the MBMS session is to be released. If the network decides to prematurely release the bearer, the network sends a PACKET TBF RELEASE message.

At the end of an MBMS session, indicated by the expiry of the Session Duration Timer, a mobile station shall notify the upper layers.

When the GERAN receives an MBMS SESSION UPDATE REQUEST message from the SGSN the network releases the MBMS channel in each cell no longer belonging to the MBMS service area in case of an ongoing MBMS broadcast session with an updated MBMS service area. The network acknowledges this request by sending the MBMS SESSION UPDATE RESPONSE message to the SGSN (see sub-clause 6.1.1.1).

6.2 Mobility procedures

6.2.1 Distribution of MBMS neighbouring cell information

If in a given cell an MBMS session is being sent on a p-t-m channel; and if in any neighbouring cell of that given cell, the same session is being sent on a p-t-m channel, the network may provide in that given cell for that MBMS session, information about the characteristics (frequency and timeslot allocation) of the MBMS p-t-m channel and the relevant MBMS_BEARER_ID of each of these neighbouring cells. The network shall not provide neighbouring cell information for sessions that are not being sent in that given cell.

This information is provided to mobile stations on the PACCH/D of the p-t-m channel using the MBMS NEIGHBOURING CELL INFORMATION message. This message also includes an indication of whether an uplink feedback channel associated to the MBMS p-t-m channel is established in the specific cell, and if so on which timeslot and whether an MPRACH is allocated onto that timeslot or not, and the MBMS In-band Signalling Indicator (see sub-clause 6.6).

In order to increase the likelihood that all mobile stations prior to reselecting a cell, have received, if available, the MBMS NEIGHBOURING CELL INFORMATION message(s) for that cell:

- If feedback is in use, a mobile station when polled shall indicate in the MBMS DOWNLINK ACK/NACK message as many as possible of and up to the 6 strongest non-serving carriers to the network. The network may in turn prioritise the transmission of MBMS NEIGHBOURING CELL INFORMATION messages according to the neighbouring cells reported by the mobile stations.

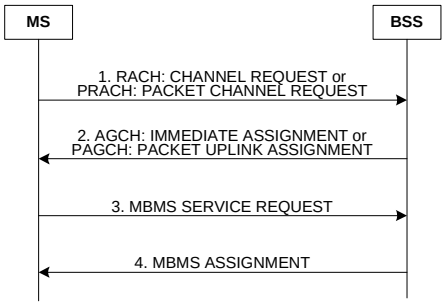
In addition, if so ordered by the network in GPRS Cell Options IE, a mobile station monitoring an MBMS session on a p-t-m channel shall not reselect a suitable neighbouring cell until it has received, if available, an MBMS NEIGHBOURING CELL INFORMATION message for that cell and that session. If within a given time after having determined a suitable neighbouring cell, the mobile station still has not received any MBMS NEIGHBOURING CELL INFORMATION message for that neighbouring cell and that session, the mobile station shall proceed with cell reselection.

NOTE: The order in which the MBMS NEIGHBOURING CELL INFORMATION messages are sent is implementation dependent.

6.2.2 MBMS reception resumption after cell reselection

6.2.2.1 Default behaviour

If a mobile station receiving an MBMS session on a p-t-m channel reselects a new cell for which it does not have any information about an MBMS bearer being allocated in the cell for that MBMS session, the mobile station, after having acquired a consistent set of (packet) system information, shall request the MBMS service from the network using the following procedure, if MBMS is supported in the cell.



1. / 2. The mobile station requests resources using a (PACKET) CHANNEL REQUEST message denoting "Single Block MBMS Access" and is allocated resources from the network.

3. The mobile station sends an MBMS SERVICE REQUEST message including its TLLI, the TMGI and the session ID of the requested MBMS service. In case the MBMS SERVICE REQUEST message is not correctly received on the network side, the network may repeat the IMMEDIATE ASSIGNMENT message on AGCH (or PACKET UPLINK ASSIGNMENT message on PAGCH), allowing the mobile station to re-send the MBMS SERVICE REQUEST message.

4. Upon receiving the MBMS SERVICE REQUEST message the network can either:

   - Instruct the mobile station to move to an MBMS point-to-multipoint bearer (MBMS ASSIGNMENT message including the MBMS_BEARER_ID and the p-t-m channel description); or

   - Notify the mobile station that no p-t-m bearer will be available (MBMS ASSIGNMENT message not including the MBMS_BEARER_ID and the p-t-m channel description) and report the cause indication why no p-t-m bearer was established (see sub-clause 6.1.1.4).

In case an uplink feedback channel is established, if there are further MS_ID identifiers available, after sending the MBMS ASSIGNMENT message, the network may decide to send an MBMS MS_ID ASSIGNMENT message on PACCH to perform the addressing procedure (see sub-clause 6.1.1.5).

NOTE. The network may send a single assignment message including not only the TMGI, the Session Id, the MBMS_BEARER_ID, the MBMS In-band Signalling Indicator, the MBMS session duration and the p-t-m channel description, but also the TLLI, the MS_ID and the timing advance parameters in the MBMS ASSIGNMENT message.

In case an uplink feedback channel is established, but there are no more MS_ID identifiers available, the network may:

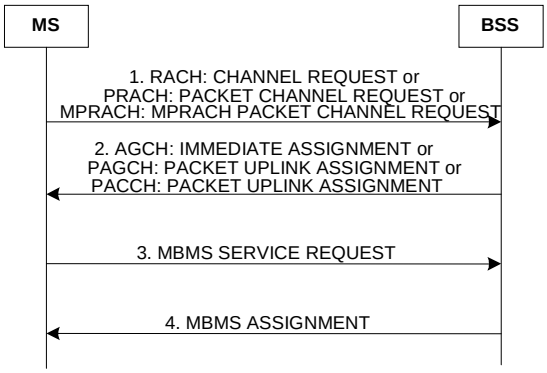
- Release the uplink feedback channel, adopting a retransmission strategy that does not exploit user feedback; or

- Retain the uplink feedback channel and decide not to address the new mobile station. In this case, the mobile station shall only listen to the MBMS p-t-m radio bearer and will not send any feedback.

6.2.2.2 Fast reception resumption

If a mobile station receiving an MBMS session on a p-t-m channel reselects a new cell for which it has received information about an MBMS bearer being allocated for that session (as described in sub-clause 6.2.1), the mobile station shall immediately switch to this MBMS bearer and continue receiving that MBMS session without waiting to receive a consistent set of (packet) system information messages on (P)BCCH in that cell. If the mobile station also has

information about an uplink feedback channel being established in the cell, the mobile station shall initiate the address assignment procedure as described below, otherwise the mobile shall not perform any access to the network. If the mobile station is in DRX mode (e.g. it is not involved in a *routeing area update* procedure) and has received the indication that an MPRACH is allocated on the uplink feedback channel, it shall initiate the procedure on that MPRACH, otherwise the procedure is initiated by the mobile station either on a PCCCH or, if a packet control channel is not allocated in the cell, on a CCCH.



1. / 2. The mobile station requests resources using a MPRACH PACKET CHANNEL REQUEST or (PACKET) CHANNEL REQUEST message denoting "Single Block MBMS Access" and is allocated resources from the network.

