Upper Layers / L1 GPRS interface
Packet Transfer mode

L1M_GS081-1

Ver 2.0

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Department: Application Specific Product / Wireless Communications System

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HISTORY

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Ver: 0.2	04/12/99	A. VALLAURI	2
Ver: 0.3	04/12/99	A. VALLAURI	3
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Ver 1.8	27 Aug 02	F.Olivero	18
Ver 1.9	02 June 03	T.Garcia	19
Ver 1.10	21 August 03	P.Gounot	20
Ver 1.11	20 Feb 03	Fady Labib	21
Ver 2.0	16 Mar 03	Fady Labib	22

NOTES :

1. **Creation.**
   This document is a temporary version that will be included in S921.doc final document.

2. **Updated with comments from meeting of April 29/30.**
   New message "MPHP_ASSIGNMENT_REQ" which replaces all previous assignment messages.
   New message "MPHP_REPEAT_UL_FIXED_ALLOC_REQ" to indicate when a fixed allocation of an UL TBF must be repeated.
   New message "MPHP_SINGLE_BLOCK_REQ" to either perform the 2nd phase of a 2 phase access or to transfer one block without TBF establishment (Measurement Report).
   Addition of the RLC/MAC-S data interface, and the SW structure block diagram.

3. **Updated with comments from meeting of June 08.**
   Added reference to S922 (basically for radio_freq definition).
   Corrected "global software structure" figure.
   Changed any T_TBF_STI structure to carry the absolute FN instead of the coded one.

Moved MAC_MODE out of T_UL_RESSOURCE_ALLOC structure.
UPLINK_TIMESLOT_ALLOCATION has been removed from T_UL_RESSOURCE_ALLOC structure since this information is redundant with ALLOCATION_BITMAP (for fixed allocation) and USF_TABLE (for dynamic allocation).
Corrected Uplink_TFI range from 0-127 to 0-31.
Restricted T_ MPHP_REPEAT_UL_FIXED_ALLOC_REQ to REPEAT_ALLOCATION, TS_OVERRIDE and TBF_ABSOLUTE_STI.
Removed "to clarify" within note for Packet PDCH Release.

4. **Updated with comments from meeting of June 29 (Power control part only).**
   Introduced a new set of messages: MPHP_UPDATE_PSI_PARAM_REQ/CON.
   New interface for CR measurement in Transfer mode.
   Rename MPHP_POWER_CONTROL_TIMING_ADVANCE_REQ/CON messages into MPHP_TIMING_ADVANCE_REQ/CON.

5. **Updated with comments from meeting of June 8 and June 29**
   Modification of the RLC_UPLINK and RLC_DOWNLINK interface to reduce the MCU CPU load and to handle potential polling priority issues. Changed the type of the parameters of these functions (UWORD16 changed to API, WORD16 changed to API_SIGNED)
   UPLINK_TIMESLOT_ALLOCATION has been restored. It is needed in dynamic allocation, and can be derived from the allocation bitmap in fixed allocation (but this increase the L1 complexity).
   Modification of the TBF release message.
   Removed the uncertainty concerning the REPEAT FIXED ALLOCATION.
   Removed POWER CONTROL parameter from T_MPHP_SINGLE_BLOCK_REQ message type.
   Clarified the cell reselection measurement in Transfer mode.
   Added new interface for Transmit Power control and upgraded accordingly the global software structure block diagram.
   Modified frequency parameter structure to be compatible with GSM circuit switched dedicated mode.

6. **Modification of the RLC_UPLINK and RLC_DOWNLINK parameter**
   §12 Modification of CS_TYPE coding scheme. Addition of TFI and CRC error flags.

7 **Reviewed the interface to support RXQUAL, Power transmission, AGC, Single block downlink**
   §3 Added a ASSIGNEMENT_ID in the assignment message Added P0, BTS_PWR_CTL, PR_MODE in assignment message to support downlink power control. Mentioned, when the MPHP_ASSIGNMENT_CON is sent. Type of RF_CHAN_CNT element (part of FREQUENCY_LIST structure) is UWORD16 and not UWORD8.
   §5 Added a ASSIGNEMENT_ID in the assignment message. Added P0, BTS_PWR_CTL, PR_MODE in assignment message to support downlink power control Supports of the single block downlink. Explained how the L1 control the output power. Type of RF_CHAN_CNT element (part of FREQUENCY_LIST structure) is UWORD16 and not UWORD8.
   §8 Radio frequencies are UWORD16 and not UWORD8.
   §10 Added MPHP_CR_MEAS_STOP_REQ, MPHP_CR_MEAS_STOP_CON
   §11 Modification of the maca_power_control parameters to compute BL_VAR, clarified the definition of receive_level_sample.
   §12 Modification of the RLC_DOWNLINK interface to report d_nerr, d_macc. Modification of RLC_UPLINK interface to mention to RLC layer when a valid TA has been detected- Added BYTE_SHIFT control bit to optimize MCU byte manipulation. Removed RLC_REQUEST_ID and renamed RLC_LAST_SENT_ID by RLC_BLOCKS_SENT.

8 Includes modification related to Neighbour Measurement in Packet Transfer. Add 2 Note, in order to explain that start ant stop of the Neighbour Measurement process is implicit. No L3 messages are requested.

9 **Section 13**: Correction of the rlc_downlink prototype, clarification of TFI filtering and clarification of rlc_downlink function call.

Creation of **section 12**: co-channel interference measurements in packet transfer mode

Added the 'interf_meas_enable' parameter in the MPHP_ASSIGNMENT_REQ message (section 3)

Section 5: Defined "dl_error_flag" parameter in MPHP_SINGLE_BLOCK_CON message. Defined MPHP_STOP_SINGLE_BLOCK_REQ and MPHP_STOP_SINGLE_BLOCK messages.

Section 10: Note1 detailed, in order to explain that when TCR meas process is started implicitly by L1, the BA(GPRS) list used is the current BA list present in L1, i.e. BA(GPRS) list passed in Packet Idle or BA list given in Circuit Switched mode. Add **Note3** to explain that "none reporting message is sent to L3 on receipt of a MPHP_TCR_MEAS_STOP_REQ message or on release of all TBF". Add **Note4** to specify that MPHP_TCR_MEAS_STOP_REQ message, is mainly used for debug from the fact that this message stops the Neighbour measurements in Packet Transfer for ever.

Section 11: Paragraph dedicated to Uplink Transmit Power re-worked.

Added ASSIGNMENT_ID field in the following messages: MPHP_ASSIGNMENT_CON, MPHP_SINGLE_BLOCK_CON, MPHP_PDCH_RELEASE_REQ/CON and MPHP_TIMING_ADVANCE_REQ/CON

Section **7**: Added several notes about the PDCH Release message: mechanism to know which TBF is concerned by the PDCH release and case when all the PDCH of a TBF are released.

Section **6**: Added a note about the pending TBFs that are released by a TBF release

10. Section **13**: added explanations on the way to use the CS_TYPE field of polling response buffers provided by RLC_UPLINK.

Section **3** and **5**: added a note about P0 parameter setting for downlink power control

11. Section 3: Added a note2 in order to specify that no Assignment Request will be send by L3 if a PACKET DOWNLINK ASSIGNMENT message containing different frequency parameters than those which are currently in effect for the uplink TBF, the mobile station shall ignore the PACKET DOWNLINK ASSIGNMENT message and continue normal operation of the uplink TBF.

12. Section 13: Modifications and explanation of PRACH 8 bits and 11 bits request in packet transfer.
Section 4: Added and corrected explanations of "Repeat fixed allocation".

13. Section 10: Modification the carrier list size of MPHP_CR_MEAS_REQ/IND: size 65 -> 33
14. Section 10: The structure of the MPHP_CR_MEAS_REQ message is modified in order to fit the code (in code this message is the same than MPHP_CR_MEAS_REQ message)
Section 1: update ETSI references
Section 3: Add a **Note3**: TBF Assignment from CCCH and from SDCCH with before STI parameters is handled through 2 consecutive assignments sent L3 to L1.

15. Section 11: Add a comment on the fact that it's a L3 responsibility to answer to maca_power_control() with the correct Downlink Power Control value during the first two call of the establishment of a PDTCH (cf BUG833).

    Sections 3, 5, 9: pc_meas_chan added in MPHP_ASSIGNMENT_REQ, MPHP_SINGLE_BLOCK_REQ. pc_meas_chan removed from MPHP_UPDATE_PSI_PARAM_REQ (BUG852).
    Sections 3, 5, 9: access_burst_type added in MPHP_ASSIGNMENT_REQ, MPHP_SINGLE_BLOCK_REQ and MPHP_UPDATE_PSI_PARAM_REQ (BUG1181).

