3GPP TSG RAN WG1 ***TSGR1#10(00)52***
January 18-21, 2000, Beijing, China

Agenda item: **Ad hoc 14**

Source: **Philips**

Title: **Draft Text Proposals for CPCH status broadcast**

Document for: **Decision**

Introduction

This document is a slightly modified version of TSGR1#9(99)j18 and contains text to add the definition of a CPCH status broadcast channel to 25.211 and 25.214. Following discussion, the main features of the proposal (in 25.211) are as follows:

- A new physical channel (CSICH) is defined where information is transmitted in the unused parts of the AICH.
- A new section is added 5.3.3.8 CPCH Status Indicator Channel (CSICH)
- The status information is assumed to be Layer 1 information
- The spreading code is the same as the AP-AICH, so no additional channelization code is required.
- The modulation/demodulation is the same as for the PICH, so there is minimal increase in UE complexity.
- In accordance with the current assumptions in WG1, one status indicator is transmitted for each CPCH. However, this could be easily modified to support channel assignment where one status indicator could be transmitted for each bit rate available.
- The binary signalling format is the optimum for continuous broadcast of status flags (like in the PICH).
- In a 20ms frame CSICH frame there are 120 bits which are filled by a combination of bit repetition and repetition of status indicators (up to a maximum of 4 per access slot). The bit repetition factor can be adjusted by the network to achieve a compromise between downlink power and update rate of the status information.
- Some limited time diversity is provided by separation between different repetitions of the status indicators

The changes to 25.214 include the requirement to monitor the status channel and check the value of the status indicator near the start of the access procedure, before transmission of the Access Preamble and again if there is no response to the AP transmission. To allow for processing time, a maximum time delay of 1ms is proposed between the receipt of any status information and its use by the UE. In order to simplify the changes, the first two stages of the CPCH access procedure have been deleted, since they correspond to MAC layer processes which should not be part of the Layer 1 specifications, and replaced with new text.

The

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Dresden, Germany, 30 Nov- 3 Dec 1999

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25.211	CR	013r1	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN#6 *list expected approval meeting # here ↑*

for approval [X] for information [ ]

strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Philips **Date:** 2000-1-12

Subject: Addition of a downlink channel indicating CPCH status

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	[ ]	**Release:**	Phase 2	[ ]
A	Corresponds to a correction in an earlier release	[ ]		Release 96	[ ]
B	Addition of feature	[X]		Release 97	[ ]
C	Functional modification of feature	[ ]		Release 98	[ ]
D	Editorial modification	[ ]		Release 99	[X]
				Release 00	[ ]

Reason for change: Broadcast of status information significantly improves performance of CPCH

Clauses affected: 3.3, 5.3.3, 6

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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3 Abbreviations

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

AI	Acquisition Indicator
AICH	Acquisition Indicator Channel
AP	Access Preamble
BCH	Broadcast Channel
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
CSICH	CPCH Status Indicator Channel
DCH	Dedicated Channel
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DSCH	Downlink Shared Channel
DTX	Discontinuous Transmission
FACH	Forward Access Channel
FBI	Feedback Information
MUI	Mobile User Identifier
PCH	Paging Channel
P-CCPCH	Primary Common Control Physical Channel
PCPCH	Physical Common Packet Channel
PDSCH	Physical Downlink Shared Channel
PI	Page Indicator
PICH	Page Indicator Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
RNC	Radio Network Controller
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronisation Channel
SF	Spreading Factor
SFN	System Frame Number
SI	Status Indicator
SSC	Secondary Synchronisation Code
STTD	Space Time Transmit Diversity
TFCI	Transport Format Combination Indicator
TSTD	Time Switched Transmit Diversity
TPC	Transmit Power Control
UE	User Equipment
UTRAN	UMTS Terrestrial Radio Access Network

5.3.3.8 CPCH Status Indicator Channel (CSICH)

The CPCH Status Indicator Channel (CSICH) is a fixed rate (SF=256) physical channel used to carry CPCH status information.

The CSICH is always associated with the physical channel used for transmission of CPCH AP-AICH and uses the same channelization and scrambling codes. Figure 23 illustrates the frame structure of the CSICH. The CSICH frame consists of 15 consecutive access slots (AS) each of length 40 bits. Each access slot consists of two parts, an unused part of 32 bits a0,….a31 and a Status Indicator (SI) part consisting of 8 bits a32,….a39. The phase reference for the CSICH is the CPICH.