3. The mobile station sends an MBMS SERVICE REQUEST message including its TLLI, the TMGI and the session ID of the requested MBMS service.

4. Upon receiving the MBMS SERVICE REQUEST message, if there are still MS_ID identifiers available, the network may send:

   - an MBMS ASSIGNMENT message on the PAGCH, or on the PCCCH corresponding to the mobile station PCCCH_GROUP if the mobile station initiated the procedure on the MPRACH; or

   - if PCCCH is not present in the cell, an IMMEDIATE ASSIGNMENT message including the *Multiple Blocks Packet Downlink Assignment* construction on the AGCH, or on the CCCH corresponding to the mobile station CCCH_GROUP if the mobile station initiated the procedure on the MPRACH, followed by the MBMS ASSIGNMENT message sent on the PDCH specified by the *Packet Channel Description* IE in the IMMEDIATE ASSIGNMENT message (see 3GPP TS 44.060 and 3GPP TS 44.018).

   The MBMS ASSIGNMENT message includes not only the TMGI, the Session Id, the MBMS_BEARER_ID, the MBMS In-band Signalling Indicator, the MBMS session duration and the p-t-m channel description, but also the TLLI, the MS_ID and the timing advance parameters. If there are no more MS_ID identifiers available, the network shall answer with an MBMS ASSIGNMENT message containing no valid MS_ID, to inform the mobile station to stop the address assignment procedure.

After receiving the MS_ID, the mobile station shall – upon polling - send an MBMS DOWNLINK ACK/NACK message on the uplink feedback channel.

NOTE: The decision regarding which cell the mobile station should reselect to is performed using the existing procedures (see 3GPP TS 45.008 [9]).

6.2.3 Cell change

The cell change procedures for mobile stations in broadcast/multicast receive mode are described in 3GPP TS 43.022 [10].

6.3 MBMS data transfer for p-t-m transmission

6.3.1 General

6.3.1.1 Point-to-multipoint data transfer options

For *A/Gb mode*, MBMS data, in the form of LLC frames, is mapped into the RLC/MAC-PTM_DATA primitive and is distributed from the SGSN to each network within the MBMS Service Area.

For the p-t-m transmission of MBMS data, the following alternatives are available:

1) Without the support of an uplink feedback channel, i.e. without ARQ at the RLC/MAC layer. Each RLC/MAC block may be retransmitted an unspecified number of times according to the principles outlined in sub-clause 6.3.1.2 below and in 3GPP TS 44.060.

2) With the support of an uplink feedback channel, i.e. with ARQ at the RLC/MAC layer. A selective retransmission technique may be used; this does not preclude the possibility to also retransmit blocks independently on user feedback, as described in bullet 1 above.

For *A/Gb mode*, the LLC layer always operates in unacknowledged mode.

6.3.1.2 RLC protocol behaviour

During an MBMS data transfer, the RLC protocol shall operate in non-persistent mode (see 3GPP TS 44.060), regardless of the presence of a feedback channel.

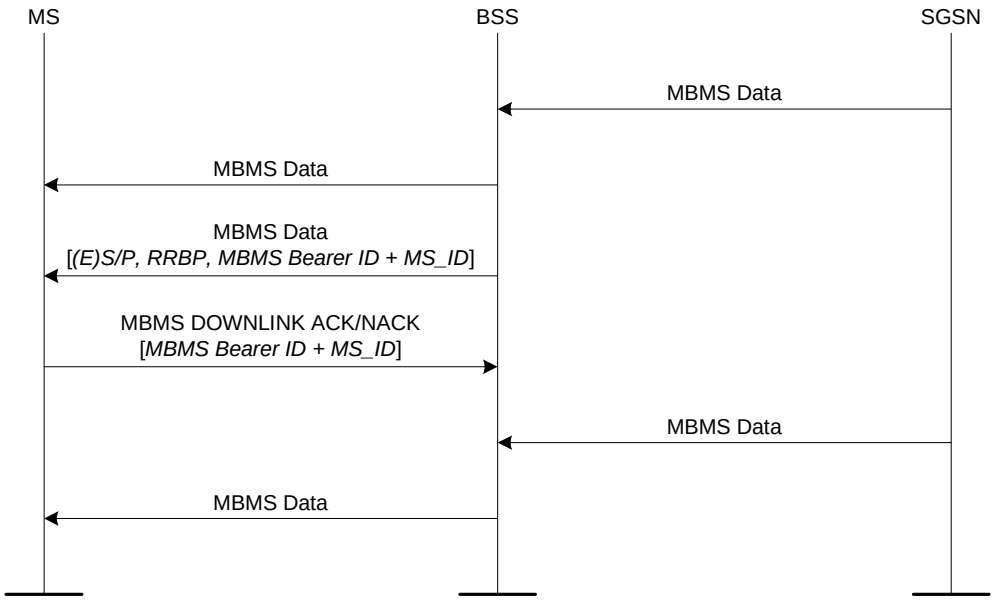
The RLC endpoints in the network and in the mobile stations shall not expect that every RLC block is correctly received at the mobile station side.

The mobile station shall consider as valid RLC blocks all the RLC blocks higher than the next expected highest numbered RLC block as well as those starting from the next expected highest numbered RLC block and going backwards a number of blocks equal to the default window size in the GPRS case or to the window size signalled by the network in the MBMS ASSIGNMENT message in the EGPRS case. If an NPM Transfer Time limitation is associated with the MBMS bearer, the mobile station shall consider as valid RLC blocks all the RLC blocks meeting the conditions above for which the corresponding timer has not expired. The network should avoid (re)transmitting RLC blocks that will not be considered as valid by the mobile stations, to avoid wasting radio resources (see 3GPP TS 44.060).

The RLC protocol behaviour in the mobile station is independent of the availability of an MS_ID identifier in the mobile station and is independent of the transmission strategy used by the network.

6.3.2 Block retransmission based on mobile station feedback

During the MBMS session, the MS_ID is used by the network in order to address a mobile station, and by the mobile station in order to allow the network to identify that mobile station among all the mobile stations involved in that MBMS session. Each mobile station addressed with an MS_ID may at any time be requested to send an MBMS DOWNLINK ACK/NACK message.



The global identifier (MBMS_BEARER_ID + MS_ID) allows the network to address a specific mobile station on an MBMS p-t-m bearer.

1) The mobile station addressed via the global identifier (MBMS_BEARER_ID + MS_ID) shall send an MBMS DOWNLINK ACK/NACK message in the uplink radio block period specified by the RRBP value. The mobile station includes the (MBMS_BEARER_ID + MS_ID) in the MBMS DOWNLINK ACK/NACK message in order to let the network detect the correct identity of the responding mobile station.

2) The network processes the received MBMS DOWNLINK ACK/NACK messages and may perform retransmissions accordingly.

The mobile station shall notify, whenever possible, the network of the release of the MS_ID for that MBMS radio bearer, on the mobile station side, for whatever reason, in the MBMS DOWNLINK ACK/NACK message. In turn and consequently, the network may send an MBMS MS_ID ASSIGNMENT message to the mobile station, deleting the MS_ID previously assigned to that mobile station on that MBMS radio bearer. Any procedure triggering the release of the MS_ID on the mobile station side shall not be delayed by such release indication (otherwise such release indication shall not be sent).

