3GPP TSG RAN WG1 ***TSGR1#10(00)175***

January 18 – 21, 2000, Beijing, China

Agenda item:

Source: **Philips**

Title: **CR 25.211 - 013r5 for CPCH status broadcast**

Document for: **Decision**

Introduction

This contains an updated version of CR 25.211 013r3 found in TSGR1#10(00)157. It contains text to add the definition of a CPCH status broadcast channel to 25.211. Following discussion, the main features of the proposal are as follows:

- A new physical channel (CSICH) is defined where information is transmitted in the unused parts of the CPCH AP-AICH, and the description of AICH in section 5.3.3.6 is updated to indicate that the rfelevant unused parts are not transmitted.
- A new section is added: 5.3.3.8 CPCH Status Indicator Channel (CSICH)
- New terms CSICH and Status Indicator (SI) added to section 3 Abbreviations.
- CSICH added to list of channels on which STTD can be applied in 5.3.1
- CSICH included in list of channels in section 6
- 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.
- 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 broadcast status information is assumed to be provided by higher layers (but CSICH is not defined as a transport channel).
- In accordance with the current assumptions in WG2, the status information indicates whether a given Transport Format is available for use in CPCH. The transport format set is assumed to be provided by higher layers e.g. defined in the CPCH set information. The mapping between transport formats and status indicators is defined in 5.3.3.8. This mapping is independent of whether channel assignment is active or not.

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Beijing, China, Jan 18 – 21, 2000

Document R1-00-0175
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.211	**CR**	**013r5**	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 #7	for approval	X	Strategic		*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic		*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: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Philips **Date:** 2000-01-20

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, 5.3.1, 5.3.3.6, 5.3.3.8, 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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<--------- double-click here for help and instructions on how to create a CR.

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

5.3.1 Downlink Transmit Diversity

Table 10 summarizes the possible application of open and closed loop Transmit diversity modes on different downlink physical channels. Simultaneous use of STTD and closed loop modes on DPCH and PDSCH is not allowed.

Table 10: Application of Tx diversity modes on downlink physical channels
"X" – can be applied, "–" – not applied

Channel	Open loop mode		Closed loop
	TSTD	STTD	Mode
P-CCPCH	–	X	–
SCH	X	–	–
S-CCPCH	–	X	–
DPCH	–	X	X
PICH	–	X	–
PDSCH (associated with DPCH)	–	X	X
AICH	–	X	–
CSICH	–	X	–

5.3.3.6 Acquisition Indicator Channel (AICH)

The Acquisition Indicator channel (AICH) is a physical channel used to carry Acquisition Indicators (AI). Acquisition Indicator AI_s corresponds to signature s on the PRACH or PCPCH. Note that for PCPCH, the AICH either corresponds to an access preamble or a CD preamble. The AICH corresponding to the access preamble is an AP-AICH and the AICH corresponding to the CD preamble is a CD-AICH. The AP-AICH and CD-AICH use different channelization codes, see further[4], Section 4.3.3.2.

Figure 19 illustrates the structure of the AICH. The AICH consists of a repeated sequence of 15 con~~s~~ecutive *access slots* (AS), each of length 40 bit intervals. Each access slot consists of two parts, an *Acquisition-Indicator* (AI) part consisting of 32 real-valued symbols a_0, …, a_{31} and an unused part consisting of 8 real-valued symbols a_{32}, …, a_{39}.

The phase reference for the AICH is the Primary CPICH.