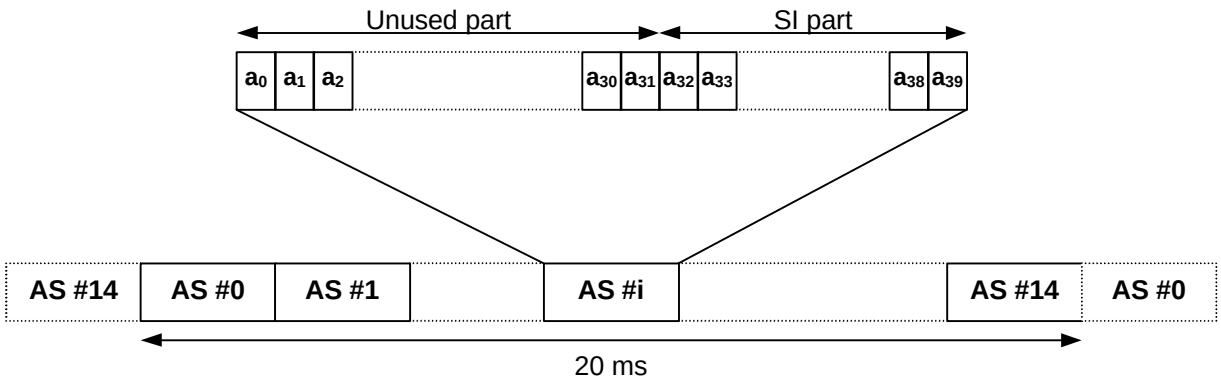


Figure 23: Structure of CPCH Status Indicator Channel (CSICH)

The bits in the SI part of each access slot are mapped to 120 bits in the complete CSICH frame the following way:

$b_k = a_{m,i}$

where the bit number in the CSICH frame is k= m*8+j-32, m is the access slot number and j is the bit number {32…..39} in the SI part of the access slot.

N Status Indicators $\{SI_0, \ldots, SI_{N-1}\}$ should be transmitted in each CSICH frame. The mapping from $\{SI_0, \ldots, SI_{N-1}\}$ to the CSICH bits $\{b_0, \ldots, b_{119}\}$ is according to table 22. The Status Indicators should be transmitted in all the access slots of the CSICH frame, even if some signatures and/or access slots are shared between CPCH and RACH.

Table 22: Mapping of Status Indicators (SI) to CSICH bits

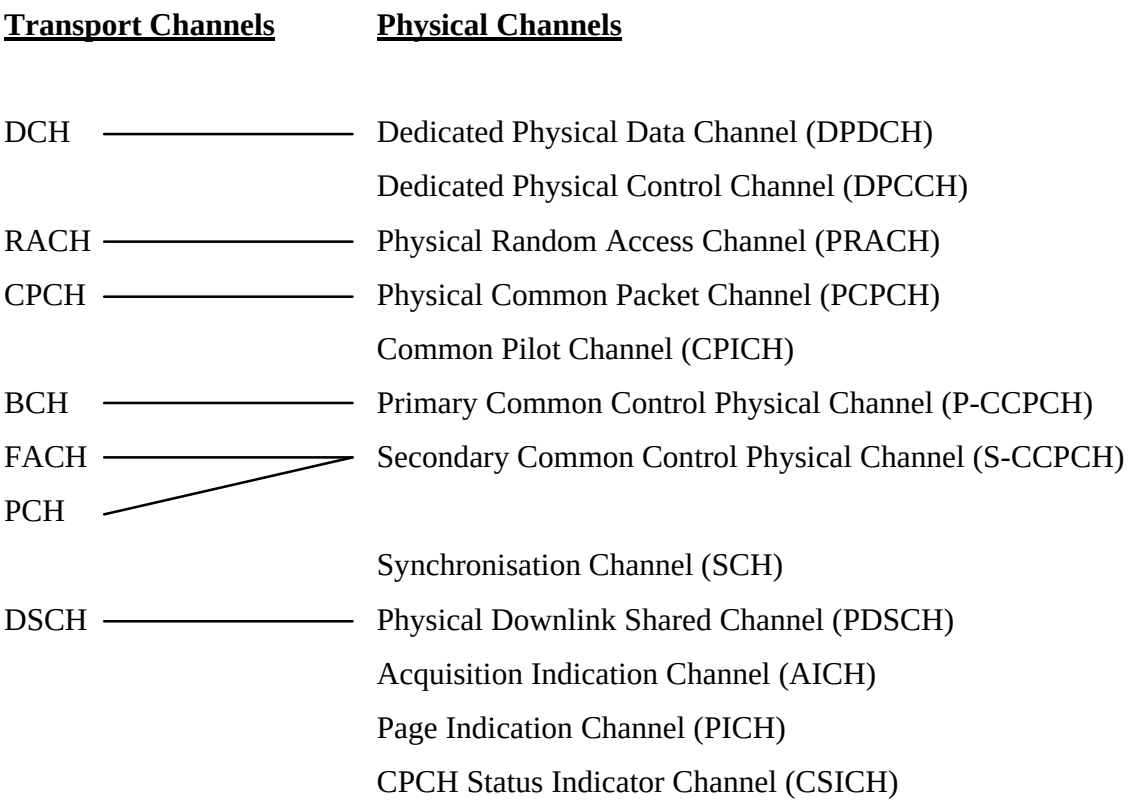
Number of SI per frame (N)	$SI_i = 1$	$SI_i = 0$
N=1	$\{b_0, \ldots, b_{119}\} = \{1,1,\ldots,1\}$	$\{b_0, \ldots, b_{119}\} = \{0,0,\ldots,0\}$
N=3	$\{b_{40i}, \ldots, b_{40i+39}\} = \{1,1,\ldots,1\}$	$\{b_{40i}, \ldots, b_{40i+39}\} = \{0,0,\ldots,0\}$
N=5	$\{b_{24i}, \ldots, b_{24i+23}\} = \{1,1,\ldots,1\}$	$\{b_{24i}, \ldots, b_{24i+23}\} = \{0,0,\ldots,0\}$
N=15	$\{b_{8i}, \ldots, b_{8i+7}\} = \{1,1,\ldots,1\}$	$\{b_{8i}, \ldots, b_{8i+7}\} = \{0,0,\ldots,0\}$
N=30	$\{b_{4i}, \ldots, b_{4i+3}\} = \{1, 1, 1, 1\}$	$\{b_{4i}, \ldots, b_{4i+3}\} = \{0, 0, 0, 0\}$
N=60	$\{b_{2i}, b_{2i+1}\} = \{1,1\}$	$\{b_{2i}, b_{2i+1}\} = \{0,0\}$