16. **Section 13:** RLC/ MAC-S interface modification related to BUG1086
17. **Section 10:** REQ1414 correction: the beacon must be included in the BA list used in packet transfer mode when PC_MEAS_CHAN = 1
    Section 13: Corrected poll response block size (13 API instead of 12 API) in the "API organization for uplink RLC/MAC blocks" draw
    Section 25: add TBF_TYPE field in the MPHP_TBF_RELEASE_CON

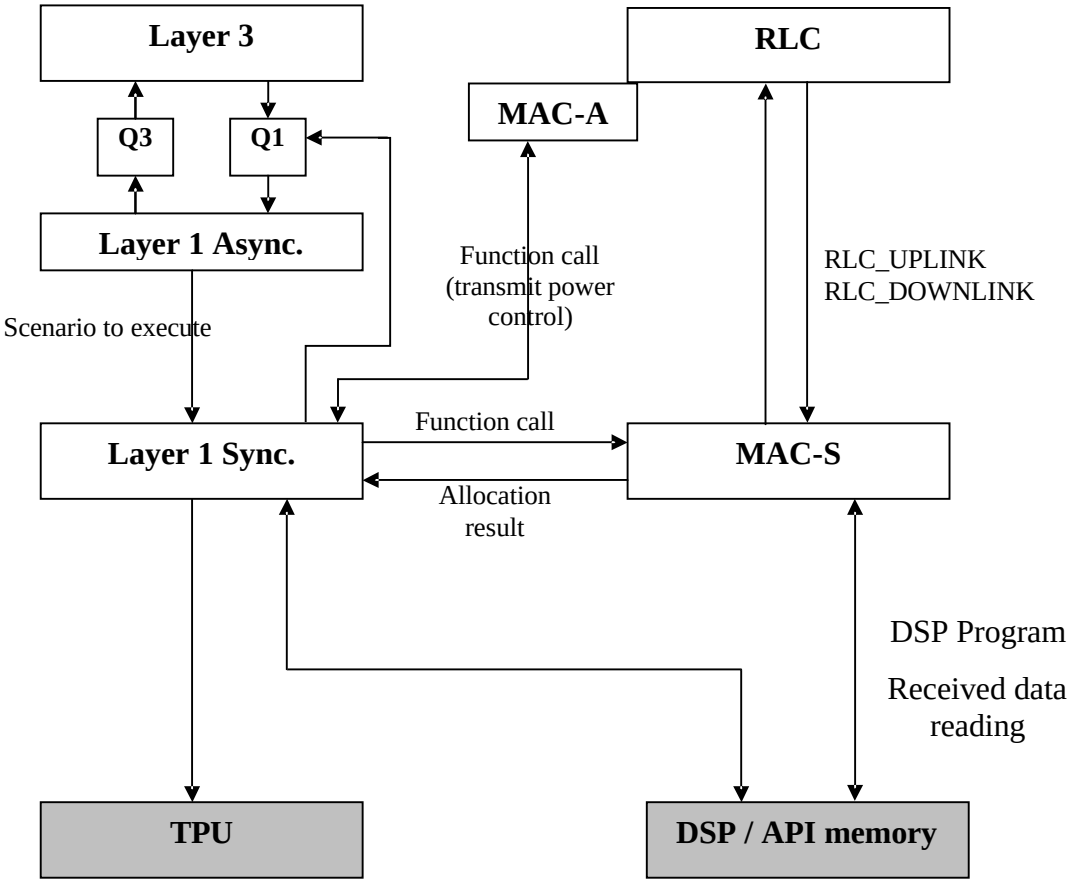
18. **Sections 3 and 8**: Added a note about PTCCH parameters assignment (BUG2437)
19. **Section 5**: Update the single block description (BUG03238)
20. **Section 5**: Update the single block description: description of status field is incorrect (BUG03397)
21. **Section 10 :** Corrected the misprints _CR_ to _TCR_ for packet transfer messages
    Section 11: Removed the old code comment for **bcch_level**
22. Changed the File Path to Match the clearcase location
    Replaced PACKET_TIMING_ADVANCE with T_PACKET_TA to match with the code
    Replaced TBF_STARTING_TIME with T_TBF_STI to match with the code
    Replaced FREQUENCY_PARAMETERS with T_PACKET_FREQ_PARAM to match with the code
    Replaced DYNAMIC_ALLOCATION with T_DYNAMIC_ALLOC to match with the code
    Replaced DL_RESOURCE_ALLOCATION with T_DL_RESSOURCE_ALLOC to match the code
    Replaced UL_RESOURCE_ALLOCATION with T_UL_RESSOURCE_ALLOC to match the code
    Replaced DOWNLINK_POWER_CONTROL with T_DL_POWER_CTL to match the code
    Replaced TIMESLOTS_AVAILABLE with timeslot_available to match the code
    Section 3 : in the Description of T_TBF_STI , Indicated explicitly that Note 2 is for Fixed Allocation.
    Section 6: Added notes about MPHP_TBF_RELEASE_CON with TBF_TYPE =2

Table of Contents

1. Reference documents

GSM 04.60	V6.9.0	Release 1997	(2000-05)
Tdoc SMG2 99-1439	Agenda item 7.1.5.1	Release 1997	SMG2#32- Sept 99
GSM 05.05	V6.7.0	Release 1997	(2000-05)
GSM 05.08	V6.8.0	Release 1997	(2000-05)
S922	V1.11		
S921	V1.10		

2. Global software structure



The communication between the low layer tasks (L1 and MAC-S) and upper layer tasks, designated in the above figure as L3 and RLC uses two main principles: messages exchange and functions call.
The main idea is to use the operating system queues for the signaling information whereas the data flow uses the function call principle.
Only the low layer can program the TPU and DSP hardware blocks. RLC_UPLINK and RLC_DOWNLINK functions are used to request or to report data/control RLC/MAC block to the RLC layer only when the TBF is established in downlink and/or uplink.
In GPRS packet transfer mode, MAC-S is called by Layer 1 at each frame to prepare the TPU scenario and program the DSP for the on going TBF.
When called by the MAC-S, the RLC shall process the request rapidly since MAC-S should return the scenario to L1S and DSP within the frame.

3. Packet Assignment

Due to Packet Uplink Assignment:
This message is sent on the PCCCH or PACCH by the network to the mobile station to assign uplink resources. The mobile station may be addressed by TFI, TQI, or Packet Request Reference depending upon the procedure used. A mobile allocation or reference frequency list received as part of this assignment message shall be valid only for the duration of the TBF to which the assignment relates.

Due to Packet Downlink Assignment:
This message is sent on the PCCCH or PACCH by the network to the mobile station to assign downlink resources to the mobile station.
For a mobile station assigned to operate in the fixed allocation MAC mode, the network may assign regularly repeating intervals during which the mobile station shall measure neighbour cell power levels. A mobile allocation or reference frequency list received as part of this assignment message shall be valid only for the duration of the TBF to which the assignment relates.

Due to Packet Uplink Ack/nack:
This message is sent on the PACCH by the network to the mobile station indicate the status of the received RLC data blocks. This message may also update the timing advance and power control parameters. A fixed allocation mobile station may also be assigned uplink resources.

Due to Packet Timeslot Reconfigure:
This message is sent on the PACCH by the network to the mobile station to assign uplink and/or downlink resources. A mobile allocation or reference frequency list received as part of this assignment message shall be valid only for the duration of the TBF to which the assignment relates.

Direction	Message name	Message Type
L3->L1	**MPHP_ASSIGNMENT_REQ**	**T_ MPHP_ASSIGNMENT_REQ**
L3<-L1	**MPHP_ASSIGNMENT_CON**	**T_MPHP_ASSIGNMENT_CON**

Note:
1. MPHP_ASSIGNMENT_REQ can be updated on fly.
2. MPHP_ASSIGNMENT_CON message is sent by L1 when the TBF starting time is passed, thus the L1 is in Packet Transfer Mode.
3. Switching to Packet Transfer mode and coming from CCCH and from SDCCH (with before STI parameters) has to be done according to the following sequence:
   o Layer 3 sends an MPHP_ASSIGNMENT_REQ with no starting time and containing the frequency parameters for use before the starting time.
   o Layer 3 waits for the MPHP_ASSIGNMENT_CON to be returned by Layer 1.
   o Layer 3 sends a second MPHP_ASSIGNMENT_REQ containing the starting time and the frequency parameters for use after the starting time.
   o Layer 1 will send a second MPHP_ASSIGNMENT_REQ when the starting time is reached.

T_MPHP_ASSIGNMENT_REQ message type

- **ASSIGNMENT_ID**
- **ASSIGNMENT_COMMAND**
- **MULTISLOT_CLASS**
- **INTERF_MEAS_ENABLE**
- **PC_MEAS_CHAN**
- **ACCESS_BURST_TYPE**
- **T_PACKET_TA**
- **T_DL_POWER_CTL**
- **TSC**
- **T_PACKET_FREQ_PARAM**
- **T_TBF_STI**
- **MAC_MODE**
- **T_DL_RESSOURCE_ALLOC**
- **T_UL_RESSOURCE_ALLOC**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment. It is used to refer to the assignment command when needed (i.e. for the power control function, for timing advance updating and for PDCH release).

ASSIGNMENT_COMMAND (UWORD8)
This field specifies the assignment command contained in this message.
0: Downlink Assignment.
1: Uplink Assignment
2: Both Uplink and Downlink Assignments.

MULTISLOT_CLASS (UWORD8)
This fields specify the MS multislot class.
Range 1 to 12 as specified in GSM05.02, Annexe B. (13 to 29 NOT YET SUPPORTED)

INTERF_MEAS_ENABLE (BOOL)
This field permit to enable or not the interference measurements processing during the assigned TBF.
0 Interference measurements disabled
1 Interference measurements enabled

PC_MEAS_CHAN (UWORD8)
This field specifies where the mobile station shall measure the received power level.
0 measurements shall be made on BCCH
1 measurements shall be made on PDCH

ACCESS_BURST_TYPE (BOOL)
The ACCESS_BURST_TYPE field indicates if 8 or 11 bit access burst shall be used on PTCCH/U. The field is coded according to the following table:
0 8 bit access burst shall be used
1 11 bit access burst shall be used

T_PACKET_TA (structure)
The Packet Timing Advance structure describes the timing advance mode and timing advance value assigned to the mobile station. If two different PTCCH parameter sets are available in the case both UL and DL TBF are enabled, it's up to the upper layer to choose the PTCCH set to be used. If the used PTCCH set must then be changed, the upper layer must update PTCCH parameters using MPMP_TIMING_ADVANCE_REQ message (see 8)

TIMING_ADVANCE_VALUE (UWORD8)
If the TIMING_ADVANCE_VALUE value is present, the mobile station shall immediately use the value contained therein. If the TIMING_ADVANCE_VALUE value is not present the mobile station shall use its previous timing advance. If the mobile station does not have a previous timing advance the mobile station shall not transmit until it receives a valid timing advance.
Range 0 to 63.
Value 255 is reserved to indicate "VALUE NOT PRESENT".

TIMING_ADVANCE_INDEX (UWORD8)
If the TIMING_ADVANCE_INDEX and TIMING_ADVANCE_TIMESLOT_NUMBER values are present the mobile station shall immediately begin operation of the Continuous Timing Advance procedure. If these two values are not present the mobile station shall stop operation of the Continuous Timing Advance procedure.
Range 0 to 15.
Value 255 is reserved to indicate "VALUE NOT PRESENT".