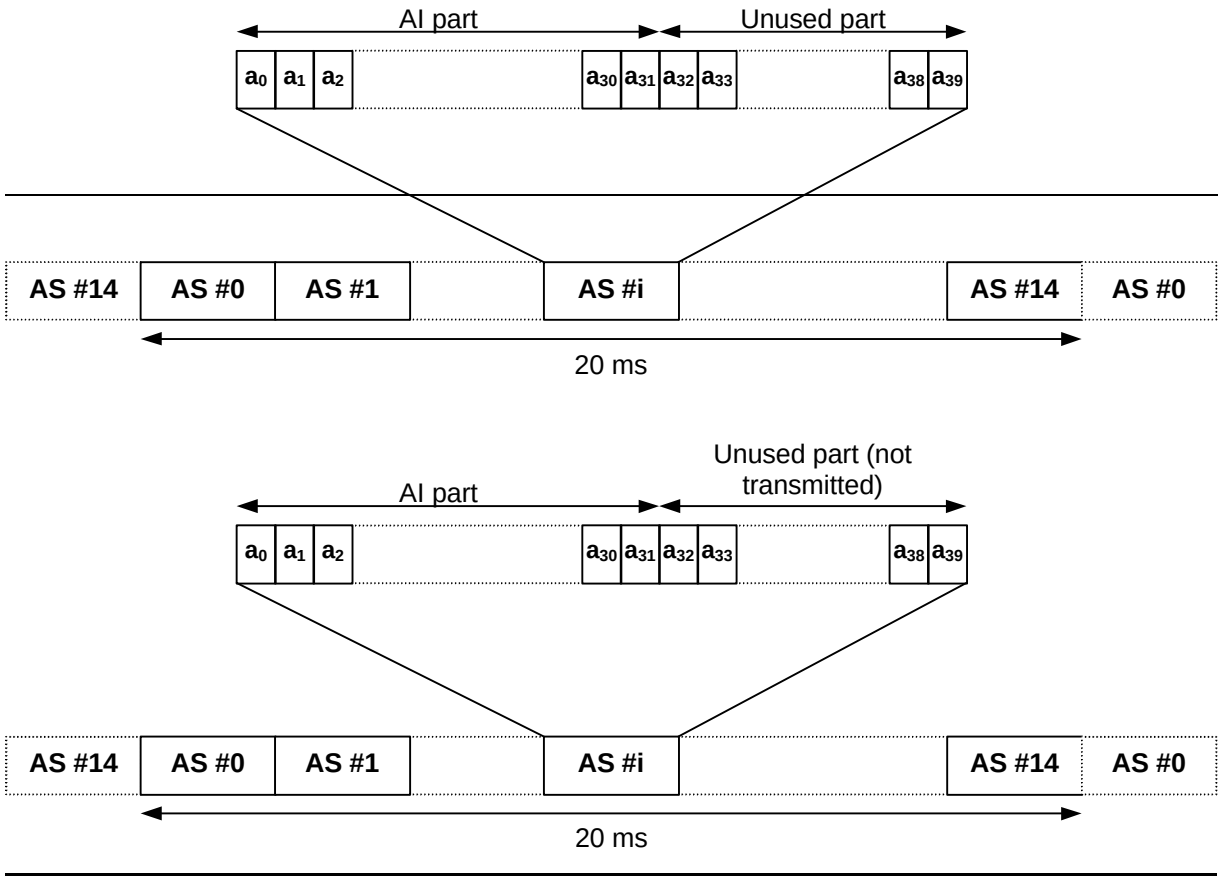


Figure 19: Structure of Acquisition Indicator Channel (AICH)

The real-valued symbols a_0, a_1, …, a_{31} in Figure 19 are given by

$$a_j = \sum_{s=0}^{15} AI_s b_{s,j}$$

where AI_s, taking the values +1, -1, and 0, is the acquisition indicator corresponding to signature s and the sequence $b_{s,0}$, …, $b_{s,31}$ is given by Table 20.

The real-valued symbols a_{32}, a_{33}, …, a_{39} in Figure 19 are not transmitted ~~undefined~~because this part of the slot may be used by CSICH (see sub clause 5.3.3.8)~~.~~

In case STTD-based open-loop transmit diversity is applied to AICH, STTD encoding according to section 5.3.1.1.1 is applied to each sequence $b_{s,0}$, $b_{s,1}$, ..., $b_{s,31}$ separately before the sequences are combined into AICH symbols a_0, …, a_{31}.

Table 20: AICH signature patterns

s	$b_{s,0}$, $b_{s,1}$…, $b_{s,31}$
0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1	1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1
2	1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1
3	1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1
4	1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1
5	1 1 -1 -1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1
6	1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1
7	1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1
8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
9	1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1
10	1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1
11	1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1
12	1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1 1 1 1 1
13	1 1 -1 -1 1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1 1 1 -1 -1
14	1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 1 1 1 1 -1 -1 -1 -1
15	1 1 -1 -1 -1 -1 1 1 -1 -1 1 1 1 1 -1 -1 -1 -1 1 1 1 1 -1 -1 1 1 -1 -1 -1 -1 1 1

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.

A CSICH is always associated with a 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, which is not transmitted, and a Status Indicator (SI) part consisting of 8 bits a32,….a39. The modulation used by the CSICH is the same as for the PICH. The phase reference for the CSICH is the CPICH.