6.4 Multiple sessions

6.4.1 Transmission of multiple sessions

When transmitting multiple sessions on the same carrier, the network has the following options:

1) the sessions can be multiplexed on the same timeslot or group of timeslots;

2) the sessions can be transmitted on separate timeslots or groups of timeslots;

3) some sessions can be transmitted with partial overlap on a subset of all the timeslots on which the sessions are located;

4) a combination of the above.

When data transfer is with ARQ, separate groups of timeslots in the downlink shall be associated with different timeslots in the uplink for the transmission of MBMS DOWNLINK ACK/NACK messages.

If sessions, for which system information and paging messages are sent on the PACCH (see sub-clause 6.6), are transmitted with partial overlap, the network may send the system information on one of the timeslots common to the overlapping sessions in order to reduce the signalling load.

6.4.2 Reception of multiple sessions

The reception of multiple sessions in parallel shall be dependent upon mobile station capabilities.

NOTE: Depending on the timeslot allocation for the sessions, a mobile station may not be capable of transmitting MBMS DOWNLINK ACK/NACK messages on more than one uplink feedback channel.

In the following the priority is an Individual Priority which is mobile station-specific and user-defined. The Individual Priority allows for prioritisation between MBMS bearer services on a per-mobile station basis.

1. If there is a clash of MBMS notification messages, then the mobile station acts on the MBMS Notification with the highest associated priority. If the highest associated priority is the same for two or more MBMS Notifications, then the mobile station shall perform an implementation dependent selection of the MBMS sessions. The mobile station shall not respond to other, lower (or equal) priority MBMS Notifications but may still receive the corresponding sessions, if the capabilities of the mobile station allow.

2. Reception of notification of lower (or equal) priority MBMS session whilst receiving higher priority MBMS session(s):

   If the MBMS bearer configuration is contained in the Notification and the capabilities of the mobile station allow, the mobile station may receive the new session in parallel, otherwise, if the Notification does not contain the MBMS bearer configuration and requires the counting procedure, the mobile station shall not perform the counting procedure but may still receive the MBMS ASSIGNMENT message to check if the new MBMS bearer configuration is consistent with its capabilities. If so, the mobile station may receive the new session in parallel.

3. Reception of notification of higher priority MBMS session whilst receiving lower priority MBMS session(s):

   If the MBMS bearer configuration is contained in the Notification and the capabilities of the mobile station allow, the mobile station may receive all the sessions in parallel. If the capabilities of the mobile station do not allow for the reception of the new session in parallel, the mobile station stops the reception of the lower priority MBMS session(s) no longer consistent with the capabilities of the mobile station (assuming the mobile station would receive the higher priority MBMS session) and receives the new session.

   If the MBMS bearer configuration is not contained in the Notification and the notification requires the counting procedure, the mobile station shall temporarily stop the reception of the lower priority MBMS session(s) and perform the counting procedure for the higher priority MBMS session. If, after receiving the MBMS ASSIGNMENT message, the mobile station detects that its capabilities do not allow for the reception of this new session in parallel, the mobile station stops the reception of the lower priority MBMS session(s) no longer consistent with the capabilities of the mobile station (assuming the mobile station would receive the higher priority MBMS session) and receives the new session.

4. Cell Change whilst active on multiple MBMS sessions:

   When the mobile station moves to the target cell, if in the serving cell the mobile station has received the MBMS NEIGHBOURING CELL INFORMATION message for (one of) the highest priority MBMS session(s) and possibly MBMS NEIGHBOURING CELL INFORMATION messages for other sessions, then the mobile station performs the Fast Reception Resumption procedure for (one of) the highest priority MBMS session(s) and, if the mobile station capabilities allow, for other MBMS sessions where bearer information is known from the serving cell.

   If in the serving cell the mobile station does not receive the MBMS NEIGHBOURING CELL INFORMATION message for (any of) the highest priority MBMS session(s), then in the target cell the mobile station performs the Fast Reception Resumption procedure without performing accesses for the session(s) where the MBMS NEIGHBOURING CELL INFORMATION messages have been received. The mobile station performs access in the target cell for (one of) the highest priority MBMS session(s). After being informed of the bearer allocation of the highest priority MBMS session, the mobile station may perform the access part of the Fast Reception Resumption procedure (if an uplink feedback channel is established) for the sessions that fall within the mobile station capabilities. The mobile station stops the reception of the session(s) that does (do) not fall within the mobile station capabilities with respect to priority, i.e. stops the reception of lower priority sessions.

The mobile station may perform access for the lower (or equal) priority MBMS sessions which were ongoing in the serving cell where the mobile station has not received the MBMS NEIGHBOURING CELL INFORMATION messages while the highest priority MBMS session is ongoing. In this case, the MBMS access is performed in passive mode, i.e. the mobile station notifies the network that the mobile station shall not be counted, but the network may still address and assign the mobile station an MS_ID value, if available and the network wishes to do so. If the capabilities of the mobile station allow, the mobile station may receive all (or some of) the lower (or equal) priority sessions in parallel with the highest priority session.

In the case where the bearer for the highest priority MBMS session is not allocated in the target cell, then the mobile station attempts the above described procedure with the next highest priority MBMS session and stops this process when a bearer is allocated.

Note: the application layer of the mobile station may decide to terminate the reception of any MBMS bearer, e.g. the application layer may terminate the MBMS bearer if a p-t-p repair is initiated and the MBMS bearer is outside the radio access capabilities (e.g. multislot capability) of the mobile station.

5. MBMS channel reconfiguration:

   If a mobile station is receiving multiple MBMS bearers and any of these are reconfigured by the network in a way that does not fall within the radio access capabilities (e.g. multislot capability) of the mobile station, then the mobile station shall continue receiving (one of) the highest priority MBMS session(s) and any other MBMS sessions that fall within the mobile station capabilities.

General Note: If the uplink feedback channels are not allocated within the multislot capabilities of the mobile station, then the mobile station shall select (one of) the highest priority MBMS session(s) with a feedback channel and any other MBMS sessions with feedback channels that then fall within the multislot capabilities.

6.5 Suspension/Resumption of the reception of an MBMS session

In case where a suspension occurs, a mobile station supporting multiple TBFs may retain the radio layer information for the suspended MBMS session until the expiry of the timeout timer that controls the normal operation during MBMS data transfer. The radio layer information is anyway deleted if the mobile station performs a cell reselection or the session duration timer for the suspended MBMS session expires.

When the mobile station returns to packet idle mode (or completes the reception of higher priority MBMS session(s) preventing the mobile station from receiving the suspended MBMS session), if the radio layer information is still available, then the mobile station attempts to resume the reception of the suspended MBMS session, otherwise the mobile station shall perform an MBMS access, according to sub-clause 6.2.2.1.

6.6 Acquisition of system information and paging messages

6.6.1 General

During the MBMS session, the mobile station needs to read system information for the serving cell and be able to receive CS and/or PS paging messages. The acquisition of system information (see sub-clause 6.6.2) and paging messages (see sub-clause 6.6.3) shall be done on (P)BCCH and (P)CCCH or on the PACCH as indicated by the MBMS In-band Signalling Indicator IE included in the MBMS ASSIGNMENT and MBMS NEIGHBOURING CELL INFORMATION messages.