TIMING_ADVANCE_TIMESLOT_NUMBER (UWORD8)
This field indicates the timeslot assigned for Continuous Timing Advance operation on the PTCCH.
Range 0 to 7.
Value 255 is reserved to indicate "VALUE NOT PRESENT".

T_DL_POWER_CTL (structure)
Note: P0, BTS_PWR_CTRL_MODE and PR_MODE fields are optional downlink power control parameters. In consequence, a special value is reserved in P0 to indicate the validity of these parameters.

P0 (UWORD8)
This field is a downlink power control parameter. Its meaning is specific to downlink power control modes A and B used by the network, as per GSM 05.08. It is encoded as follows:

Bit 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	P0= 0 dB
0 0 0 0 0 0 0 1	P0= 2 dB
…	
0 0 0 0 1 1 1 1	P0 = 30 dB

Value 255 is reserved to indicate no downlink power control is applied. In such a case, BTS_PWR_CTL_MODE and PR_MODE defined below are not meaningful/considered.

Note: GSM 05.08 section 10.2.2: "Downlink power control can only be used when the serving BCCH and the used PDCH frequencies are in the same frequency band". This condition must be checked by L3 and P0 must be set to 255 if downlink power control cannot be used.

BTS_PWR_CTL_MODE (BOOL)
This field indicates the downlink power control mode used by the network, as defined in GSM 05.08. It is encoded as follows:
0 Mode A (valid in dynamic and fixed allocation)
1 Mode B (valid in fixed allocation only)

PR_MODE (BOOL)
0 PR mode A (for one addressed MS)
1 PR mode B (for all MS)

TSC (UWORD8)
The purpose of the TSC field is to provide a training sequence code (TSC) for the physical channel description. The TSC field is binary coded, see GSM 05.02.
Range 0 to 7

T_PACKET_FREQ_PARAM (structure)

CHAN_SEL (structure)

H (BOOL)
This field indicates if the channel uses a single frequency or a hopping scheme. This field is coded as shown:
0 single frequency
1 hopping frequency

RF_CHANNEL (union)

SINGLE_RF (structure)

ARFCN (UWORD16)
This field contains the frequency of the assigned carrier in case of single frequency channel. This field is encoded as the L1-ARFCN.
Range 0 to 1023

HOPPING_RF (structure)

MAIO (UWORD8)
This field contains the MAIO of the assigned channel. This field is encoded as the MAIO defined in GSM 04.08.
Range 0 to 1023

HSN (UWORD8)
The purpose of the HSN field is to provide a hopping sequence number (HSN) for the physical channel description. The HSN field is binary coded, range: 0 to 63, see

GSM 05.02. Default value: HSN = 0.

FREQUENCY_LIST (structure)
This structure contains the frequency list used in case of frequency hopping.

RF_CHAN_CNT (UWORD16)
Number of carriers in the list.

RF_CHAN_NO (structure)

RADIO_FREQ_LIST[64] (64 x UWORD16)
Frequency list. Each field is encoded as the L1-ARFCN.

T_TBF_STI (structure)
The TBF Starting Time field contains an absolute starting time that indicates the frame number during which the assigned TBF may start.

Remark for UL TBF:
In case of **dynamic allocation**, when the indicated TDMA frame number occurs, the mobile station shall immediately begin to monitor the USF field and use the new assigned Uplink TBF parameters when its USF has occured.
Note1 (extract from 4.60/8.1.1.1): When the mobile station receives a complete uplink assignment that does not contain a TBF starting time, the mobile station shall immediately begin monitoring the assigned PDCHs for the assigned USF value for each assigned PDCH. If a TBF starting time information element is present and no uplink TBF is in progress, but a downlink TBF is in progress, the mobile station shall wait until the starting time before beginning to monitor the USFs. While waiting for the starting time, the mobile station shall monitor the assigned PDCHs. If an uplink TBF is already in progress, the mobile station shall continue to use the assigned parameters of the uplink TBF until the TDMA frame number indicated by the TBF starting time occurs, at which time the mobile station shall immediately begin to use the newly assigned uplink TBF parameters. If while waiting for the framenumber indicated by the TBF starting time the mobile station receives another uplink assignment, the mobile station shall act upon the most recently received uplink assignment and shall ignore the previous uplink assignment.

Note2: For **fixed allocation** (extract from 04.60/8.1.1.3.5.1)
"*If the mobile station receives a PACKET DOWNLINK ASSIGNMENT message containing different frequency parameters than are currently in effect for the uplink TBF, the mobile station shall ignore the PACKET DOWNLINK ASSIGNMENT message and continue normal operation of the uplink TBF*".
It means that it's the L3 responsibility to not send an Assignment Request in such a case.

In case of single **block allocation**, the mobile station shall use the assigned timeslot in the indicated TDMA frame number.

In case of **fixed allocation**, the mobile station shall use the assigned resources from the Indicated TDMA frame number and forward, according to the parameters in the fixed allocation struct.

Remark for DL TBF:
If **no downlink TBF is in progress**, the mobile station need not monitor the TFI field of downlink RLC data blocks until the indicated framenumber. After the indicated framenumber, the mobile station shall operate as during a downlink TBF.

If a **downlink TBF is already in progress**, the mobile station shall continue to use the parameters of the existing TBF until the TBF starting time occurs. When the indicated framenumber occurs, the mobile station shall immediately begin to use the new parameters assigned.

PRESENT (BOOL)
0 Starting time not present
1 Starting time present

ABSOLUTE_FN (UWORD32)
Absolute stating frame number.

MAC_MODE (UWORD8)
This field specifies which allocation type must be used. This field is coded as shown:
0 Dynamic allocation
1 Extended Dynamic allocation (NOT YET SUPPORTED)
2 Fixed allocation, not half duplex mode
3 Fixed allocation, half duplex mode (NOT YET SUPPORTED)

T_DL_RESSOURCE_ALLOC (structure)

DOWNLINK_TFI (UWORD8)
This information element identifies the downlink TFI, to which this message applies. This field is Range 0 to 31.

DOWNLINK_TIMESLOT_ALLOCATION (UWORD8)
This information field indicates the timeslots assigned for use during the TBF. Bit 8 (MSB) indicates the status of timeslot 0, bit 7 indicates the status of timeslot 1, etc. At least one timeslot must be assigned.
0 Timeslot is not assigned
1 Timeslot is assigned

T_UL_RESSOURCE_ALLOC (structure)

UPLINK_TFI (UWORD8)
This information element identifies the uplink TFI, to which this message applies. This field is Range 0 to 31.

UPLINK_TIMESLOT_ALLOCATION (UWORD8)
This information field indicates the timeslots assigned for use during the TBF. Bit 8 (MSB) indicates the status of timeslot 0, bit 7 indicates the status of timeslot 1, etc. At least one timeslot must be assigned.
0 Timeslot is not assigned
1 Timeslot is assigned

T_DYNAMIC_ALLOC (structure)
This structure contains parameters necessary to define the radio resources of a dynamic allocation or an extended dynamic allocation.

USF_TABLE[8] (8 x UWORD8)
This table, indexed by Timeslot Number, indicates the allocated USF.

USF_GRANULARITY (BOOL)
This information field indicates the USF granularity to be applied by the mobile station.
0 the mobile station shall transmit one RLC/MAC block
1 the mobile station shall transmit four consecutive RLC/MAC blocks

T_FIXED_ALLOC (structure)
This structure contains parameters necessary to define the radio resources of a fixed allocation.

DOWNLINK_CONTROL_TIMESLOT (UWORD8)
This information field indicates the downlink timeslot that mobile station operating in fixed allocation mode shall monitor for downlink PACCH. This field is coded as the binary representation of the timeslot number as defined in GSM 05.10.
Range 0 to 7

ALLOCATION_BITMAP_LENGTH (UWORD8)
This specifies the number of bits in the ALLOCATION_BITMAP.
Range 0 to 127

ALLOCATION_BITMAP[127] (127 x UWORD8)
This table contains the uplink allocation on a block period basis (for instance, ALLOCATION_BITMAP[10] is the allocation for the 10^{th} block relative to the TBF Starting time), each byte corresponds to a bitmap timeslot allocation (MSB=TS0,…, LSB=TS7). When a bit is set to 1 the PDCH corresponding to that timeslot is allocated for the considered block. These timeslot allocations must be in line with the general TIMESLOT_ALLOCATION field content.

For instance, lets consider ALLOCATION_BITMAP[10] = 12 (00001100b), this means that timeslots 4 and 5 are allocated for uplink in the block 10 relative to the TBF starting time.

T_MPHP_ASSIGNMENT_CON message type

- **ASSIGNMENT_ID**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment.

4. Repeat UL fixed Allocation

Due to Packet Uplink Ack/nack:
This message is sent on the PACCH by the network to the mobile station indicate the status of the received RLC data blocks. A fixed allocation mobile station may also be assigned uplink resources.

MPHP_REPEAT_UL_FIXED_ALLOC_REQ message must be sent only in packet transfer fixed allocation mode when an Uplink TBF is enabled

Direction	Message name	Message Type
L3->L1	**MPHP_REPEAT_UL_FIXED_ALLOC_REQ**	**T_MPHP_REPEAT_UL_FIXED_ALLOC_REQ**
L3<-L1	**MPHP_REPEAT_UL_FIXED_ALLOC_CON**	**Trigger**

Notes:
When Packet Uplink Ack/nack contains “Repeat Allocation = 1”, the upper layer must send a MPHP_REPEAT_UL_FIXED_ALLOC_REQ message (with REPEAT_ALLOCATION boolean set to 1) that must always contain a starting time i.e. upper layer is in charge of determining the starting time of the repeated allocation:

a) if the message is received whereas the current allocation is not completed (allocation bitmap not exhausted), MS waits until the allocation bitmap exhaustion and then begins repeating the current allocation.

b) if the message is received whereas the current allocation is already completed, MS waits until the next repeated allocation boundary and then begins repeating the current allocation.

The starting time must always be provided because in the case where Packet Uplink Ack/nack containing the "repeat allocation" is received at the very end of the current allocation, the MPHP_REPEAT_UL_FIXED_ALLOC_REQ can reach L1 after the STI
has already passed. In such a case, L1 must start immediately for the remaining part of the allocation bitmap.