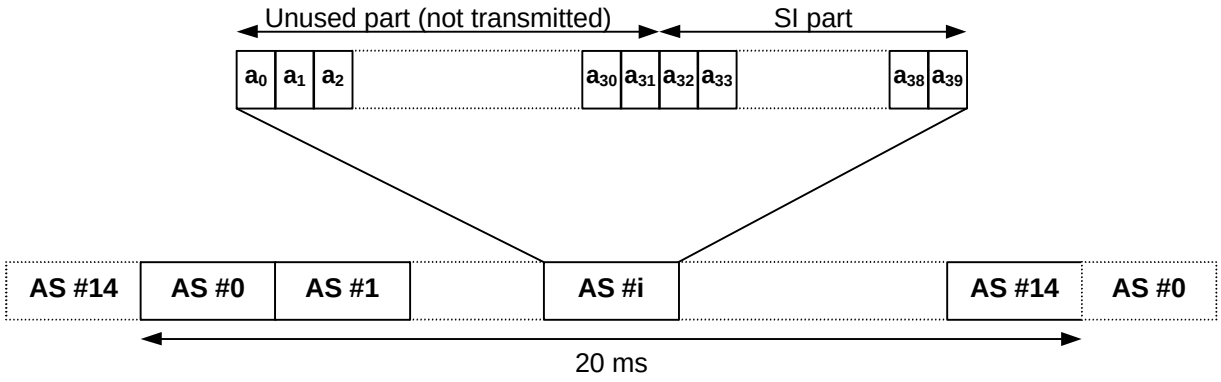


Figure 23: Structure of CPCH Status Indicator Channel (CSICH)

N Status Indicators $\{SI_0, \ldots, SI_{N-1}\}$ shall 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 shall 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	$\{b_{2i}, b_{2i+1}\} = \{1,1\}$	$\{b_{2i}, b_{2i+1}\} = \{0,0\}$

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

$a_{m,i} = b_k$

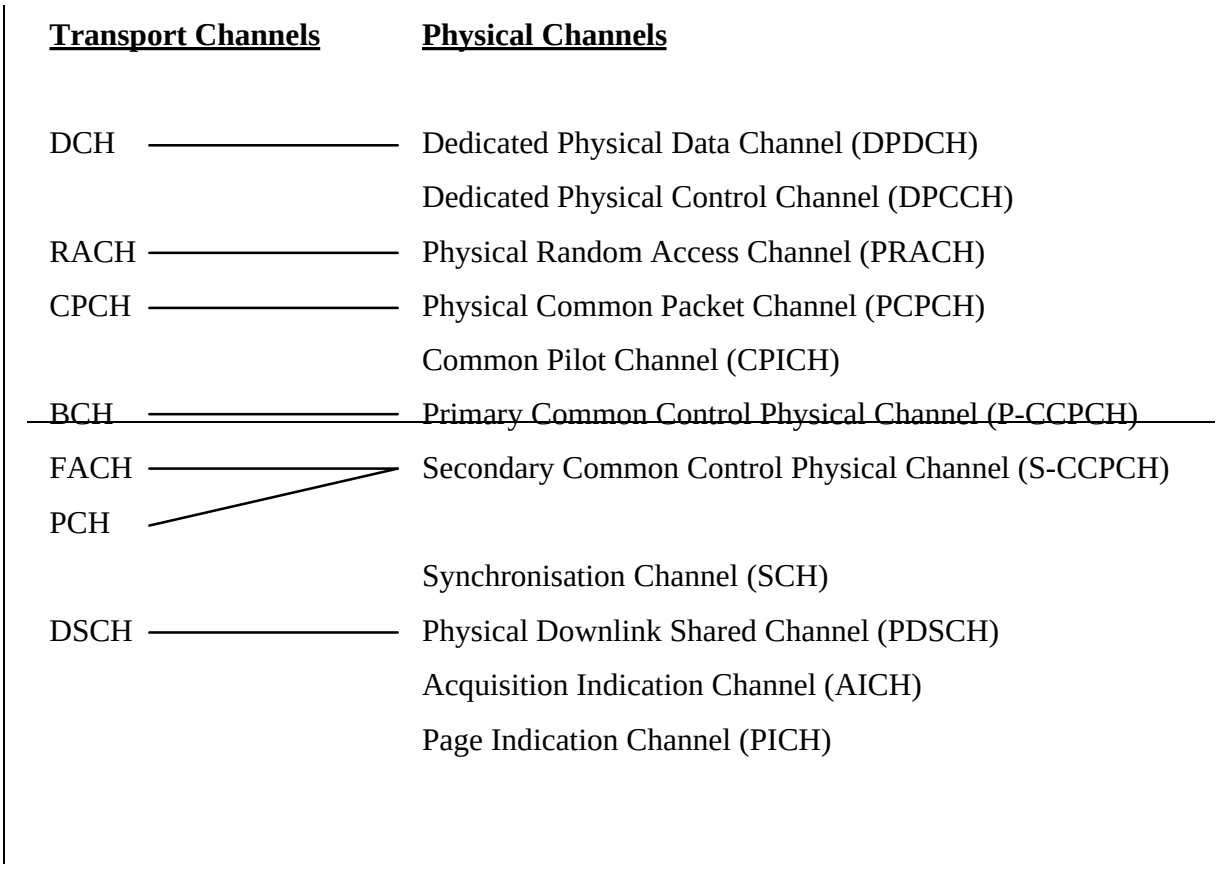
where k is the bit number in the CSICH frame, given by k= m*8+j-32, m is the access slot number, and j is the bit number {32…..39} in the SI part of the access slot.