6.6.2 Acquisition of system information

The mobile station reads system information for the serving cell from the (P)BCCH in parallel to the reception of the MBMS radio bearer, unless the network has indicated, by setting the MBMS In-band Signalling Indicator, that system information are sent on the PACCH of the MBMS radio bearer.

6.6.3 Reception of paging messages

The mobile station reads paging messages from the (P)CCCH in parallel to the reception of the MBMS radio bearer, unless the network has indicated, by setting the MBMS In-band Signalling Indicator, that paging messages are sent on the PACCH of the MBMS radio bearer, and the mobile station has received an MS_ID. If a mobile station has not (yet) received an MS_ID on the MBMS radio bearer, and the location of the MBMS radio bearer with respect to the control channels does not allow the mobile station to read the (P)CCCH, the mobile station shall skip the reception of those radio blocks of the MBMS radio bearer that would prevent the monitoring of its paging group on the paging channel(s).

NOTE: If the mobile station is in non-DRX mode period (e.g. during a *routeing area update* procedure) it shall read all the paging occurrences on the (P)CCCH.

The network does not need to send paging messages on the PACCH to a mobile station whose MS_ID has been released due to that the mobile station has not responded when being polled (i.e. T3195 has started for that MS_ID).

If the network sets the MBMS In-band Signalling Indicator, MBMS notifications are also sent on the PACCH.

7 Mobile Station requirements

7.1 General requirements

An MBMS capable mobile station shall be able to receive at least one MBMS service. The mobile station shall also be able to receive multiple services if they are transmitted on the same carrier (provided that the MBMS multislot capabilities of the mobile station are not exceeded). The simultaneous reception of multiple services on different carriers shall be dependent upon mobile station capabilities.

A mobile station receiving an MBMS p-t-m transmission shall be in *broadcast/multicast receive mode*. This state is defined only for the mobile station; from the network's point of view, the mobile station shall be in packet idle mode. However, if the network has indicated in the assignment message that the mobile station does not need to listen to the (P)CCCH and (P)BCCH in parallel to the MBMS data, and the mobile station has an MS_ID on that MBMS radio bearer, the network needs to keep track of such mobile station listening to that MBMS radio bearer in order to send CS and/or PS paging messages on the PACCH/D.

Unless the network has indicated in the assignment message that the mobile station does not need to listen to the (P)BCCH and (P)CCCH in parallel to the MBMS data, the mobile station shall, in parallel to the MBMS data, read system information for the serving cell from the broadcast control channel and CS and/or PS paging messages from its paging group on the paging channel(s) allocated in the cell. Reading system information and paging messages takes precedence over listening to the MBMS session.

NOTE: In case the network does not provide system information and paging messages on the PACCH, the location of the MBMS bearer with respect to the control channels should be chosen such that it will be possible for the mobile station to read all the PDCHs of the MBMS radio bearer while monitoring the control channels.

A mobile station receiving MBMS shall operate in Network Control mode NC0 (see 3GPP TS 45.008 [9]) even if it had been commanded otherwise by the network. If in GMM-Ready state, the mobile station shall move to NC0 upon the start of the MBMS session. Upon termination of the MBMS session, the mobile station shall revert to the control mode commanded by the network before the start of the MBMS session if the mobile station is still in GMM-Ready state.

7.2 Mobile Station tasks

When in broadcast/multicast receive mode, the requirements for monitoring the received signal level of neighbouring cells shall be the same as those for packet idle mode (see 3GPP TS 45.008 [9]). For the reconfirmation of the BSIC of neighbouring cells, however, the requirements for packet transfer mode shall apply (see 3GPP TS 45.008 [9]).

If the PBCCH is not present in the serving cell, a mobile station in broadcast/multicast receive mode shall not attempt to decode the BCCH data block that contains the parameters affecting cell reselection for non-serving cells that have been provided by the System Information (see 3GPP TS 45.008 [9]). Instead, this information shall be provided by the serving cell either on BCCH or on PACCH.

The behaviour of the MS which does not receive in time or does not receive at all this information is defined in 3GPP TS 43.022 [10].

Mobile stations in broadcast/multicast receive mode shall obey the intra-RAT and inter-RAT cell reselection algorithms defined for the GMM Ready state (see3GPP TS 45.008).

A mobile station in broadcast/multicast receive mode shall be able to respond to a PACKET POLLING REQUEST message as defined in 3GPP TS 44.060 when addressed with its TLLI. It shall also be able to receive a PACKET POWER CONTROL/TIMING ADVANCE message and act accordingly (see 3GPP TS 44.060).

7.3 Multislot capabilities

The multislot capability of an MBMS capable mobile station shall be such that the mobile station is capable of receiving on up to 5 timeslots per frame and the timeslots shall be assigned within a window of maximum size Rx=6.

An MBMS capable mobile station shall be capable of receiving MBMS:

- on up to 4 timeslots simultaneously, if the MS must listen to the (P)BCCH and (P)CCCH in addition to the timeslots assigned for MBMS data transfer; or
- on up to 5 timeslots simultaneously, if PBCCH/PCCCH is mapped on one of the PDCHs assigned to the MBMS session and the number of timeslots assigned to the PCCCH is equal to one; or
- on up to 5 timeslots simultaneously, if the network transmits system information and paging messages on the PACCH of the MBMS radio bearer.

NOTE: The downlink timeslots could be used to receive multiple MBMS sessions in parallel (see subclause 6.4).

If data transfer is with ARQ (see subclause 6.3), the mobile station shall additionally be capable of transmitting on up to two timeslots. The number of timeslots allocated for the reception of MBMS (*m*) and the number of timeslots allocated for transmission (*n*) shall be such that the sum of *m* and *n* does not exceed 6 (5 in case the mobile station needs to listen to the (P)BCCH and (P)CCCH in addition to the timeslots assigned for MBMS data transfer).

Regardless of the data transfer method, the mobile station shall additionally be capable of reading the (P)BCCH and the (P)CCCH on up to one additional timeslot in those frames where the mobile station is required to read the (packet) broadcast control channel or the (packet) common control channel. The network can however indicate in the assignment message that the mobile station will receive system information and CS and/or PS paging messages on the PACCH/D of the MBMS radio bearer. In that case, the mobile station shall not listen to the (P)BCCH and the (P)CCCH in parallel to the MBMS data (see sub-clause 6.6).

NOTE: This will be possible without interrupting the reception of MBMS only if allowed by the relative location of the (packet) control channels and of the MBMS traffic channel and depending on the number of timeslots allocated to MBMS (see Annex B), unless system information for the serving cell and CS and/or PS paging messages are transferred on the PACCH/D.

If the number of timeslots allocated to the (P)CCCH is higher than one, the number of timeslots on which MBMS can be received may be reduced.

7.4 MBMS notification for mobile stations in dedicated mode or packet transfer mode or dual transfer mode

A mobile station in class A mode of operation which supports the MBMS feature and requires notification of commencing MBMS sessions during dedicated mode operation shall perform the service information sending procedure:

- at the earliest opportunity after the early Classmark sending procedure and any DTM related signalling, if and only if the dedicated mode MBMS notification feature is supported in the cell; or
- if the P-TMSI of the MS is reallocated during the CS connection and the dedicated mode MBMS notification feature is supported in the cell; or

- on the main DCCH of a target cell after successfully completing the handover procedure, if indicated to do so in the HANDOVER COMMAND message and the dedicated mode MBMS notification feature is supported in the target cell.