In case of subsequent allocation message only the latest is considered.

When Packet Uplink Ack/nack contains “Repeat Allocation = 0”, the mobile station shall transmit to the end of its current allocation without repeating the allocation, regardless of any previous REPEAT_ALLOCATION indications that may have been received. In consequence, the upper layer must send a MPHP_REPEAT_UL_FIXED_ALLOC_REQ message to inform the L1 (with REPEAT_ALLOCATION boolean set to 0).

T_ MPHP_REPEAT_UL_FIXED_ALLOC_REQ message type

- **REPEAT_ALLOCATION**
- **TS_OVERRIDE**
- **T_TBF_STI**

REPEAT_ALLOCATION (BOOL)
This field indicates whether the mobile's current allocation repeats after it ends.
0 cancel any pending "Repeat Allocation".
1 repeat the current fixed allocation when it ends.

TS_OVERRIDE (UWORD8)
This information field indicates which the timeslots whose allocation should be overridden. The override applies for one repeated allocation. Bit 8 indicates the status of timeslot 0, bit 7 indicates the status of timeslot 1, etc. At least one timeslot must be assigned.
0 The mobile shall use the ALLOCATION_BITMAP during the allocation to determine during which radio blocks it shall transmit.
1 The mobile shall transmit on all uplink radio blocks during the allocation.

T_TBF_STI (structure)
The TBF Starting Time field contains an absolute starting time that indicates the frame number during which the assigned fixed allocation must start to be repeated.

Remark:
If this starting time is already passed, L1 will start repeating the remaining part of the fixed allocation immediately.

PRESENT (BOOL)
0 Starting time not present
1 Starting time present

ABSOLUTE_FN (UWORD32)
Absolute stating frame number.

5. Single block request

The Single block task has three different purposes:

- **Two-phase access:** This procedure is used in (Packet) Idle mode for establishing an Uplink TBF. It is initiated either by the MS requesting "two-phase" access in a (Packet) Channel Request or by the Network responding to a "one-phase" (Packet) Channel Request with a single uplink block allocation. In both cases, the assignment message (Packet Uplink Assignment on PAGCH or Immediate Assignment on AGCH) sent by the Network grants a single uplink block on a given PDCH. Once the MS has transmitted in the granted block the Packet Resource Request message (TLLI included for contention resolution), it shall – while waiting for the uplink TBF assignment – monitors all downlink PACCH blocks on that same PDCH until it finally enters Packet Transfer.

- **UL single block Tx**: This procedure is initiated by the MS in (Packet) Idle when it needs to transmit an RLC/MAC control message such as Packet Measurement Report or Packet Cell Change Failure. On reception of either a "two-phase" Channel Request on RACH or a Packet Channel Request indicating "single block without TBF establishment" on PRACH, the Network replies by assigning to the MS a single uplink block on a PDCH. Once the MS has transmitted the RLC/MAC control message in the allocated block, it shall return to (Packet) Idle mode.

- **DL single block Rx**: The Network uses the "single block packet downlink assignment" procedure to assign a single downlink block on a PDCH for the transfer of a RLC/MAC control message (e.g.: Packet Cell change Order, Packet Measurement Order) to a MS in Idle mode.
  Important: This procedure is not used on cells supporting PCCCH; instead the Network sends the message to the MS on PPCH.

Direction	Message name	Message Type
L3->L1	**MPHP_SINGLE_BLOCK_REQ**	**T_MPHP_SINGLE_BLOCK_REQ**
L3<-L1	**MPHP_SINGLE_BLOCK_CON**	**T_MPHP_SINGLE_BLOCK_CON**
L3->L1	**MPHP_STOP _SINGLE_BLOCK_REQ**	**Trigger**
L3<-L1	**MPHP_STOP_SINGLE_BLOCK_CON**	**Trigger**

1. MPHP_SINGLE_BLOCK_REQ is used by L3 to start the single block task for UL or DL single block, and 2-phase access, as specified by the "purpose" field. In case of UL single block or 2-phase access the data block to transmit is stored in the DATA_ARRAY field.

2. MPHP_SINGLE_BLOCK_CON indicates to L3 whether the single block task was successful or not. It is sent by L1 when the starting time has been reached. In case of downlink, the received data block is stored in the DATA_ARRAY field.

3. MPHP_STOP_SINGLE_BLOCK_REQ is used by L3 to abort the single block task.

4. MPHP_STOP_SINGLE_BLOCK_CON is sent by L1 to L3 to confirm that the single block task has been stopped.

5. In case of single block without TBF establishment:
   - The Paging Reading task is interrupted (not stopped) when the single block is transmitted/received.

- The Single Block task is automatically stopped once the starting time has expired: L3 receives MPHP_SINGLE_BLOCK_CON.

6. In case of two-phase access:
   - The single block activity is automatically stopped by L1 when entering packet transfer mode, i.e.: TBF starting time has elapsed and MPHP_ASSIGNMENT_CON sent to L3.
   - However, if the procedure has to be aborted before packet transfer mode is entered, then L3 must first stop the single block task using MPHP_STOP_SINGLE_BLOCK_REQ (even if MPHP_SINGLE_BLOCK_CON was received). Furthermore, if a TBF task was pending (L3 waiting for MPHP_ASSIGNMENT_CON), it must be aborted too, using MPHP_TBF_RELEASE_REQ.
     It is important to ensure both SINGLE and TBF tasks are stopped before going back to (packet) idle mode.
   - After the starting time has expired, the downlink PACCH blocks monitored by the MS are reported via MPHP_DATA_IND messages.
   - The paging reading task is automatically stopped by L1 on MPHP_SINGLE_BLOCK_CON.

Notes:
- Stop Confirmation messages are not sent to L3 when L1 implicitly stops the SINGLE, CCCH or PCCCH tasks.
- Starting the SINGLE task implies an execution of the SYNCHRO task (highest priority), which aborts any running tasks. Consequently the PCCCH block occurring just before the single block cannot be read.

T_MPHP_SINGLE_BLOCK_REQ message type

- **ASSIGNEMENT_ID**
- **PURPOSE**
- **PC_MEAS_CHAN**
- **ACCESS_BURST_TYPE**
- **T_PACKET_TA**
- **T_DL_POWER_CTL**
- **TSC**
- **T_PACKET_FREQ_PARAM**
- **T_TBF_STI**
- **TIMESLOT_NUMBER**
- **DATA_ARRAY**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment. It is used to refer to the assignment command when needed (i.e. for the power control function).

PURPOSE (UWORD8)
This field indicates the purpose of the single block request message.
0, 1, 2 Reserved.

3 Single block downlink transfer without TBF establishment- DATA-ARRAY not valid.
4 Single block uplink without TBF establishment (Measurement Report). DATA-ARRAY is valid.
5 Two phases access. DATA-ARRAY is valid.

PC_MEAS_CHAN (UWORD8)
This field specifies where the mobile station shall measure the received power level.
0 measurements shall be made on BCCH
1 measurements shall be made on PDCH

ACCESS_BURST_TYPE (BOOL)
The ACCESS_BURST_TYPE field indicates if 8 or 11 bit access burst shall be used on PTCCH/U. The field is coded according to the following table:
0 8 bit access burst shall be used
1 11 bit access burst shall be used

T_PACKET_TA (structure)
The Packet Timing Advance structure describes the timing advance mode and timing advance value assigned to the mobile station.

TIMING_ADVANCE_VALUE (UWORD8)
If the TIMING_ADVANCE_VALUE value is present, the mobile station shall immediately use the value contained therein. If the TIMING_ADVANCE_VALUE value is not present the mobile station shall use its previous timing advance. If the mobile station does not have a previous timing advance the mobile station shall not transmit until it receives a valid timing advance.
Range 0 to 63.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

TIMING_ADVANCE_INDEX (UWORD8)
If the TIMING_ADVANCE_INDEX and TIMING_ADVANCE_TIMESLOT_NUMBER values are present the mobile station shall immediately begin operation of the Continuous Timing Advance procedure. If these two values are not present the mobile station shall stop operation of the Continuous Timing Advance procedure.
Range 0 to 15.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

TIMING_ADVANCE_TIMESLOT_NUMBER (UWORD8)
This field indicates the timeslot assigned for Continuous Timing Advance operation on the PTCCH.
Range 0 to 7.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

T_DL_POWER_CTL (structure)
Note: P0, BTS_PWR_CTRL_MODE and PR_MODE fields are optional downlink power control parameters. In consequence, a special value is reserved in P0 to indicate the validity of these parameters.

P0 (UWORD8)
This field is a downlink power control parameter. Its meaning is specific to downlink power control modes A and B used by the network, as per GSM 05.08. It is encoded as follows:

Bit 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	P0= 0 dB
0 0 0 0 0 0 0 1	P0= 2 dB
…	
0 0 0 0 1 1 1 1	P0 = 30 dB

Value 255 is reserved to indicate no downlink power control is applied. In such a case, BTS_PWR_CTL_MODE and PR_MODE defined just after are not meaningful/considered.
Note: GSM 05.08 section 10.2.2: "Downlink power control can only be used when the serving BCCH and the used PDCH frequencies are in the same frequency band". This condition must be checked by L3 and P0 must be set to 255 if downlink power control cannot be used.

BTS_PWR_CTL_MODE (BOOL)
This field indicates the downlink power control mode used by the network, as defined in GSM 05.08. It is encoded as follows:
0 Mode A (valid in dynamic and fixed allocation)
1 Mode B (valid in fixed allocation only)

PR_MODE (BOOL)
0 PR mode A (for one addressed MS)
1 PR mode B (for all MS)

TSC (UWORD8)
The purpose of the TSC field is to provide a training sequence code (TSC) for the physical channel description. The TSC field is binary coded, see GSM 05.02.
Range 0 to 7

T_PACKET_FREQ_PARAM (structure)

CHAN_SEL (structure)

H (BOOL)
This field indicates if the channel uses a single frequency or a hopping scheme. This field is coded as shown:
0 single frequency
1 hopping frequency

RF_CHANNEL (union)

SINGLE_RF (structure)

ARFCN (UWORD16)
This field contains the frequency of the assigned carrier in case of single frequency channel. This field is encoded as the L1-ARFCN.