When transmit diversity is employed for the CSICH, STTD encoding is used on the CSICH bits as described in section 5.3.1.1.1.

The number and values of the Status Indicators are set by higher layers. If a Status Indicator is set to "1" it is an indication that the associated CPCH Transport Format is not available, otherwise it is an indication that it is free. At the UE Status Indicator SI_n shall be associated with Transport Format number (n mod N_{format}) where N_{format} is the size of the CPCH Transport Format Set and N should have a value greater than or equal to N_{format}.

6 Mapping of transport channels onto physical channels

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



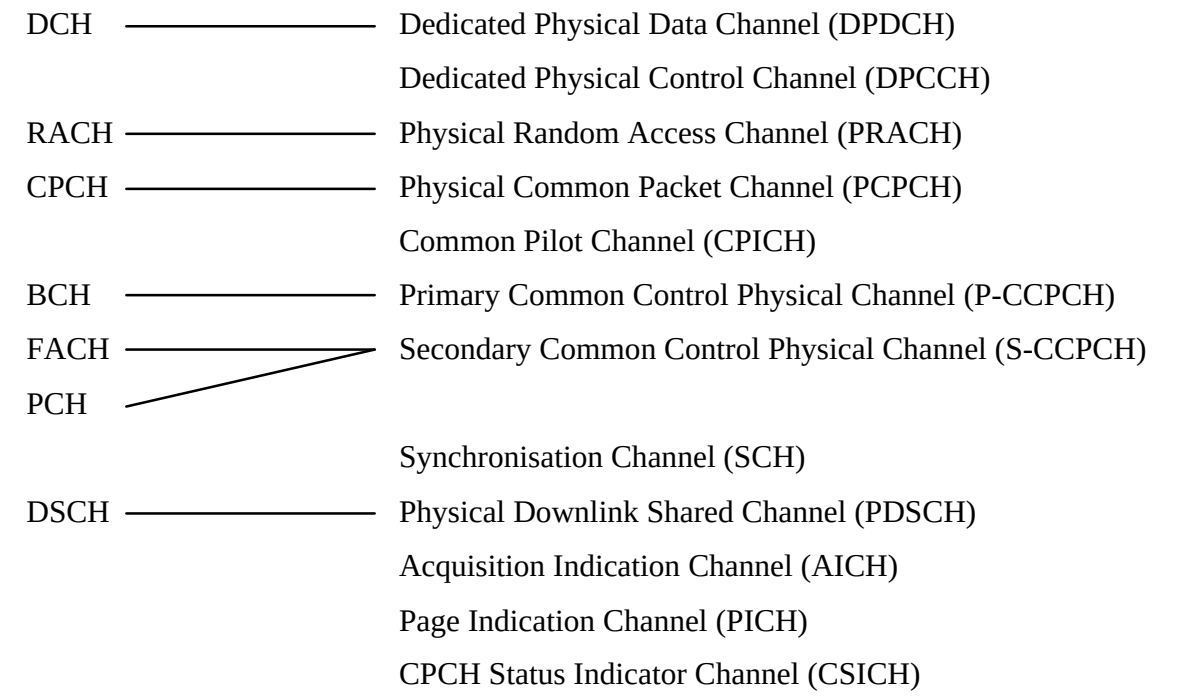


Figure 21: Transport-channel to physical-channel mapping

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.