8 Network requirements

8.1 General requirements

In a network providing MBMS services, the support of the PBCCH is not mandatory.

If the PBCCH is not present in a cell, the network shall provide the parameters affecting cell reselection towards neighbouring cells either on BCCH or on the PACCH.

For each session in a given cell, the network may provide MBMS neighbouring cell information as described in sub-clause 6.2.1.

If the PBCCH is allocated, the support of NMO I is mandatory.

NOTE: If NMO III is used, the mobile station may need to interrupt the reception of MBMS to listen to CS paging messages.

The network may transmit an MBMS session on up to 4 timeslots, regardless of whether data transfer is with or without ARQ (see subclause 6.3).

8.2 MBMS notification for mobile stations in dedicated mode or packet transfer mode or dual transfer mode

The network indicates whether the network supports the Dedicated MBMS Notification mechanism and therefore whether the mobile stations are allowed to send the SERVICE INFORMATION message or include information in the GPRS SUSPENSION REQUEST message being sent to the network on the main DCCH.

The network may notify a mobile station that has requested to be notified on the main DCCH of starting MBMS sessions when in dedicated mode or MAC-Dedicated state, using the MBMS ANNOUNCEMENT message.

The network may inform a mobile station in the HANDOVER COMMAND message that a mobile station after completing the Handover procedure should re-request the network to send notifications on the main DCCH for starting MBMS sessions, if previously requested.

Note: The network should ensure that any transmissions of the MBMS ANNOUNCEMENT message, for the purpose of notifying the mobile station of the start of an MBMS session, are only sent to mobile stations that joined that MBMS session.

Annex A (normative): Requirements and recommendations

A.1 General requirements and recommendations

A.1.1 General requirements

1. MBMS shall utilise the radio resource in an efficient manner.

2. MBMS data transfer shall be downlink only.

3. The reception of MBMS data blocks in p-t-m is not guaranteed at the GERAN level. MBMS does not support individual retransmissions at the radio link layer. This does not preclude the periodic repetitions of the MBMS content based on operator or content provider scheduling or retransmissions based on feedback at the radio level and/or at the application level.

4. Simultaneous reception of MBMS and non-MBMS services shall be possible and shall depend upon mobile station capabilities.

5. Simultaneous transmission of more than one MBMS service shall be possible and the reception shall depend upon mobile station capabilities.

6. Mobile station controlled "service based" cell selection/reselection shall not be permitted.

7. A mechanism to enable the network to move MBMS subscribers, in an MBMS session, between RATs and cells is required.

8. Supported QoS attributes shall be the same for MBMS Multicast and Broadcast modes.

9. During MBMS data transmission it shall be possible to page a given mobile station, irrespective of the RRC state / RR mode of operation.

10. The MBMS Notification procedure shall be used to indicate the start (and potentially about the ongoing) of MBMS data transmission in the cell.

    10.a. The mobile station shall return to DRX mode (if it was in DRX mode before receiving the notification) in case no bearer establishment for that particular session has been received before a given time. A maximum time limit needs to be defined on the network side between notification and bearer establishment.

    10.b. The mobile station shall disregard a notification for which no bearer establishment has been received before a given time

    10.c. Mobile station reaction upon notification must be done on a session basis, in which case means must exist to distinguish in the network the mobile station responses per session

    10.d. Due to capacity reasons, GERAN shall be able in any particular cell within the service area, not to notify the session start of a given session hence not to transfer this session at all

11. A mechanism shall be defined to enable the network to start the MBMS data transmission for a multicast session in a cell if there is at least one user joined to this multicast session in the cell.

12. A mechanism shall be defined to allow the network to stop the MBMS data transmission for a given multicast session in a cell which does not contain any MBMS mobile station joined to this multicast session.

13. Continuing the acquisition of a given MBMS service after cell change within the MBMS service area shall be possible.

A.1.2 General recommendations

1. MBMS should maximise the reuse of existing channels.
2. The GERAN should provide mechanisms to reduce the MBMS outage for a mobile station at cell change.
3. Header compression should be supported.

A.2 Mobile Station requirements and recommendations

A.2.1 Mobile Station requirements

1. During an MBMS session the mobile station shall be able to listen to the required paging channel(s), unless the network has indicated that the paging messages are sent on the PACCH/D of that MBMS session and the mobile station has received an MS_ID.

A.2.2 Mobile Station recommendations

No recommendations for the mobile station have been identified.

A.3 GERAN requirements and recommendations

A.3.1 GERAN requirements

1. The procedure for MBMS mobile station multicast activation (Joining) shall be transparent to the GERAN.
2. The MBMS Notification procedure shall be performed within the MBMS service area.
3. MBMS shall not prevent support for SGSN in pool.
4. MBMS shall allow for efficient mobile station power consumption.

A.3.1 GERAN recommendations

1. MBMS charging should be transparent to the GERAN.

Annex B (informative): Physical channel allocation scenarios

In this Annex, the maximum number of timeslots that can be received by an MBMS capable mobile station in different scenarios is investigated. This investigation is useful in the case of the reception of multiple sessions. The maximum number of timeslots that an MBMS session can be transmitted upon is 4. When transmitting multiple sessions on the same carrier, the network can choose one of the options in subclause 6.4.1; depending on the number of timeslots allocated to each session and which of the options in subclause 6.4.1 is chosen, the mobile station may or may not be able to listen to more than one session in parallel.

Only the cases where the mobile station needs to listen to the (P)CCCH and (P)BCCH in parallel to the MBMS data are analysed in this Annex. The analysis is carried out under the assumption that the mobile station is able to read both the (packet) broadcast control channel and the (packet) common control channel without having to interrupt the reception of MBMS and the transmission on the uplink feedback channel, if established. Additionally, in all the scenarios the maximum number of timeslots is calculated assuming that both the (P)BCCH and the (P)CCCH are located on only one timeslot; if this assumption is not satisfied (i.e. additional timeslots are used for (P)CCCH), the number of timeslots that MBMS can be received upon will be reduced.

Throughout the Annex, the maximum number of timeslots for each scenario is calculated assuming that the mobile station capabilities require $T_{tb} = 1$ and $T_{ra} = 1$ (see 3GPP TS 45.002 [8]).

NOTE: Due to the fact that $T_{ra} = 1$, neighbour cell measurements are not indicated in the figures.

The maximum number of timeslots will depend on whether an uplink feedback channel per MBMS session is established or not (see subclause 6.3). In case where an uplink feedback channel per MBMS session is established, for simplicity reasons in the following it is assumed that (any of) the uplink feedback channel(s) is(are) established on the same uplink timeslot.

The material in this Annex is not meant to provide an exhaustive analysis but only to give some general guidance.

B.1 Data transfer when no uplink feedback channel is established

B.1.1 PBCCH not deployed, transmission with frequency hopping

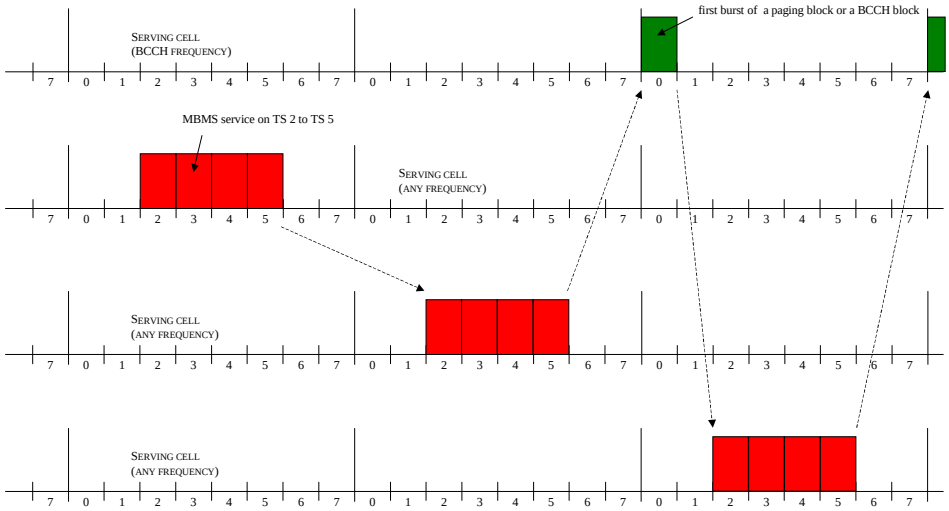


Figure B.1

Figure B.1 shows that it is possible to have the simultaneous reception of paging or broadcast channel and MBMS data if MBMS sessions are received on up to 4 timeslots.

NOTE: In this scenario, it would be possible to receive multiple MBMS sessions on up to 5 timeslots, still meeting the requirement of T_{ra} = 1; however, this exceeds the required multislot capabilities of an MBMS capable mobile station.

It is assumed that channel combination iv (BCCH+CCCH+FCCH+SCH) is allocated on TN 0 of the BCCH carrier. If the CCCH is located on other timeslots in addition to timeslot 0, the number of timeslots that MBMS can be received on is reduced. For example, if a second timeslot is allocated to the CCCH (i.e. BS_CC_CHANS = 2), then it necessarily has to be timeslot 2 (see 3GPP TS 45.002 [8]). Therefore only timeslots 4, 5 and 6 can be used for the transmission of MBMS, and the maximum number of timeslots is reduced to 3.

B.1.2 PBCCH not deployed, transmission without frequency hopping

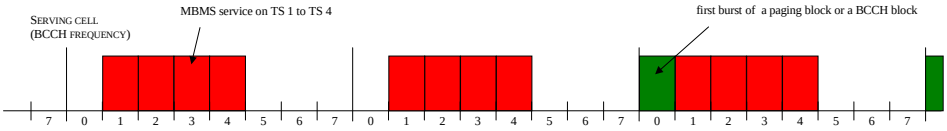


Figure B.2

Figure B.2 shows that in this scenario the maximum number of timeslots that one or more MBMS sessions can be received upon is 4.

NOTE: It would be possible to receive multiple MBMS sessions on up to 6 timeslots, still meeting the requirement of T_{ra} = 1, but this exceeds the required multislot capabilities of an MBMS capable mobile station.

B.1.3 PBCCH deployed, transmission with frequency hopping

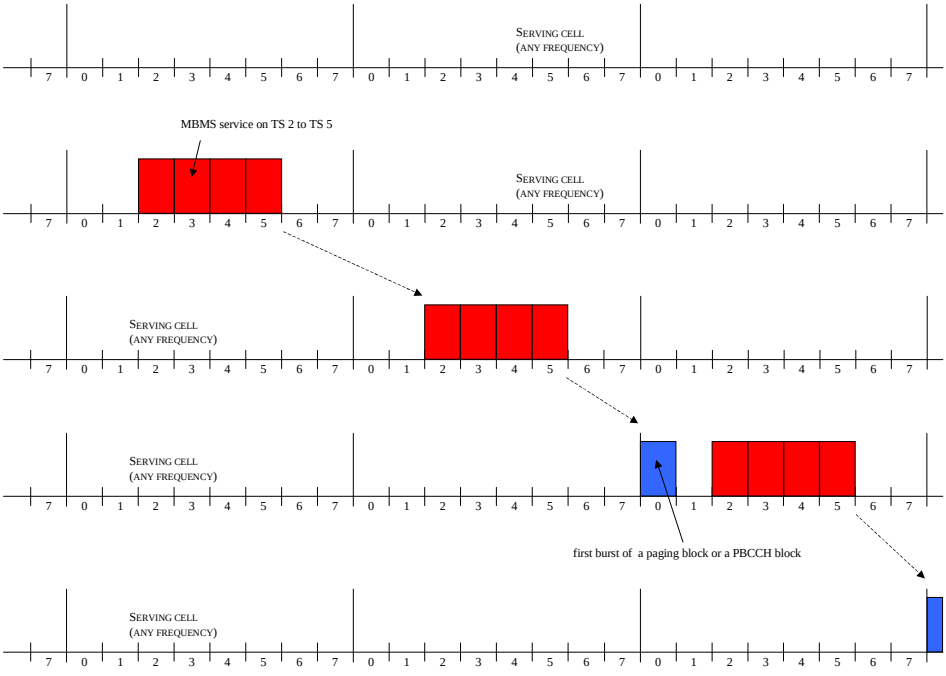


Figure B.3

Figure B.3 shows that in this scenario the maximum number of timeslots that one or more MBMS sessions can be received upon is 4.

NOTE 1: It would be possible to receive multiple MBMS sessions on up to 6 timeslots, still meeting the requirement of T_{ra} = 1, but this exceeds the required multislot capabilities of an MBMS capable mobile station.

It is assumed that channel combination xi (PBCCH+PCCCH+PDTCH/F+PACCH/F+PTCCH/F) is present on TN 0 and that all the PCCCH blocks are located on the same timeslot as the PBCCH (i.e. no PCCCH blocks are located on other timeslots).

NOTE 2: As paging coordination is mandatory in the network for MBMS, the mobile station does not need to read the BCCH and the CCCH.

It is also assumed that both the PBCCH and the MBMS traffic channels use frequency hopping, that the hopping pattern is the same and that, in every frame, the PBCCH and the MBMS traffic channels are transmitted on the same frequency. If the hopping pattern is not the same, the maximum number of timeslots that one or more MBMS sessions can be received upon is still 4.