Range 0 to 1023

HOPPING_RF (structure)

MAIO (UWORD8)
This field contains the MAIO of the assigned channel. This field is encoded as the MAIO defined in GSM 04.08.
Range 0 to 1023

HSN (UWORD8)
The purpose of the HSN field is to provide a hopping sequence number (HSN) for the physical channel description. The HSN field is binary coded, range: 0 to 63, see
GSM 05.02. Default value: HSN = 0.

FREQUENCY_LIST (structure)
This structure contains the frequency list used in case of frequency hopping.

RF_CHAN_CNT (UWORD16)
Number of carriers in the list.

RF_CHAN_NO (structure)

RADIO_FREQ_LIST[64] (64 x UWORD16)
Frequency list. Each field is encoded as the L1-ARFCN.

T_TBF_STI (structure)
The TBF Starting Time field contains an absolute starting time that indicates the frame number during which the assigned timeslot shall be used.

PRESENT (BOOL)
0 Starting time not present
1 Starting time present

ABSOLUTE_FN (UWORD32)
Absolute stating frame number.

TIMESLOT_NUMBER (UWORD8)
This information field indicates the timeslot number assigned for transmitting the single.
Range: 0 to 7.

DATA_ARRAY [23] (23 x UWORD8)
Single block data array

Note:
L1 controls the output power of the block to transmit by requesting (on the block period preceding the TBF starting time) the output power to apply. The request is made thanks to the interface described in Transmit

Power Control paragraph. The transmit power to apply depends to the latest averaged value and thus requires to be requested just before the transmission.

T_MPHP_SINGLE_BLOCK_CON message type

- **ASSIGNMENT_ID**
- **PURPOSE**
- **STATUS**
- **DL_ERROR_FLAG**
- **DATA_ARRAY**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment.

PURPOSE (UWORD8)
This field indicates the purpose of the single block request message.

0, 1, 2	Reserved.
3	Single block downlink transfer with TBF establishment- DATA-ARRAY is valid.
4	Confirmation that the Single block transfer without TBF establishment request was sent-DATA-ARRAY is invalid
5	Confirmation that the two phases access request was treated. DATA-ARRAY is invalid

STATUS (UWORD8)
This field indicates the purpose of the single block request message.

0	In uplink (PURPOSE = 4 or 5), indicates that the block was sent.
1	Starting time is passed -Single block uplink/downlink was not sent/received.
2	No Valid Timing Advance-Single block uplink was not sent. Indeed, if the continuous timing advance procedure is applied, when the MS receives the single block assignment with a valid TAI index, it starts to monitor the PTCCH/D blocks to receive a valid TA before the starting time.
3	In downlink (PURPOSE = 3) indicates that the downlink block was received.

BOOL **dl_error_flag**
Indicates if data block is valid:
TRUE == invalid block info read
FALSE == valid block info read

Note: “dl_error_flag” value is not applicable for Single Block Uplink

DATA_ARRAY [23] (23 x UWORD8)
Single block data array

6. Packet TBF release

Direction	Message name	Message Type
L3->L1	**MPHP_TBF_RELEASE_REQ**	**T_MPHP_TBF_RELEASE_REQ**
L3<-L1	**MPHP_TBF_RELEASE_CON**	**T_MPHP_TBF_RELEASE_CON**

T_MPHP_TBF_RELEASE_REQ message type

- **TBF_TYPE**

TBF_TYPE (UWORD8)
This field indicates which TBF must be released
00 Release only the downlink TBF
01 Release only the uplink TBF
02 Release both uplink and downlink TBFs

Note:
When a MPHP_TBF_RELEASE_REQ message is sent, the running TBF and the possible pending TBF(s) are released

T_MPHP_TBF_RELEASE_CON message type

- **TBF_TYPE**

TBF_TYPE (UWORD8)
This field indicates which TBF was released
00 Release only the downlink TBF
01 Release only the uplink TBF
02 Release both uplink and downlink TBFs

Note :
It is possible that L3 receives only one MPHP_TBF_RELEASE_CON with TBF_TYPE =2 as confirmation for two MPHP_TBF_RELEASE_REQ with TBF_TYPE = 0 , 1 respectively if these two requests were received in the same block period before the starting of the new block.
The same comment applies for the MPHP_TBF_RELEASE_REQ with TBF_TYPE =2 while only one TBF is in progress, in this case the confirmation message will indicate TBF_TYPE =2 rather than the single TBF which was released.

7. Packet PDCH Release

Due to Packet PDCH Release: This message is sent on PACCH by the network to all mobile stations within the cell that are assigned to the corresponding PDCH, to notify mobile stations that one or more PDCHs will be immediately released and become unavailable for packet data traffic.

Direction	Message name	Message Type
L3->L1	**MPHP_PDCH_RELEASE_REQ**	**T_MPHP_PDCH_RELEASE_REQ**
L3<-L1	**MPHP_PDCH_RELEASE_CON**	**T_MPHP_PDCH_RELEASE_CON**

T_MPHP_PDCH_RELEASE_REQ message type

- **ASSIGNMENT_ID**
- **TIMESLOT_AVAILABLE**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment on which the PDCH release apply.

TIMESLOT_AVAILABLE (UWORD8)
This information field indicates the timeslots assigned for GPRS use on the current MAIO or ARFCN. MSB indicates the status of timeslot 0, etc, LSB indicates the status of timeslot 7.

Notes:

- PDCH Release message contains an ID. L1 checks the active channel ID: if it is the same, L1 releases the channel and confirms by message, else L1 does not do anything.
- For pending assignments, L3 checks if the PDCH to be released takes part of that assignment. If so, L3 will send a new assignment to L1 after having removed the released PDCH. L1**accepts** the possible "glitch" which could be introduced by this mechanism if L1 starts using pending channel whereas L3 is building the corrected assignment.
- L3 manages to check which PDCH is released. If it is the last PDCH of a TBF, L3 sends a TBF release request to L1 instead of the usual PDCH release request. Therefore if all PDCH currently in use must be released, L3 sends a TBF release request.
- In UL TBF with fixed allocation, if the "PDCH Release" makes the release of the DL PACCH timeslot, the MS must start monitoring all the remaining DL timeslot to seek for a "Timeslot Reconfigure" message which can be sent on any of them.

T_MPHP_PDCH_RELEASE_CON message type

- **ASSIGNMENT_ID**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment.

8. Timing Advance

Due to Packet Power Control/Timing Advance:
This message is sent on PACCH by the network to the mobile station in order to update the mobile station timing advance or power control parameters.

This message must also be used by upper layer to change the PTCCH parameter set to be used by L1 when two different sets are available (one for each enabled TBF in case of simultaneous UL and DL TBF). As the L1 only uses one PTCCH set, the upper layer must switch between the two available sets when needed. For example when the TBF associated to PTCCH parameters used by L1 is released, the upper layer must then set the PTCCH parameters corresponding to the remaining TBF using this message.

Direction	Message name	Message Type
L3->L1	**MPHP_TIMING_ADVANCE_REQ**	**T_MPHP_TIMING_ADVANCE_REQ**
L3<-L1	**MPHP_TIMING_ADVANCE_CON**	**T_MPHP_TIMING_ADVANCE_CON**

T_MPHP_TIMING_ADVANCE_REQ message type

- **ASSIGNMENT_ID**
- **T_PACKET_TA**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment on which the timing advance updating apply.

T_PACKET_TA (structure)
The Packet Timing Advance structure describes the timing advance mode and timing advance value assigned to the mobile station.

TIMING_ADVANCE_VALUE (UWORD8)
If the TIMING_ADVANCE_VALUE value is present, the mobile station shall immediately use the value contained therein. If the TIMING_ADVANCE_VALUE value is not present the mobile station shall use its previous timing advance. If the mobile station does not have a previous timing advance the mobile station shall not transmit until it receives a valid timing advance.
Range 0 to 63.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

TIMING_ADVANCE_INDEX (UWORD8)
If the TIMING_ADVANCE_INDEX and TIMING_ADVANCE_TIMESLOT_NUMBER values are present the mobile station shall immediately begin operation of the Continuous Timing Advance procedure. If these two values are not present the mobile station shall stop operation of the Continuous Timing Advance procedure.
Range 0 to 15.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

TIMING_ADVANCE_TIMESLOT_NUMBER (UWORD8)

This field indicates the timeslot assigned for Continuous Timing Advance operation on the PTCCH.
Range 0 to 7.
Value 255 is reserved to indicate “VALUE NOT PRESENT”.

Note:
Timing advance updating message contains an ID. L1 checks the active channel ID: if it is the same, L1 updates the timing advance values and confirms by message, else L1 does not do anything.

T_MPHP_TIMING_ADVANCE_CON message type

- **ASSIGNMENT_ID**

ASSIGNMENT_ID (UWORD8)
This field is used to identify the Assignment.

9. Update PSI Parameters

Due to PSI messages received on downlink PACCH.

Direction	Message name	Message Type
L3->L1	**MPHP_UPDATE_PSI_PARAM_REQ**	**T_MPHP_UPDATE_PSI_PARAM_REQ**
L3<-L1	**MPHP_UPDATE_PSI_PARAM_CON**	**Trigger**

T_MPHP_UPDATE_PSI_PARAM_REQ message type

- **Pb**
-
- **ACCESS_BURST_TYPE**

Pb (UWORD8)
The Pb parameter is a power reduction value used by the BTS on PBCCH/PCCCH blocks (PBCCH and PCCH are considered transmitted with the same output power), relative to the output power used on BCCH. The field is coded according to the following table:
Range: 0 to 15 with,

power reduction in dB = 2 * Pb

Example: Pb=8 => power reduction =16dB

ACCESS_BURST_TYPE (BOOL)
The ACCESS_BURST_TYPE field indicates if 8 or 11 bit access burst shall be used on PTCCH/U. The field is coded according to the following table:
0 8 bit access burst shall be used
1 11 bit access burst shall be used

10. Cell reselection Measurement in Transfer mode

Note:

The MPHP_TCR_MEAS_IND is sent every 104 TDMA frame.
A new MPHP_TCR_MEAS_REQ can be sent at any time, however the new list is taken into account when the current 104 TDMA frame reporting period is completed. If during the same 104 TDMA frame period several MPHP_TCR_MEAS_REQ message are sent, only the latest one is considered.