If a Status Indicator is set to "1" it is an indication that the CPCH associated with that Status Indicator is not available, otherwise it is an indication that the channel is free.

The mapping between CPCH and the Status Indicators is as follows: SI_i is associated with CPCH number (i mod N_{CPCH}), where the number of CPCH's is N_{CPCH} and N must be greater than or equal to N_{CPCH}. Note that the status of some CPCH may be transmitted less frequently than others.

6 Mapping of transport channels onto physical channels

Figure 21 summarises the mapping of transport channels onto physical channels.



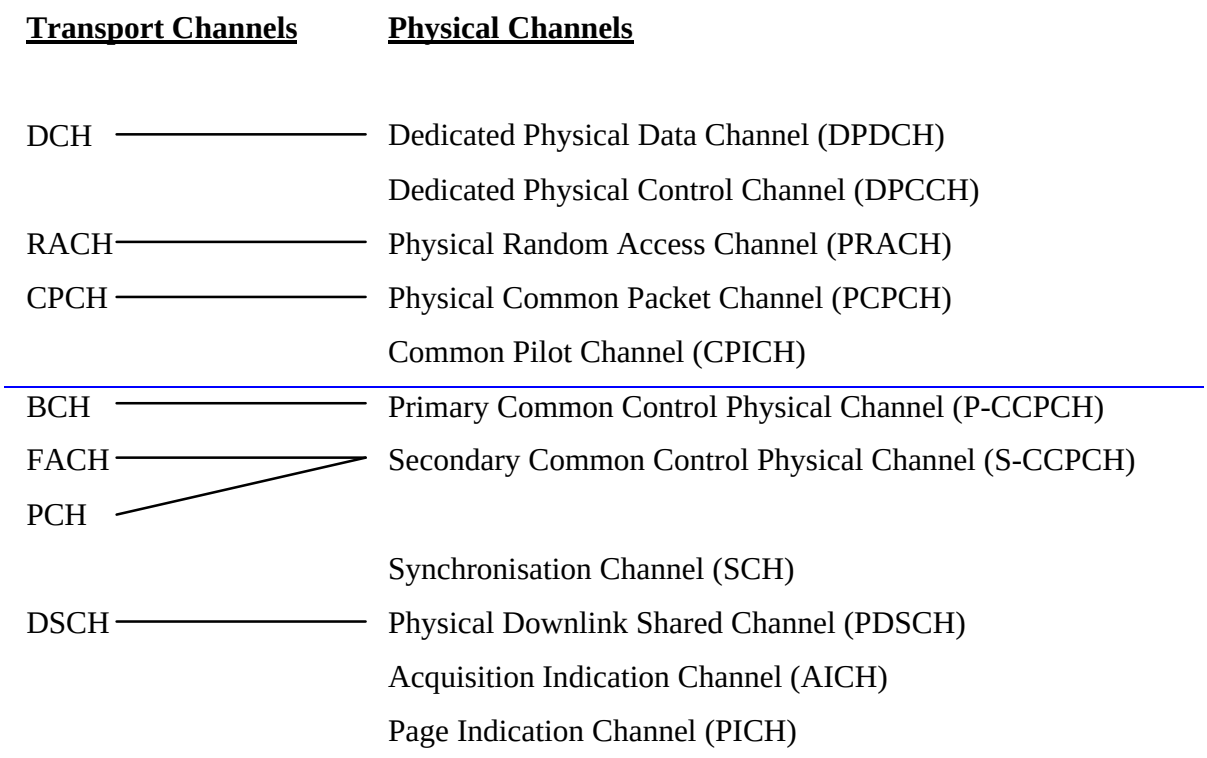


Figure 21: Transport-channel to physical-channel mapping

The DCHs are coded and multiplexed as described in [3] , and the resulting data stream is mapped sequentially (first-in-first-mapped) directly to the physical channel(s). The mapping of BCH and FACH/PCH is equally straightforward, where the data stream after coding and interleaving is mapped sequentially to the Primary and Secondary CCPCH respectively. Also for the RACH, the coded and interleaved bits are sequentially mapped to the physical channel, in this case the message part of the random access burst on the PRACH.

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25.214	CR	022r1	Current Version:	3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN#6 *list expected approval meeting # here ↑*

for approval [X]
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Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Philips **Date:** 2000~~1999~~-11~~1~~-12~~25~~

Subject: Inclusion of CPCH status monitoring in CPCH access procedure

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	[ ]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[X]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: In order to make use of broadcast CPCH status information, some changes are needed to the CPCH access procedure

Clauses affected: 6.2

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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6.2 CPCH Access Procedures

For each CPCH physical channel in a CPCH set allocated to a cell the following physical layer parameters are included in the System Information message:

- UL Access Preamble (AP) scrambling code.
- UL Access Preamble signature set
- The Access preamble slot sub-channels group
- AP- AICH preamble channelization code.