B.2 Data transfer when an uplink feedback channel is established

B.2.1 PBCCH not deployed, transmission with frequency hopping

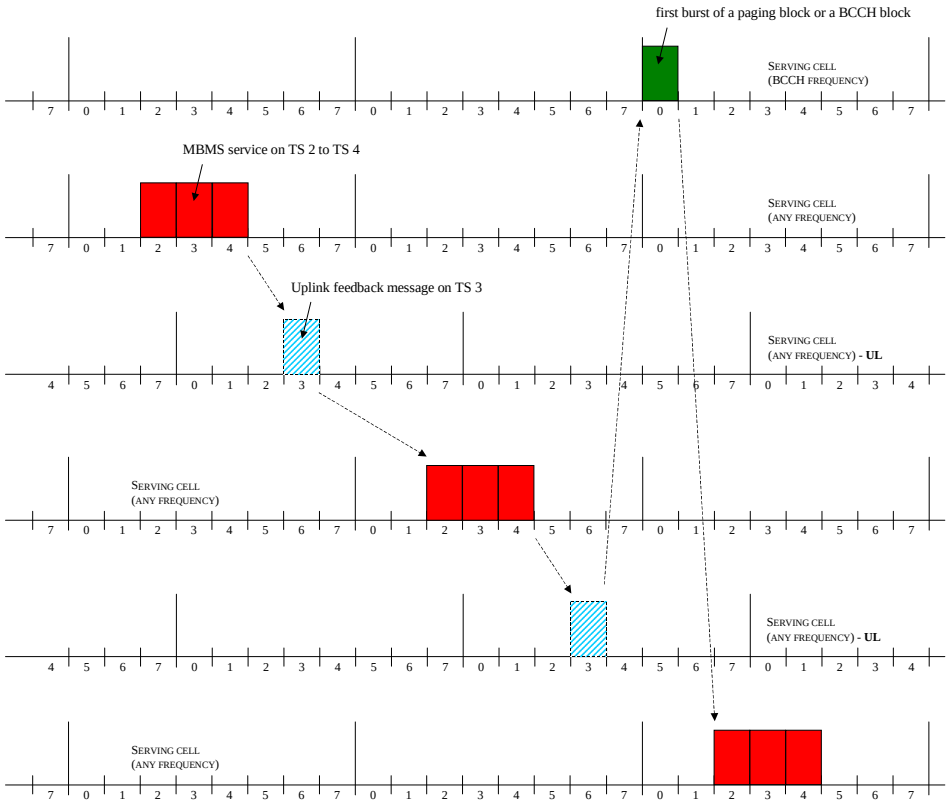


Figure B.4

In this configuration, it is assumed that the BCCH and the CCCH are located on timeslot 0 (with no additional timeslots assigned to CCCH). As shown in Figure B.4, the mobile station is able to transmit also when the BCCH or the CCCH need to be read, if one or more MBMS sessions are received on up to 3 timeslots.

NOTE 1: If in a frame the MS needs to read the BCCH or CCCH and transmit on the uplink, the MS will need to perform three switchings within that frame.

NOTE 2: After receving a (pre-)notification for a new session while listening to an ongoing session, the mobile station enters non-DRX mode and listens to all the paging blocks on the CCCH to receive a(n) (notification)assignment. As the time elapsing until the assignment received on the mobile station side (see subclauses 6.1.1.2, 6.1.1.3, 6.1.1.4) could last for a considerable length of time (up to the value of T3214, which is equal to 60 seconds, see 3GPP TS 44.018 and 3GPP TS 44.060), the worst case is in those frames where the mobile station is required to: read 1 timeslot for BCCH or CCCH, use 1 timeslot for switching from the reception of BCCH/CCCH to the reception of MBMS, read 3 timeslots for MBMS and transmit on 1 timeslot to send feedback. In this scenario the sum of RX and TX is equal to 6; this leaves only 2 timeslots for switching. As the mobile station needs to be able to perform neighbour cell measurements during these periods, it follows that T_{tb} = 1 and T_{ra} = 1.

B.2.2 PBCCH not deployed, transmission without frequency hopping

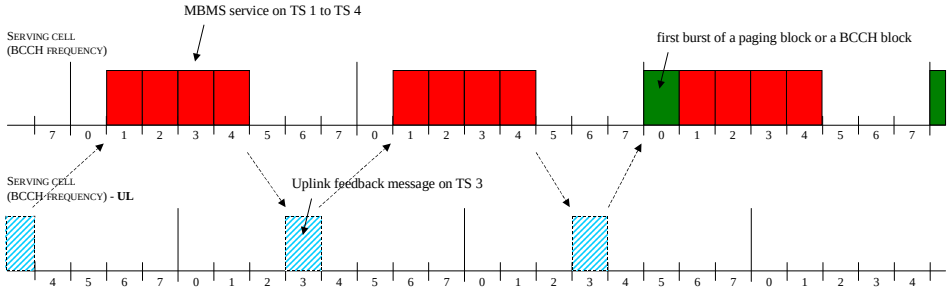


Figure B.5

In this scenario, the maximum number of timeslots that one or more MBMS sessions can be received upon is 4. This assumes that both the BCCH and the CCCH are located on timeslot 0.

NOTE: After receving a (pre-)notification for a new session while listening to an ongoing session, the mobile station enters non-DRX mode and listens to all the paging blocks on the CCCH to receive a(n) (notification)assignment. As the time elapsing until the assignment received on the mobile station side (see subclauses 6.1.1.2, 6.1.1.3, 6.1.1.4) could last for a considerable length of time (up to the value of T3214, which is equal to 60 seconds, see 3GPP TS 44.018 and 3GPP TS 44.060), the worst case is in those frames where the mobile station is required to: read 1 timeslot for BCCH or CCCH, read 4 timeslots for MBMS and transmit on 1 timeslot to send feedback. In this scenario the sum of RX and TX is equal to 6; this leaves only 2 timeslots for switching. As the mobile station needs to be able to perform neighbour cell measurements during these periods, it follows that T_{tb} = 1 and T_{ra} = 1.

B.2.3 PBCCH deployed, transmission with frequency hopping

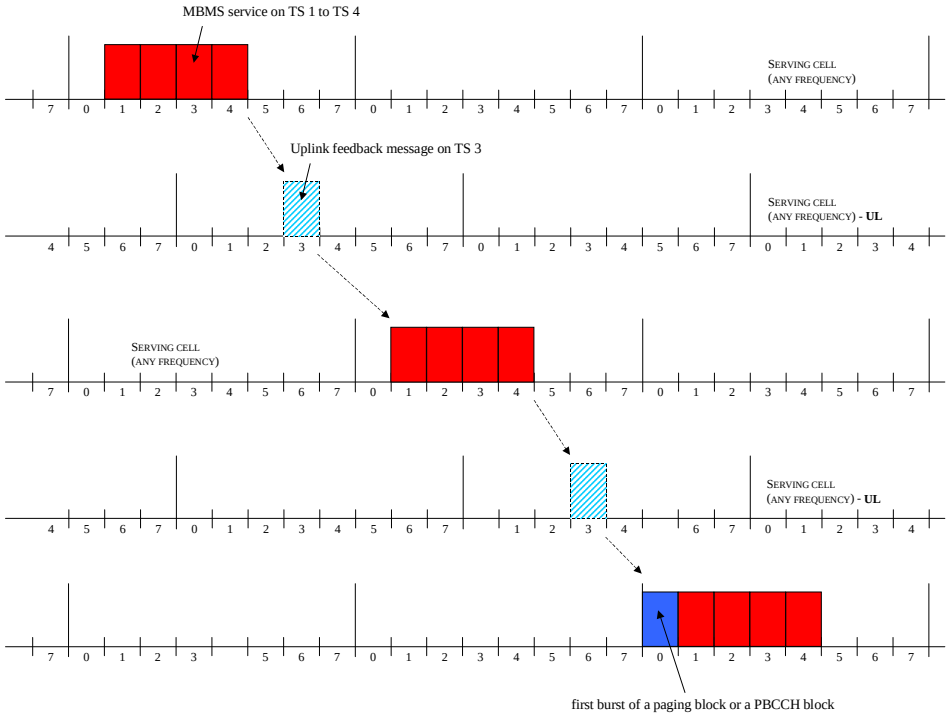


Figure B.6

Figure B.6 shows that in this scenario the maximum number of timeslots that one or more MBMS sessions can be received upon is 4.

It is assumed that the PBCCH and the PCCCH are located on a single timeslot. If the PCCCH is transmitted on more than one timeslot, then the number of timeslots that one or more MBMS sessions can be received upon is reduced accordingly.

NOTE 1: As paging coordination is mandatory in the network for MBMS, the mobile station does not need to read the BCCH and the CCCH.

NOTE 2: After receving a (pre-)notification for a new session while listening to an ongoing session, the mobile station enters non-DRX mode and listens to all the paging blocks on the PCCCH to receive a(n) (notification)assignment. As the time elapsing until the assignment received on the mobile station side (see subclauses 6.1.1.2, 6.1.1.3, 6.1.1.4) could last for a considerable length of time (up to the value of T3214, which is equal to 60 seconds, see 3GPP TS 44.060), the worst case is in those frames where the mobile station is required to: read 1 timeslot for PBCCH or PCCCH, read 4 timeslots for MBMS and transmit on 1 timeslot to send feedback. In this scenario the sum of RX and TX is equal to 6; this leaves only 2 timeslots for switching. As the mobile station needs to be able to perform neighbour cell measurements during these periods, it follows that $T_{tb} = 1$ and $T_{ra} = 1$.

It is also assumed that both the PBCCH and the MBMS traffic channels use frequency hopping, that the hopping pattern is the same and that, in every frame, the PBCCH and the MBMS traffic channels are transmitted on the same frequency. If the hopping pattern is not the same, the maximum number of timeslots that multiple MBMS sessions can be received upon is reduced to 3.

NOTE 3: If the hopping pattern is not the same and in a frame the MS needs to read the PBCCH or PCCCH and transmit on the uplink, the MS will need to perform three switchings within that frame.

Annex C (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2004-08	GP-21	GP-042241			Approved for Release 6		6.0.0
2004-11	GP-22	GP-042782	001	1	MBMS cell reselection	6.0.0	6.1.0
2004-11	GP-22	GP-042800	002	1	Definition of MPRACH	6.0.0	6.1.0
2004-11	GP-22	GP-042778	003	1	Clarification on RLC protocol behaviour	6.0.0	6.1.0
2004-11	GP-22	GP-042801	004	2	Editorial corrections	6.0.0	6.1.0
2004-11	GP-22	GP-042908	007	3	Suspension & Resumption of the reception of an MBMS session	6.0.0	6.1.0
2004-11	GP-22	GP-042566	008		Addition of flexible reconfiguration for MBMS_BEARER_ID and MS_ID	6.0.0	6.1.0
2004-11	GP-22	GP-042678	009	1	Addition of reception of multiple sessions	6.0.0	6.1.0
2004-11	GP-22	GP-042679	010	1	Addition of the cause indication whereby an MBMS p-t-m bearer is not established in a cell inside the MBMS ASSIGNMENT message	6.0.0	6.1.0
2004-11	GP-22	GP-042805	011	1	Prioritzing MBMS Neighbouring Cell Information	6.0.0	6.1.0
2004-11	GP-22	GP-042807	012	1	Introduction of prenotification	6.0.0	6.1.0
2004-11	GP-22	GP-042681	013	1	Modifications to description of MBMS Channels	6.0.0	6.1.0
2004-11	GP-22	GP-042898	014	3	Use of the MBMS NEIGHBOURING CELL INFORMATION message	6.0.0	6.1.0
2004-11	GP-22	GP-042896	015	2	MBMS notification for MS in packet transfer mode	6.0.0	6.1.0
2004-11	GP-22	GP-042897	016	2	MBMS notification for MS in dedicated mode	6.0.0	6.1.0
2005-01	GP-23	GP-050309	019		Repeated notifications of an ongoing session	6.1.0	6.2.0
2005-01	GP-23	GP-050310	020		Definition of when MBMS ASSIGNMENT is a distribution or non-distribution message	6.1.0	6.2.0
2005-01	GP-23	GP-050438	021	1	Update of sub-clause 6.1.1.3	6.1.0	6.2.0
2005-01	GP-23	GP-050439	022	1	Access limitation definitions	6.1.0	6.2.0
2005-01	GP-23	GP-050369	023		Deletion of MS ID	6.1.0	6.2.0
2005-01	GP-23	GP-050598	024	2	Clean-up to the MBMS stage 2	6.1.0	6.2.0
2005-01	GP-23	GP-050564	025		Corrections related to cell reselection	6.1.0	6.2.0
2005-04	GP-24	GP-050985	026	1	Clarification of usage of ARQ and block repetition	6.2.0	6.3.0
2005-04	GP-24	GP-050634	027		Removal of multiple MBMS radio bearers per MBMS service per cell	6.2.0	6.3.0
2005-04	GP-24	GP-050988	028	1	Align Resource Management Procedure with Stage 3	6.2.0	6.3.0
2005-04	GP-24	GP-050891	029		Clarification of PACKET POLLING REQUEST message in MBMS broadcast/multicast mode	6.2.0	6.3.0
2005-04	GP-24	GP-051128	030	2	MBMS notification for MSs in dedicated mode	6.2.0	6.3.0
2005-06	GP-25	GP-051359	031		Clarification to counting requirement for higher priority MBMS sessions during multiple sessions	6.3.0	6.4.0
2005-06	GP-25	GP-051677	032	1	Clarification of the session duration timer	6.3.0	6.4.0
2005-06	GP-25	GP-051493	033		Corrections to Annex B	6.3.0	6.4.0
2005-09	GP-26	GP-052235	0034	2	Introduction of MBMS DOWNLINK ACK/NACK message	6.4.0	6.5.0
2005-09	GP-26	GP-052232	0035	1	Introduction of ARP for MBMS	6.4.0	6.5.0
2005-11	GP-27	GP-052461	0036		Correction to MBMS notification for mobile stations in DTM or MAC-DTM state	6.5.0	6.6.0
2005-11	GP-27	GP-052462	0037		Correction to passive mode	6.5.0	6.6.0
2005-11	GP-27	GP-052878	0038	3	MBMS Transfer Mode	6.5.0	6.6.0
2006-04	GP-29	GP-060710	0040		Correction to reconfiguration for an MBMS radio bearer	6.6.0	6.7.0
2006-04	GP-29	GP-060858	0043	1	Clarification for T3195	6.6.0	6.7.0
2006-04	GP-29	GP-060777	0039	2	MBMS cell reselection enhancement	6.7.0	7.0.0
2006-06	GP-30	GP-061337	0045	1	Correction to MS_ID release procedure	7.0.0	7.1.0
2006-09	GP-31	GP-061864	0047	2	Differentiation of the MBMS multislot capability requirements	7.1.0	7.2.0
2006-09	GP-31	GP-061762	0049	1	Correction to the MBMS assignment on the CCCH	7.1.0	7.2.0
2006-11	GP-32	GP-062099	0050		Introduction of the MBMS Session Update procedure	7.2.0	7.3.0

2006-11	GP-32	GP-062412	0052	2	Introduction of NPM Transfer Time	7.2.0	7.3.0
2008-12	GP-40				Version for Release 8	7.3.0	8.0.0

History

Document history		
V8.0.0	February 2009	Publication