Direction	Message name	Message Type
L3->L1	**MPHP_TCR_MEAS_REQ**	**T_MPHP_TCR_MEAS_REQ**
L3<-L1	**MPHP_TCR_MEAS_IND**	**T_MPHP_TCR_MEAS_IND**
L3->L1	**MPHP_TCR_MEAS_STOP_REQ**	**Trigger**
L1->L3	**MPHP_TCR_MEAS_STOP_CON**	**Trigger**

T_MPHP_TCR_MEAS_REQ message type

- **NB_CARRIER**
- **RADIO_FREQ_NO**
- **LIST_ID**

NB_CARRIER (UWORD8)
This field specifies the number of neighbour cell carriers to measure
Range 1 to 65.

RADIO_FREQ_NO[33] (33 x UWORD16)
An array containing up to 33 carriers to measure: 32 carriers + the serving carrier.

LIST_ID (UWORD8)
This field allows identifying the list.

Note1: Neighbour Measurement process is automatically started by L1 once Packet Transfer mode is established. No implicit message is request to start the measurement process. BA(GPRS) list used is the current one i.e. BA(GPRS) list passed during Packet Idle phase or BA list given during Circuit Switch Idle mode.

Note2: Stop of the Neighbour Measurement process is done once all TBF are released. No implicit message is request to stop the measurement process.

Note3: No reporting message is sent to L3 on receipt of a MPHP_TCR_MEAS_STOP_REQ message or on release of all TBF.

Note4: MPHP_TCR_MEAS_STOP_REQ message is mainly used for debug from the fact that it stops the Neighbour measurements in Packet Transfer for ever (i.e Measurements can't be resume by sending a MPHP_TCR_MEAS_REQ. The only way is to stop Packet Transfer and to restart it).

Note5: The beacon must be included in the BA list used in packet transfer mode when PC_MEAS_CHAN = 0 (6 measurements on the beacon per MF52 are disabled) for two reasons:
- the input level on the beacon must be maintained for the return to idle mode
- If downlink power control is used in packet transfer, in case of reception hole, the AGC algorithm needs at least the processing of one measurement on the beacon to recover the IL on the downlink PDTCH/PACCH

T_MPHP_TCR_MEAS_IND message type

- **ACC_LEVEL[33]**
- **ACC_NBR[33]**
- **LIST_ID**

ACC_LEVEL[33] (33 x WORD16)
Accumulation of the power strength level (rxlev encoded, see note 1) for up to 33 radio frequency numbers in the order of the list provided within the request message MPHP_CR_MEAS_REQ.

Note1: **rxlev** is encoded without clipping (binary coded ranges -128 to +127 in spite of "0 to 63" range as it is specified in GSM05.08. This allows a greater discrimination in L3.

ACC_NBR[33] (33 x UWORD8)
Number of measurement samples accumulated within ACC_LEVEL for up to 33 radio frequency numbers in the order of the list provided within the request message MPHP_CR_MEAS_REQ.

LIST_ID (UWORD8)
This field allows identifying the list.

11. Transmit Power Control

The Process is shared between L1 and Upper Layers:

L1 performs receive level measurements from the serving cell every 40 ms or every 20ms if measures are performed on PDCH. According to PC_MEAS_CHAN the received signal level must be performed on the BCCH or on the PDCH monitored for the PACCH (see 05.08). Besides, to compute the BL_VAR of each radio block, the received level of the PACCH radio block (or first correct radio block in case of more than one timeslots are allocated and no PACCH decoded) needs to be reported every 20 ms.
The upper layers compute ***Cn, BL_VAR*** and ***PCH[]*** and returns the transmit power for each timeslot.

The communication between L1 and upper layers is made through a MACA function with the following prototype:

```
maca_power_control ( UWORD8  assignment_id, /* ID of the current assignment being used by L1 */
                     BOOL    crc_error,     /* Indicates if the radio block on which the measurements are done has CRC
                                               error or not */
                     WORD8   bcch_level,
                     UWORD16 radio_freq[4], /* ARFCN of the four normal bursts of the PDCH monitored on the downlink. */
                     WORD8   burst_level[4], /* Levels of the four normal bursts of the PDCH monitored on the downlink */
                     UWORD8  *pch           /* Pointer to array of size 8 for returning the uplink power levels to use on the
                                               next radio block */
                   );
```

Where:

assignment_id is the current assignment used by the L1. This parameter is required to make a correlation with the assignment command power control parameter.

crc_error

0	radio block is correctly received
1	radio block is not correctly received

bcch_level parameter corresponds to the received signal level of the BCCH serving Cell. The measure is performed every 40ms and only if PC_MEAS_CHAN = 0. A special value 0x80 will be put in bcch_level if PC_MEAS_CHAN = 1 (measures have been performed on PDCH) or if no measures have be done. “bcch_level” is encoded without clipping (binary coded ranges -128 to +127 in spite of “0 to 63” range specified in GSM05.08). This allows a greater discrimination in L3.

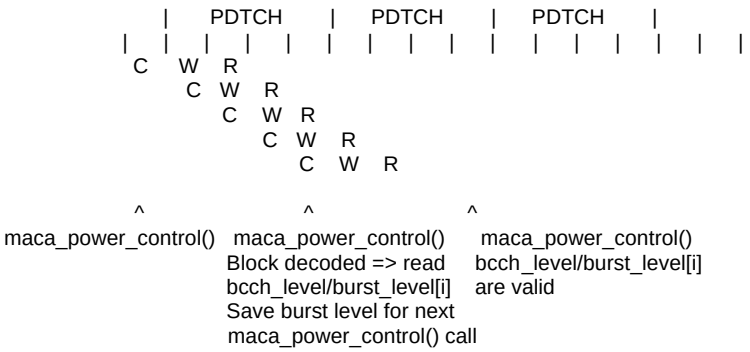
radio_freq[i] is the radio frequency of i^{th} TDMA frame within the radio block.

burst_level[i] corresponds to the received Signal level of the first valid downlink PDCH radio blocks. If there is not any valid radio block, burst_level[i] corresponds to the final radio block received. The four normal burst NB0 … NB4 are respectively stored in burst_level[0] … burst_level[3] with their associated radio_freq[i]. A special value 0x80 will be put in burst_level[i] if PC_MEAS_CHAN =0 (measures have been performed on PBCCH Serving Cell) or if no measures have be done. burst_level[i] is encoded without clipping (binary coded ranges -128 to +127 in spite of “0 to 63” range specified in GSM05.08). This allows a greater discrimination in L3.

pch is a pointer on a table of 8 UWORD8. This is used to return transmit power indexed by the timeslot number.

Call of maca_power_control() during the first 2 block of a PDTCH establishment:

From the fact that "maca_power_control()" is call on first CTRL of a PDTCH block with burst_level[i] or bcch_level values filled only when the block is decoded (i.e. on last READ, burst 4, cf. figure here below), It's then a L3 responsibility to answer to the 2 first call, after a PDTCH establishment, with a correct DL Txpwr (cf. 05.08 section 10.2). During this first two calls burst_level[i] or bcch_level values are set to invalid.



pch[i] range: 0 to 31 (as described in GSM05.05)

GSM 900	
PCH	**Nominal Output Power (dBm)**
0-2	39
3	37
4	35
5	33
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19-31	5

DCS1800	
PCH	**Nominal Output Power (dBm)**
29	36
30	34
31	32
0	30
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15-28	0

12. Co-channel interference measurements in transfer mode

In Packet transfer mode, the interference measurement processing is implicitly started when the starting time of an assigned TBF occurs (MPHP_ASSIGNMENT_CON message). The boolean interf_meas_enable included in the MPHP_ASSIGNMENT_REQ message must be set to 1 (see 3). Interference measurement processing is continuous. Each time two-measurement sessions (one on a PTCCH frame and one on a search frame) are completed, measured signal strengths are reported in MPHP_TINT_MEAS_IND message.
When the resources used by the TBF are changed with a new MPHP_ASSIGNMENT_REQ message, the interference measurement process is re-started using the new channels when the starting time of the new TBF occurs.
This process is implicitly stopped when re-entering in packet idle mode (MPHP_TBF_RELEASE_CON message when all the active TBF are released).

Direction	Message name	Message Type
L3<-L1	**MPHP_TINT_MEAS_IND**	**T_MPHP_INT_MEAS_IND (see S921)**

13. Packet transfer data flow interface

In order to exchange data or control RLC/MAC blocks when a Temporary Block Flow is established in downlink and /or uplink two functions are provided: RLC_UPLINK, RLC_DOWNLINK.

Type definition:

```
typedef   UWORD16    API;
typedef   WORD16     API_SIGNED;
```

RLC_UPLINK

This function is used to request data or control block to transmit from RLC task. RLC_UPLINK is called by MAC-S in packet transfer mode. The principle is to call the function on every block period where a data block or a control block (due to polling) can be transmitted. The function is called once by block and returns the radio blocks that are potentially allocated for uplink transfer. The uncertainty has two reasons:

- In dynamic allocation the uplink state flag of the previous downlink RLC/MAC block need to be decoded before any transmission. In some case, MAC-S can request a RLC/MAC block to transmit and the resource can be de-allocated by the network. In such a case, the block is ordered again to the RLC (which can therefore change the block order according to its priority). MAC-S mentions the number of transmitted RLC/MAC data/control blocks (excluding the polling RLC/MAC control block) thanks to RLC_BLOCKS_SENT parameter.
- An uplink radio block can be allocated by the polling mechanism. MAC-S filters the blocks according to MAC header TFI if present. Upper layer is in charge to detect RRBP fields in the MAC header and determines the correct frame number for the response. Upper layer passes the poll response at the correct time on the RLC uplink request. Note that potentially on any block a poll response can be transmitted. In consequence, MAC-S has to call RLC_UPLINK function on each block period. Besides, if a poll response does not respect the mobile multi-slot class the poll response is discarded and LAST_POLL_RESPONSE parameter reports it.