- UL Collision Detection(CD) preamble scrambling code.
- CD Preamble signature set
- CD preamble slot sub-channels group
- CD-AICH preamble channelization code.
- CPCH UL scrambling code.
- CPCH UL channelization code. (variable, data rate dependant)
- DPCCH DL channelization code.([512] chip)

NOTE: There may be some overlap between the AP signature set and CD signature set if they correspond to the same scrambling code.

The following are access, collision detection/resolution and CPCH data transmission parameters:

Power ramp-up, Access and Timing parameters (Physical layer parameters)

1) N_AP_retrans_max = Maximum Number of allowed consecutive access attempts (retransmitted preambles) if there is no AICH response. This is a CPCH parameter and is equivalent to Preamble_Retrans_Max in RACH.

2) $P_{RACH} = P_{CPCH}$ = Initial open loop power level for the first CPCH access preamble sent by the UE.

   [RACH/CPCH parameter]

3) ΔP_0 = Power step size for each successive CPCH access preamble.

   [RACH/CPCH parameter]

4) ΔP_1 = Power step size for each successive RACH/CPCH access preamble in case of negative AICH. A timer is set upon receipt of a negative AICH. This timer is used to determine the period after receipt of a negative AICH when ΔP_1 is used in place of ΔP_0.

   [RACH/CPCH parameter]

5) T_{cpch} = CPCH transmission timing parameter: This parameter is identical to PRACH/AICH transmission timing parameter.

   [RACH/CPCH parameter]

6) $L_{pc\text{-}preamble}$ = Length of power control preamble (0 or 8 slots)

   [CPCH parameter]

NOTE: It is FFS if ΔP_0 for the CPCH access may be different from ΔP_0 for the RACH access as defined in section 6.1.

The CPCH -access procedure in the physical layer is:

1) ~~The UE MAC function selects a CPCH transport channel from the channels available in the assigned CPCH set The CPCH channel selection includes a dynamic persistence algorithm (similar to RACH) for the selected CPCH channel.~~

2) ~~The UE MAC function builds a transport block set for the next TTI using transport formats which are assigned to the logical channel with data to transmit. The UE MAC funtion sends this transport block set to the UE PHY function for CPCH access and uplink transmission on the selected CPCH transport channel.~~

1) The identity of the CPCH transport channel and the AP signature which is to be used for this access attempt is supplied by the UE MAC function.

2) The UE shall test the value of the most recent transmission of the Status Indicator corresponding to the identified channel. If this indicates that the channel is 'not available' the UE shall abort the access attempt and send a failure message to the MAC layer.

3) The UE sets the preamble transmit power to the value $P_{CPCH\_}$ which is supplied by the MAC layer for initial power level for this CPCH access attempt.

4) The UE sets the AP Retransmission Counter to N_AP_Retrans_Max (value TBD).

5) The UE randomly selects a CPCH-AP signature from the signature set for this selected CPCH channel. The random function is TBD.

6) The UE Derives the available CPCH-AP access slots in the next two frames, defined by SFN and SFN+1 in the AP access slot sub-channel group with the help of SFN and table 7 in section 6.1. The UE randomly selects one access slot from the available access slots in the next frame, defined by SFN, if there is one available. If there is no access slot available in the next frame, defined by SFN then, randomly selects one access slot from the available access slots in the following frame, defined by SFN+1. Random function is TBD

7) The UE shall test the value of the most recent transmission of the Status Indicator corresponding to the identified CPCH transport channel. If this indicates that the channel is 'not available' the UE shall abort the access attempt and send a failure message to the MAC layer. Otherwise the UE transmits the AP using the UE selected uplink access slot, and the MAC supplied signature and initial preamble transmission power

~~The UE transmits the AP using the MAC supplied uplink access slot, signature, and initial preamble transmission power~~.

8) If the UE does not detect the positive or negative acquisition indicator corresponding to the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE~~:~~ shall test the value of the most recent transmission of the Status Indicator corresponding to the identified CPCH transport channel. If this indicates that the channel is 'not available' the UE shall abort the access attempt and send a failure message to the MAC layer. Otherwise the following steps shall be executed:

   a) Selects the next uplink access slot from among the access slots in the CPCH-AP sub-channel group, as selected in 4.1. There must be a minimum distance of three or four access slots from the uplink access slot in which the last preamble was transmitted depending on the CPCH/AICH transmission timing parameter. [NOTE: Use of random function here to select access slot is FFS for RACH and CPCH.].

   b) Increases the preamble transmission power with the specified offset ΔP . Power offset ΔP_0 s is used unless the negative AICH timer is running, in which case ΔP_1 is used instead..

   c) Decrease the Preamble Retransmission Counter by one.

   d) If the Preamble Retransmission Counter < 0, the UE aborts the access attempt and sends a failure message to the MAC layer.

9) If the UE detects the AP-AICH_nak (negative acquisition indicator) corresponding to the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE aborts the access attempt and sends a failure message to the MAC layer. The UE sets the negative AICH timer to indicate use of ΔP_1 use as the preamble power offset until timer expiry

10) Upon reception of AP-AICH, the access segment ends and the contention resolution segment begins. In this segment, the UE randomly selects a CD signa~~t~~ture from the signature set and also select one-CD access slot

sub-channel from the CD sub-channel group supported in the cell.and transmits a CD Preamble, then waits for a CD-AICH from the Node B.

11) If the UE does not receive a CD-AICH in the designated slot, the UE aborts the access attempt and sends a failure message to the MAC layer.

12) If the UE receives a CD-AICH in the designated slot with a signature that does not match the signature used in the CD Preamble, the UE aborts the access attempt and sends a failure message to the MAC layer.

13) If the UE receives a CD-AICH with a matching signature, the UE transmits the power control preamble $\tau_{cd\text{-}p\text{-}pc\text{-}p}$ ms later as measured from initiation of the CD Preamble. . The transmission of the message portion of the burst starts immediately after the power control preamble.

14) During CPCH Packet Data transmission, the UE and UTRAN perform inner-loop power control on both the CPCH UL and the DPCCH DL.

15) If the UE detects loss of DPCCH DL during transmission of the power control preamble or the packet data, the UE halts CPCH UL transmission, aborts the access attempt and sends a failure message to the MAC layer.

16) If the UE completes the transmission of the packet data, the UE sends a success message to the MAC layer.

Note: In testing a Status Indicator in steps 2) 7) and 8) a maximum delay of 1ms is permitted between the time at which the end of that Status Indicator transmission is received by the UE and the time at which any new status information is used by the UE.