Note:

It is important that the RLC_UPLINK function returns:

- The poll radio blocks in growing order of timeslot occurrence.
- A maximum of one radio block can be allocated on the same timeslot, thus the RLC layer manages the priority
- The data block in priority order.
- If no poll response is requested, the CS_TYPE of the first poll response buffer must be set to ‘NONE’. If one or several poll responses (less than 4) are requested, the CS_TYPE of the poll response buffer following the last used poll response buffer must be set to ‘NONE’.

  Furthermore, to mention to MAC-S no more block are available for transmission it is recommended that RLC_UPLINK function set the CS_TYPE parameter to none (0000).
  Even if during one block period, a data block or a polling block is not transmitted and valid for the next block period transmission, the RLC_UPLINK function must re-write the data.

Prototype:

```
RLC_UPLINK( UWORD8                ASSIGNMENT_ID,
            UWORD8                TX_DATA_NO,
            UWORD32               FN,

            UWORD8                TIMING_ADVANCE_VALUE,
            T_UL_POLL_RESPONSE    *UL_POLL_RESPONSE,
            T_UL_DATA             *UL_DATA,
            BOOL                  ALLOCATION_EXHAUSTED)
```

Parameters:

Type	*Name*	*Description*	*type*
UWORD8	**ASSIGNMENT_ID**	Identification of the active channel	MAC->RLC
UWORD8	**TX_DATA_NO**	Maximum number of timeslots allocated for uplink RLC/MAC data block, updated by MAC-S	MAC->RLC
UWORD32	**FN**	Frame number	MAC->RLC
UWORD8	**TIMING_ADVANCE_VALUE**	Range 0 to 63. Value 255 is reserved to indicate that the Timing Advance information is not currently known by the L1 (see Note 1).	MAC->RLC
T_UL_POLL_RESPONSE	***UL_POLL_RESPONSE[4]**	Pointer on UL_POLL_RESP structures updated by RLC. RLC must map the UL_POLL_RESP structures in growing order of timeslot occurrence. When less than 4 poll responses must be sent, the CS_TYPE field of the first UL_POLL_RESP structure coming after the last poll response to transmit must be set to NONE.	RLC->MAC
T_UL_DATA	***UL_DATA[4]**	Pointer on UL_DATA structures updated by RLC. RLC must map the UL_DATA structures according to their priority of transmission	RLC->MAC
BOOL	**ALLOCATION_EXHAUSTED**	This boolean is set to 1 when the allocation bitmap used in fixed mode is exhausted	MAC->RLC

Note:

1. To transmit any RLC/MAC blocks a valid timing advance need to be known by the mobile. This timing advance can be communicated to the mobile either in Packet Assignment / Reconfiguration message or if the continuous timing advance procedure is applied thanks to the PTCCH. In the first case, the information is sent by the L3 to the L1, in the second case the L1 decodes the PTCCH and informs the RLC layer when a valid TA has been decoded which allows the RLC to send RLC/MAC data block. While the TIMING_ADVANCE_VALUE remains to 255, no RLC/MAC blocks should be given to the MAC layer except the ones, which respond to a polling request using PRACH coding scheme.

T_UL_POLL_RESPONSE structure:

Type	*Name*	*Description*
API	**BLOCK_STATUS**	This parameter is a bitmap containing the CS type and some status block information. In uplink, only the CS_TYPE field (bit 0 to 3) is applicable and represents the channel coding type of the uplink data block to transmit, which permits to indicate the data length to the DSP. CS type can be Bit3.2.1 0 0 0 0 0 None (no more poll response requested) 0 0 0 1 Not Applicable 0 0 1 0 Not Applicable 0 0 1 1 CS1 – Poll response 0 1 0 0 Not applicable 0 1 0 1 Not applicable 0 1 1 0 Not applicable. 0 1 1 1 PRACH 8 bits 1 0 0 0 PRACH 11 bits Bit 4: reserved. Bit 5 BYTE_SHIFT. This parameter is used to indicate that the data contained into the RLC/MAC buffer are shifted by one byte, i.e. that the first byte (MSB) must be ignored. When set to 1, byte 0 (LSB) of UL_BLOCK[] is ignored. First byte used by the DSP is byte 1. BYTE_SHIFT is Not Applicable for PRACH 8 bits and PRACH 11 bits.
API	**TIMESLOT**	Timeslot on which the poll response must be placed
API	**UL_BLOCK[13]**	Uplink data to transmit that is located in the API. Meaningful block size is function of the CS_TYPE: CS1: 12 UWORD16 (distributed on 13 UWORD16 if BYTE_SHIFT is applied). PRACH 8 bits: 1 UWORD16 PRACH 11 bits: 1 UWORD16

Note: PRACH 8 bit and PRACH 11 bit uplink data to transmit must be stored in the first word UL_BLOCK[0] by L3 with bit 0 being the LSB (the 8/11 bits should occupy the least significant bits of UL_BLOCKS[0]). BSIC information is appended by Layer 1.

T_UL_DATA structure:

Type	*Name*	*Description*
API	**BLOCK_STATUS**	This parameter is a bitmap containing the CS type and some status block information. In uplink, only the CS_TYPE field (bit 0 to 3) is applicable and represents the channel coding type of the uplink data block to transmit, which permits to indicate the data length to the DSP. CS type can be Bit3.2.1 0 0 0 0 0 None (no more uplink data block) 0 0 0 1 Not applicable 0 0 1 0 CS1 - Data or control block 0 0 1 1 Not applicable. 0 1 0 0 CS2 0 1 0 1 CS3 0 1 1 0 CS4 0 1 1 1 Not applicable. 1 0 0 0 Not applicable. Bit 4: reserved. Bit 5: BYTE_SHIFT. This parameter is used to indicate that the data contained into the RLC/MAC buffer are shifted by one byte, i.e. that the first byte (MSB) must be ignored. When set to 1, byte 0 (LSB) of UL_BLOCK[] is ignored. First byte used by the DSP is byte 1.
API	**UL_BLOCK[28]**	Uplink data block to transmit that is located in the API. Meaningful block size is function of the CS_TYPE: CS1: 12 UWORD16 CS2: 17 UWORD16 (distributed on 18 UWORD16 if BYTE_SHIFT is applied). CS3: 20 UWORD16 (distributed on 21 UWORD16 if BYTE_SHIFT is applied). CS4: 27 UWORD16 (distributed on 28 UWORD16 if BYTE_SHIFT is applied).

BYTE_SHIFT explanation:

- No Byte shift is applied

word 0	0002	
word 1	0003	
word 2	02	01
word 3	04	03
word 4	06	05
word 5	08	07
word 6	0a	09
word 7	…	…
…	…	…

DSP is reformatting the burst as the following:

word 0	02	01
word 1	04	03
word 2	06	05
word 3	08	07
word 4	0a	09
…	…	…

- Byte shift is applied (xx must be ignored)

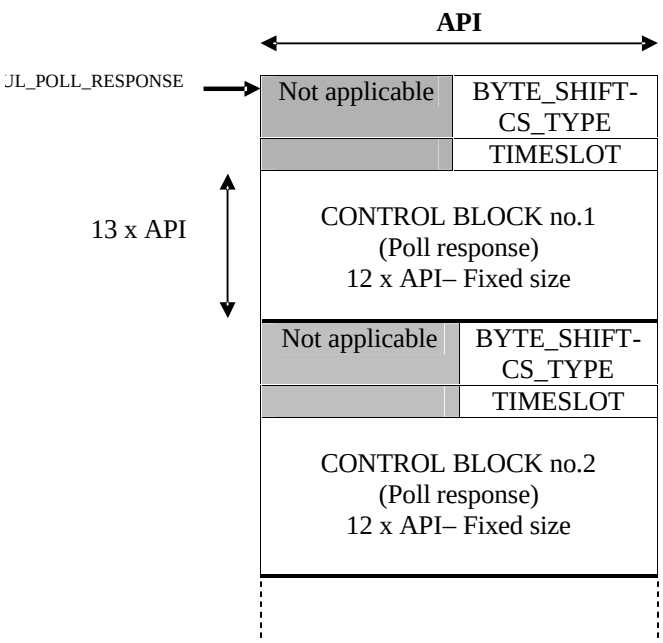
word 0	0012	
word 1	0003	
word 2	01	xx
word 3	03	02
word 4	05	04
word 5	07	06
word 6	09	08
word 7	00	0a
…	…	…

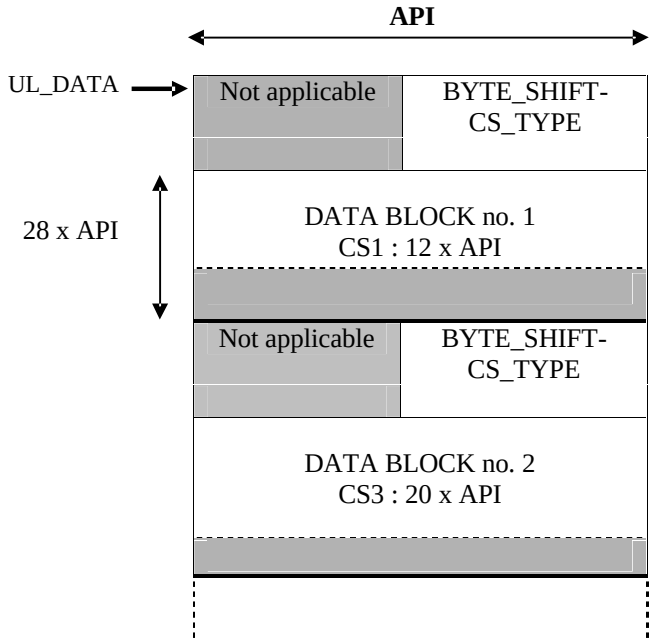
DSP is reformatting the burst as the following:

word 0	02	01
word 1	04	03
word 2	06	05
word 3	08	07
word 4	0a	09
…	…	…

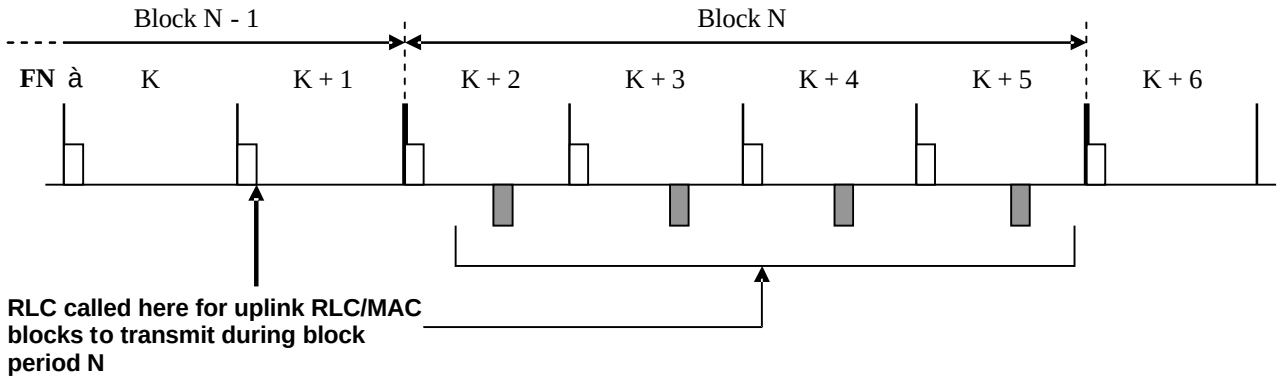
API organization for uplink RLC/MAC blocks:

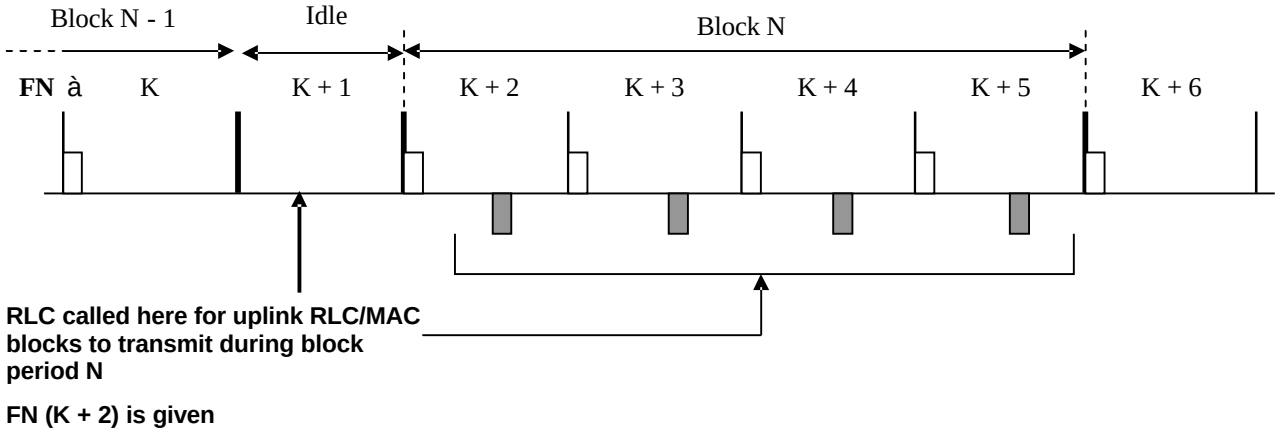
Example: CS_TYPE for DATA_BLOCK no. 1 is CS1
CS_TYPE for DATA_BLOCK no. 2 is CS3





FN explanation:





Note:

When the CS_TYPE parameter of the first data block buffer is set to NONE, the MAC-S does not transmit any RLC/MAC block. The transmission of RLC/MAC dummy block is managed at RLC layer by setting CS_TYPE = CS1 and appropriate data.

Optionally, CS_TYPE field can be set to NONE by RLC if:

- At the end of a TBF, when the network hasn't released the transfer, Layer 1 continues to call MAC-S but there's no more RLC/MAC data block to transmit. RLC indicates to MAC-S that no data block is available

RLC_DOWNLINK

This function is used to report all received PDCTH and PACCH radio blocks in packet transfer mode. There is one call by block period to report all the received radio blocks. In the absence of any radio block to report or when the received blocks are bad according to their CRC and/or their TFI, the function is called.

. All received downlink blocks are reported with an information indicating if the block is addressed to the mobile according to TFI filtering. In some cases, MAC-S can't do any filtering on certain radio blocks.

Prototype:

```
RLC_DOWNLINK(    UWORD8       ASSIGNMENT_ID,
                 UWORD32      FN,
                 T_DL_STRUCT  *DATA_PTR,
                 UWORD8       RLC_BLOCKS_SENT,
                 UWORD8       LAST_POLL_RESPONSE)
```

Parameters:

Type	*Name*	*Description*	*type*
UWORD8	**ASSIGNMENT_ID**	Identification of the active channel	MAC->RLC
T_DL_STRUCT	***DATA_PTR**	Pointer on the downlink structure (see bellow).	MAC->RLC
UWORD32	**FN**	Frame number.	MAC->RLC
UWORD8	**RLC_BLOCKS_SENT**	Number of RLC/MAC blocks transmitted (excepting polling), updated by MAC-S	MAC->RLC
UWORD8	**LAST_POLL_RESPONSE**	Bitmap updated by MAC-S 0 – No poll error 1 – Poll error (a poll requested on this timeslot wasn't transmitted) MSB bit corresponds to timeslot 0 LSB bit corresponds to timeslot 7	MAC->RLC

T_DL_STRUCT Downlink structure:

Type	*Name*	*Description*
API	**RX_NO**	Number of received radio blocks (with good or bad TFI/CRC), updated by MAC-S
T_DL_DATA	***DL_DATA**	Pointer on downlink data block structures.

T_DL_DATA structure:

Type	*Name*	*Description*
API	**BLOCK_STATUS**	This parameter is a bitmap containing the CS type and some status block information (BLK_STATUS). CS_TYPE field (bit 0 to 3) represents the channel coding type identified by the DSP. CS type can be: Bit 3.2.1 0 0 0 0 0 None 0 0 0 1 Not applicable 0 0 1 0 CS1 - Data or control block 0 0 1 1 Not applicable.

		0 1 0 0 CS2 0 1 0 1 CS3 0 1 1 0 CS4 0 1 1 1 Not applicable. 1 0 0 0 Not applicable. BLK_STATUS contains CRC_ERROR and TFI_RESULT fields. CRC_ERROR field (bit 8) mention if the block is received with a good or bad CRC. CRC_ERROR bit set to 0 => Good CRC CRC_ERROR bit set to 1 => Bad CRC TFI_RESULT field (bit 9 and 10) mention if the block is address or not to the mobile by performing a TFI filtering when possible. TFI_RESULT 10 9 0 0 TFI filtering not performed. 0 1 TFI field not present in RLC/MAC block 1 0 RLC/MAC block address to the mobile 1 1 RLC/MAC block not address to the mobile. This parameter is updated by the DSP
API	**TIMESLOT**	Timeslot on which the downlink block was received Updated by MAC-S
API	**D_MACC**	Accumulated Metric (reported by the Channel Decoder) max is 456*56 = 25536.
API	**D_NERR**	Number of estimated errors (max =456), reported by the Channel decoder.
API	**DL_BLOCK[27]**	Downlink data, updated by the DSP. Meaningful block size is function of CS_TYPE: CS1: 12 UWORD16 CS2: 17 UWORD16 CS3: 20 UWORD16 CS4: 27 UWORD16

Note:
The L1 reports all the RLC/MAC blocks with ANY TFI. It updates the CRC_ERROR field and the TFI_RESULT field. It is up to the RLC layer to use or not the data information.

LAST_POLL_RESPONSE explanation:

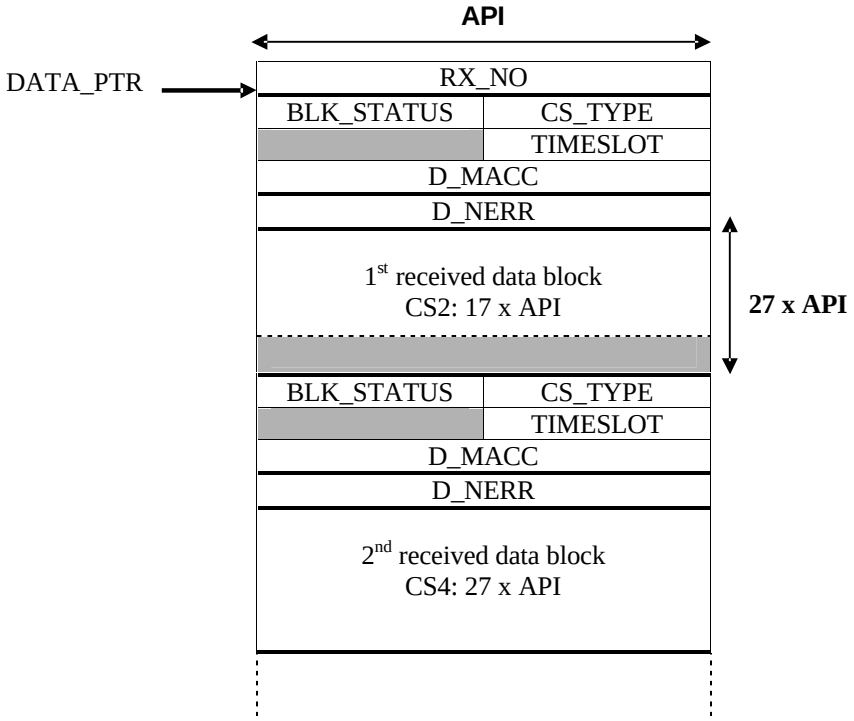
This variable informs the RLC layer on the poll response transmitted or not.

Example:
Poll responses are requested on timeslots 0,1,2 on block period N.
If only one poll response is transmitted on timeslot 1, LAST_POLL_RESPONSE value for block period N + 1 will be:

MSB							LSB
0	1	2	3	4	5	6	7
1	0	1	0	0	0	0	0

Poll error on timeslots 0 and 2.

API organization for downlink RLC/MAC blocks:
Example: CS_TYPE for 1st data block is CS2
CS_TYPE for 2nd data block is CS4



FN explanation: