TSG-RAN Meeting #28
Quebec, Canada, 01-03 June 2005

RP-050318
agenda item 8.11

Source: **TSG-RAN WG2.**

Title: **25.302 CRs on TEI6**

The following CR is in RP-050318:

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.302	0152	-	Rel-6	Correction to the description of RACH transport channel.	F	6.3.0	6.4.0	R2-051158	TEI6
25.302	0153	-	Rel-6	Add physical layer signalling information in the figures of UE's physical layer model for TDD mode.	F	6.3.0	6.4.0	R2-051159	TEI6

CR-Form-v7

CHANGE REQUEST

⌘ **25.302** **CR** **0152** ⌘ **rev** **-** ⌘ Current version: **6.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘	Correction to the description of RACH transport channel.
Source:	⌘	RAN WG2
Work item code:	⌘	TEI6 ***Date:*** ⌘ 07/04/2005
Category:	⌘	**F** ***Release:*** ⌘ Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	RACH transport channel should be used in both FDD and TDD modes. However in subclause 6.1, RACH is described as: 'It shows the models for DCH, E-DCH, RACH, CPCH (the latter three used in FDD mode only) and USCH (TDD only).' It means RACH is described as FDD mode only. Therefore, it should be corrected.
Summary of change:	⌘	Rewrite to remove the editorial errors.
Consequences if not approved:	⌘	Misunderstanding on RACH transport channel for TDD mode may occur.

Clauses affected:	⌘	6.1

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under

ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6 Model of physical layer of the UE

6.1 Uplink models

Figure 2 shows models of the UE's physical layer in the uplink for both FDD and TDD mode. It shows the models for DCH, RACH, E-DCH, ~~RACH,~~ CPCH (the latter ~~three~~ two used in FDD mode only) and USCH (TDD only). Some restriction exist for the use of different types of transport channel at the same time, these restrictions are described in the clause "UE Simultaneous Physical Channel combinations". More details can be found in [3] and [4].

…

CR-Form-v7

CHANGE REQUEST

⌘ 25.302 CR 0153 ⌘ rev - ⌘ Current version: 6.3.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Add physical layer signalling information in the figures of UE's physical layer model for TDD mode.
Source:	⌘	RAN WG2
Work item code:	⌘	TEI6 **Date:** ⌘ 07/04/2005
Category:	⌘	F **Release:** ⌘ Rel-6

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	In case of TDD, the traffic burst also carries Transmit Power Control (TPC) and Synchronisation Shift (SS) symbols (1.28Mcps TDD only). However, in the figures of UE's physical layer model, physical layer signalling, TPC and SS are missing in DPCH and PDSCH, PUSCH.
Summary of change:	⌘	Add TPC and SS in the figures of physical layer model.
Consequences if not approved:	⌘	Misunderstanding on UE's physical layer model for TDD may occur.

Clauses affected:	⌘	6.1, 6.2

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments: ⌘

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6 Model of physical layer of the UE

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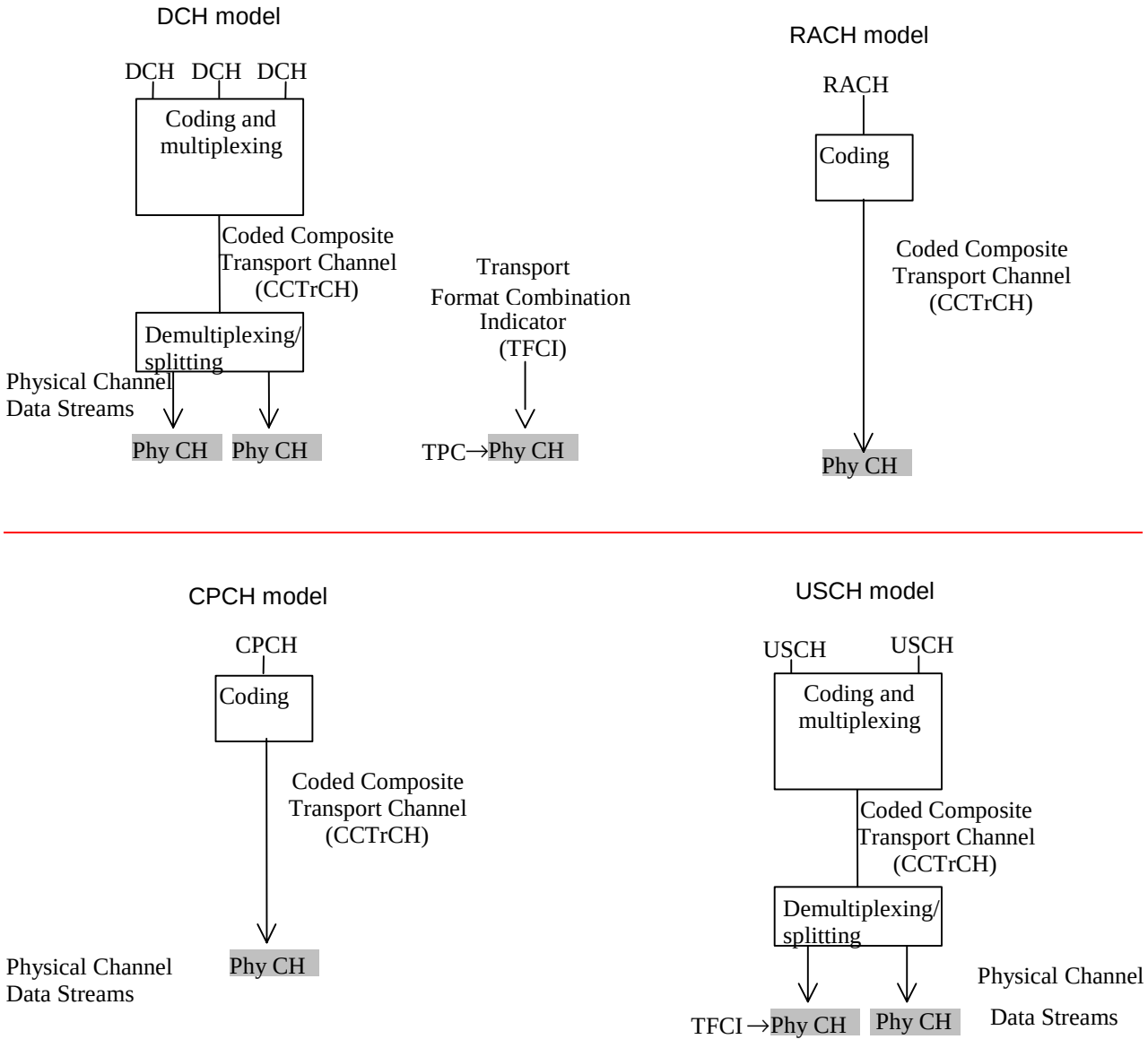
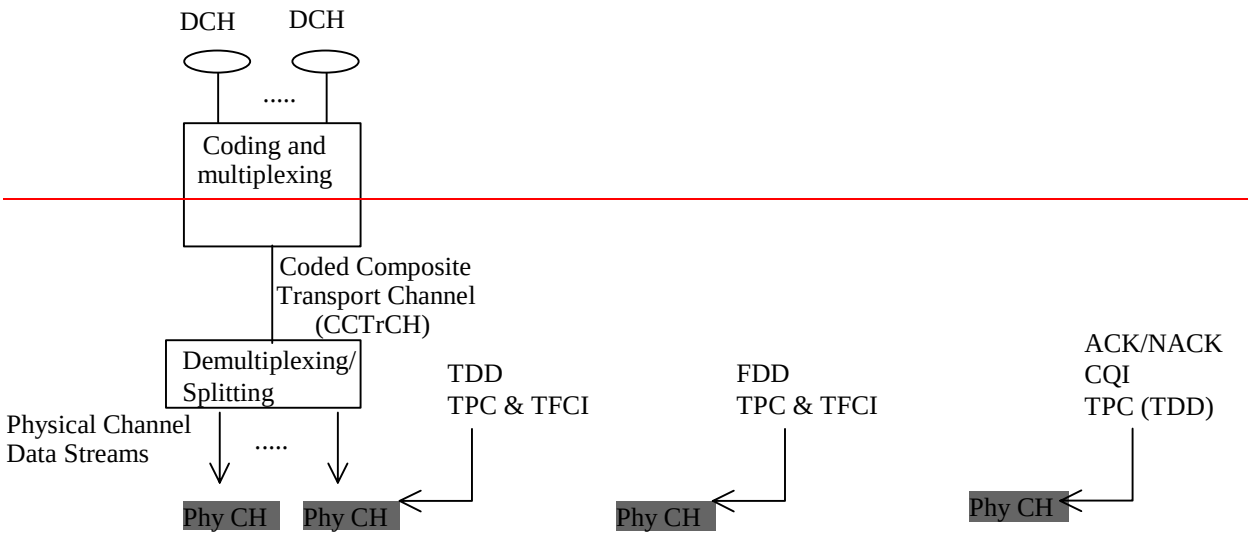
Figure 2 shows models of the UE's physical layer in the uplink for both FDD and TDD mode. It shows the models for DCH, E-DCH, RACH, CPCH (the latter three used in FDD mode only) and USCH (TDD only). Some restriction exist for the use of different types of transport channel at the same time, these restrictions are described in the clause "UE Simultaneous Physical Channel combinations". More details can be found in [3] and [4].

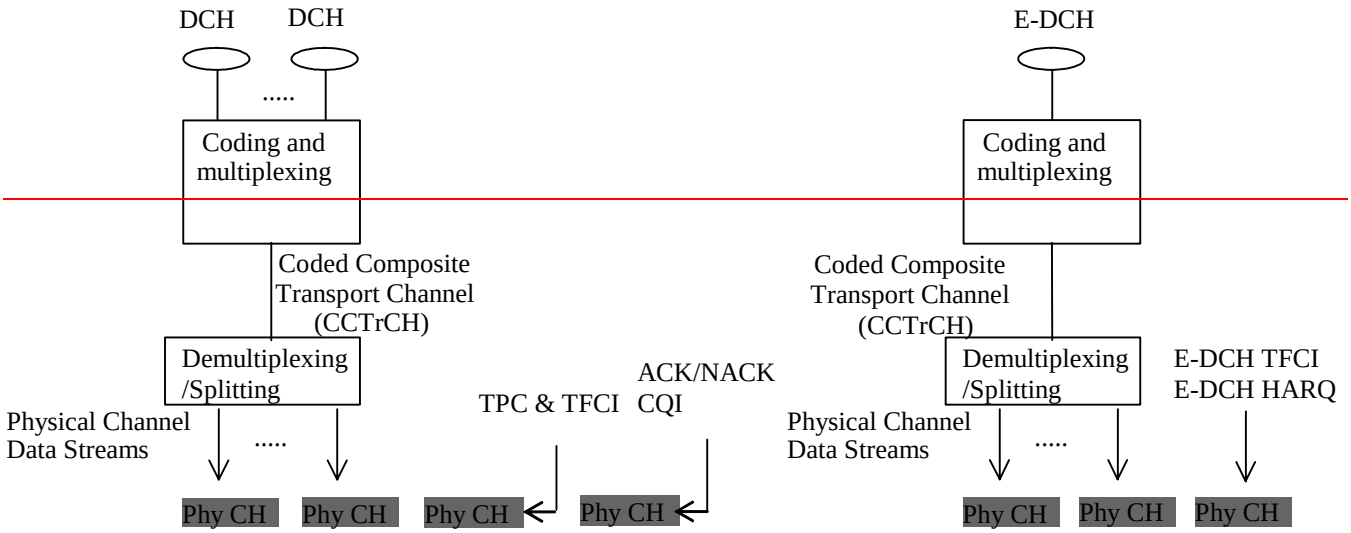
Figure 2 shows models of the UE's physical layer in the uplink for both FDD and TDD mode. It shows the models for DCH, E-DCH, RACH, CPCH (the latter three used in FDD mode only) and USCH (TDD only). Some restriction exist for the use of different types of transport channel at the same time, these restrictions are described in the clause "UE Simultaneous Physical Channel combinations". More details can be found in [3] and [4].



DCH model with HS-DSCH support



DCH and E-DCH model with HS-DSCH support



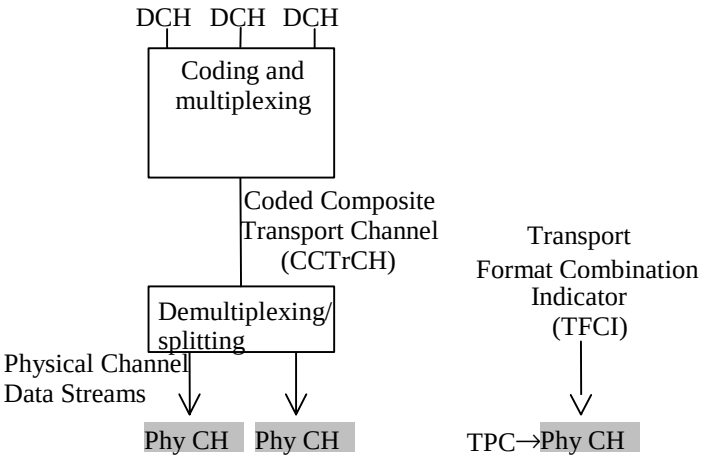
~~NOTE 1: CPCH is for FDD only.~~

~~NOTE 2: USCH is for TDD only.~~

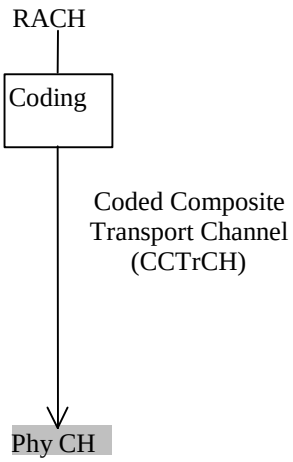
~~NOTE 3: E-DCH is for FDD only.~~

~~Figure 2: Model of the UE's physical layer – uplink~~

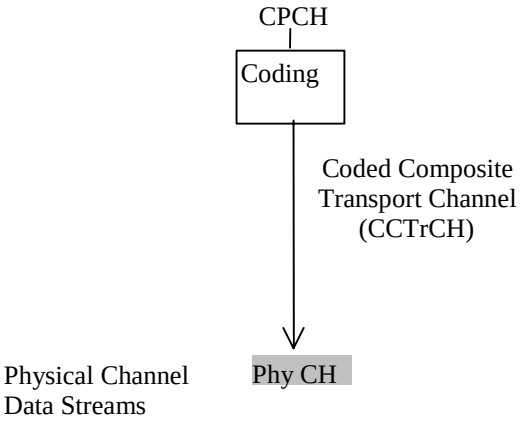
DCH model



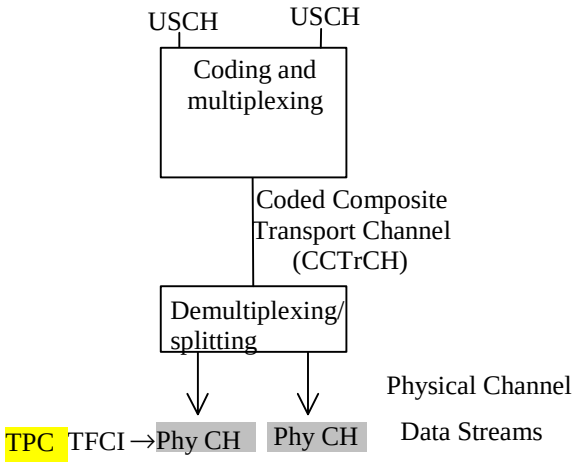
RACH model



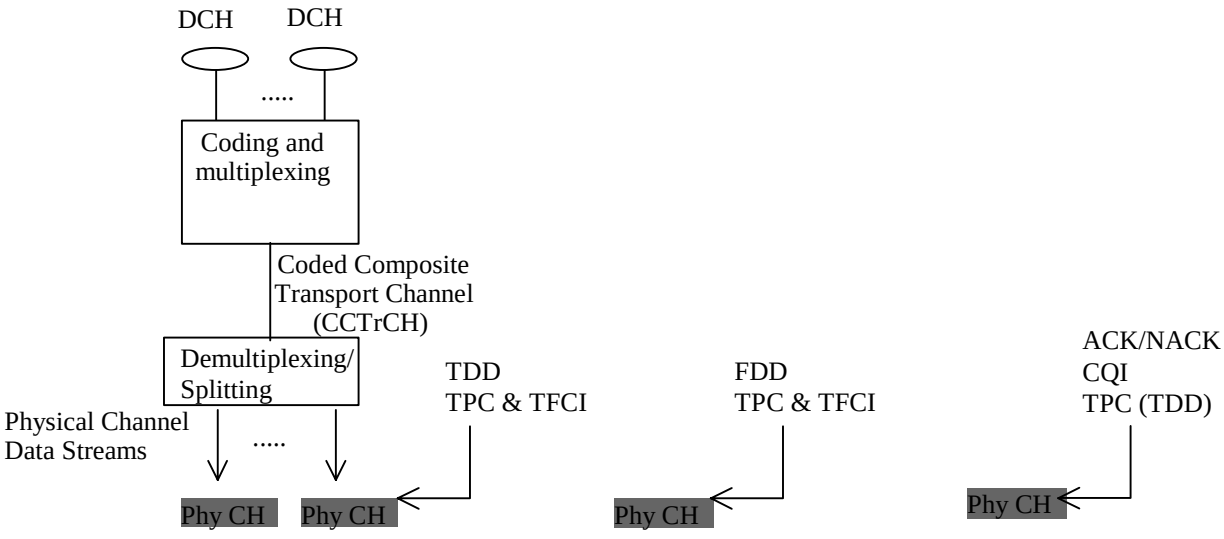
CPCH model



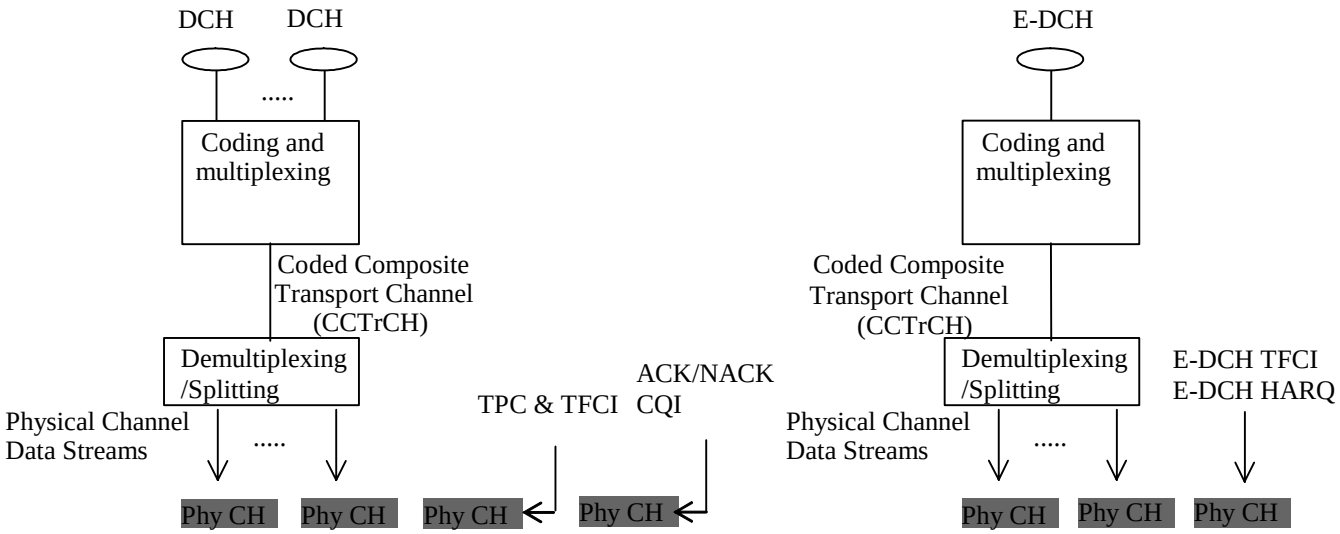
USCH model



DCH model with HS-DSCH support



DCH and E-DCH model with HS-DSCH support



NOTE 1: CPCH is for FDD only.

NOTE 2: USCH is for TDD only.

NOTE 3: E-DCH is for FDD only.

Figure 2: Model of the UE's physical layer – uplink

The DCH model shows that one or several DCHs can be processed and multiplexed together by the same coding and multiplexing unit. The detailed functions of the coding and multiplexing unit are not defined in the present document but in [3] and [4]. The single output data stream from the coding and multiplexing unit is denoted *Coded Composite Transport Channel (CCTrCH)*.

The bits on a CCTrCH Data Stream can be mapped on the same Physical Channel and should have the same C/I requirement.

On the downlink, multiple CCTrCH can be used simultaneously with one UE. In the case of FDD, only one fast power control loop is necessary for these different CCtrCH, but the different CCtrCH can have different C/I requirements to provide different QoS on the mapped Transport Channels. In the case of TDD, different power control loops can be applied for different CCTrCH. One physical channel can only have bits coming from the same CCTrCH.

On the uplink and in the case of FDD, when E-DCH is not configured, only one CCTrCH can be used simultaneously. On the uplink and in the case of TDD, multiple CCTrCH can be used simultaneously.

On the uplink and in case of FDD, two CCTrCHs are used simultaneously when the E-DCH Transport Channel is configured.

When multiple CCTrCH are used by one UE, one or several TFCI can be used, but each CCTrCH has only zero or one corresponding TFCI. In the case of FDD, these different words are mapped on the same DPCCH. In the case of TDD, these different TFCIs can be mapped on different DPCH.

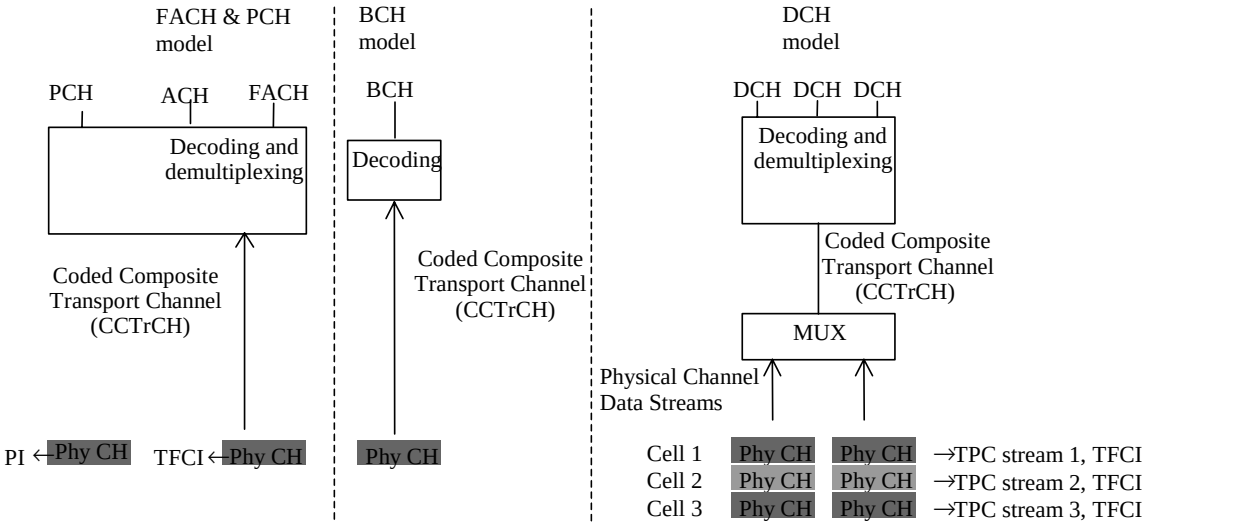
The data stream of the CCTrCH is fed to a data demultiplexing/splitting unit that demultiplexes/splits the CCTrCH's data stream onto one or several *Physical Channel Data Streams*.

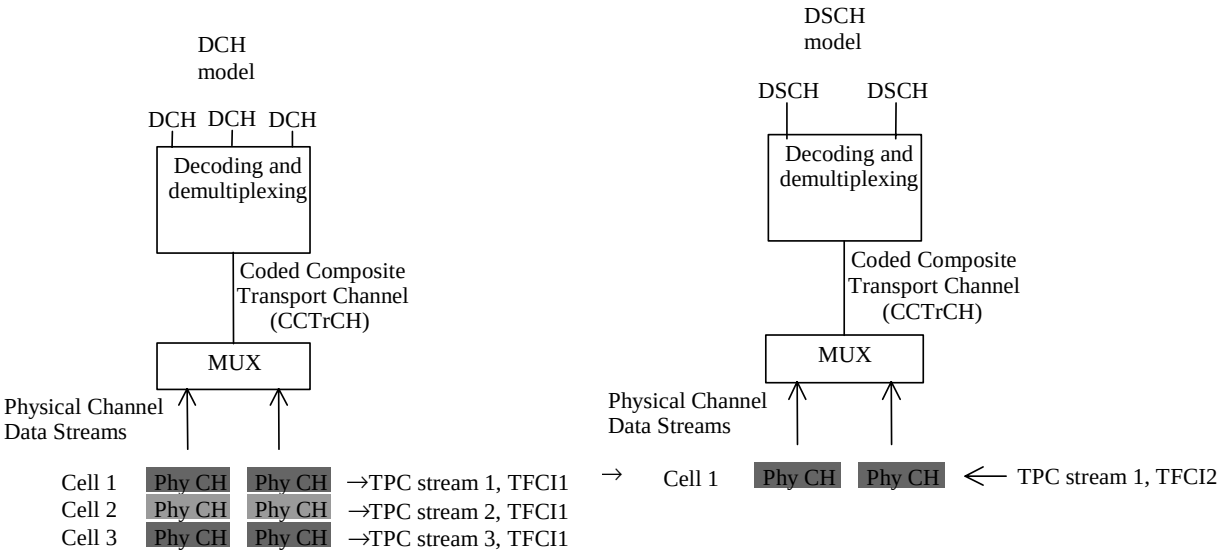
The current configuration of the coding and multiplexing unit is either signalled to, or optionally blindly detected by, the network for each 10 ms frame. If the configuration is signalled, it is represented by the *Transport Format Combination Indicator (TFCI)* bits. Note that the TFCI signalling only consists of pointing out the current transport format combination within the already configured transport format combination set. In the uplink there

is only one TFCI representing the current transport formats on all DCHs of one CCTrCH simultaneously. In FDD mode, the physical channel data stream carrying the TFCI is mapped onto the physical channel carrying the power control bits and the pilot. In TDD mode the TFCI is time multiplexed onto the same physical channel(s) as the DCHs. The exact locations and coding of the TFCI are signalled by higher layers.
The DCH and USCH have the possibility to perform Timing Advance in TDD mode.
The model for the RACH case shows that RACH is a common type transport channel in the uplink. RACHs are always mapped one-to-one onto physical channels (PRACHs), i.e. there is no physical layer multiplexing of RACHs, and there can only be one RACH TrCH and no other TrCH in a RACH CCTrCH. Service multiplexing is handled by the MAC layer. In one cell several RACHs/PRACHs may be configured. If more than one PRACH is configured in a cell, the UE performs PRACH selection as specified in [4].
In FDD, the RACHs mapped to the PRACHs may all employ the same Transport Format and Transport Format Combination Sets, respectively. It is however also possible that individual RACH Transport Format Sets are applied on each available RACH/PRACH.
In TDD, there is no TFCI transmitted in the burst, and therefore each RACH is configured with a single transport format within its TFS. The RACHs mapped to the PRACHs may all employ the same Transport Format. It is however also possible that individual RACH Transport Formats are applied on each available RACH/PRACH combination.
The available pairs of RACH and PRACHs and their parameters are indicated in system information. In FDD mode, the various PRACHs are distinguished either by employing different preamble scrambling codes, or by using a common scrambling code but distinct (non-overlapping) partitions of available signatures and available subchannels. In TDD mode, the various PRACHs are distinguished either by employing different timeslots, or by using a common timeslot but distinct (non-overlapping) partitions of available channelisation codes and available subchannels. Examples of RACH/PRACH configurations are given in [6].
The CPCH, which is another common type transport channel, has a physical layer model as shown in figure2. There is always a single CPCH transport channel mapped to a PCPCH physical channel which implies a one-to-one correspondence between a CPCH TFI and the TFCI conveyed on PCPCH. There can only be one CPCH TrCH and no other TrCH in a CPCH CCTrCH. A CPCH transport channel belongs to a CPCH set which is identified by the application of a common, CPCH set-specific scrambling code for access preamble and collision detection, and multiple PCPCH physical channels. Each PCPCH shall employ a subset of the Transport Format Combinations implied by the Transport Format Set of the CPCH set. A UE can request access to CPCH transport channels of a CPCH set, which is assigned when the service is configured for CPCH transmission.
In FDD in case of a configured HS-DSCH one physical channel (HS-DPCCH) is configured for the reporting of HS-DSCH transport block acknowledgement / negative acknowledgement and channel quality indicator. In TDD in case of a configured HS-DSCH a shared physical channel (HS-SICH) is configured for the reporting of HS-DSCH transport block acknowledgement / negative acknowledgement, channel quality indicator and transmit power control symbols.
The E-DCH is applicable to the FDD mode only. There can only be one E-DCH TrCH and no other TrCH in a E-DCH CCTrCH. The E-DCH CCTrCH is carried on E-DPDCH(s) physical channel(s). E-DCH TFCI and E-DCH HARQ information are carried on a E-DPCCH physical channel. It is FFS whether some E-DCH scheduling information is also carried by the physical layer.

6.2 Downlink models

Figure 3 and figure 4 show the model of the UE's physical layer for the downlink in FDD and TDD mode, respectively. Note that there is a different model for each transport channel type.

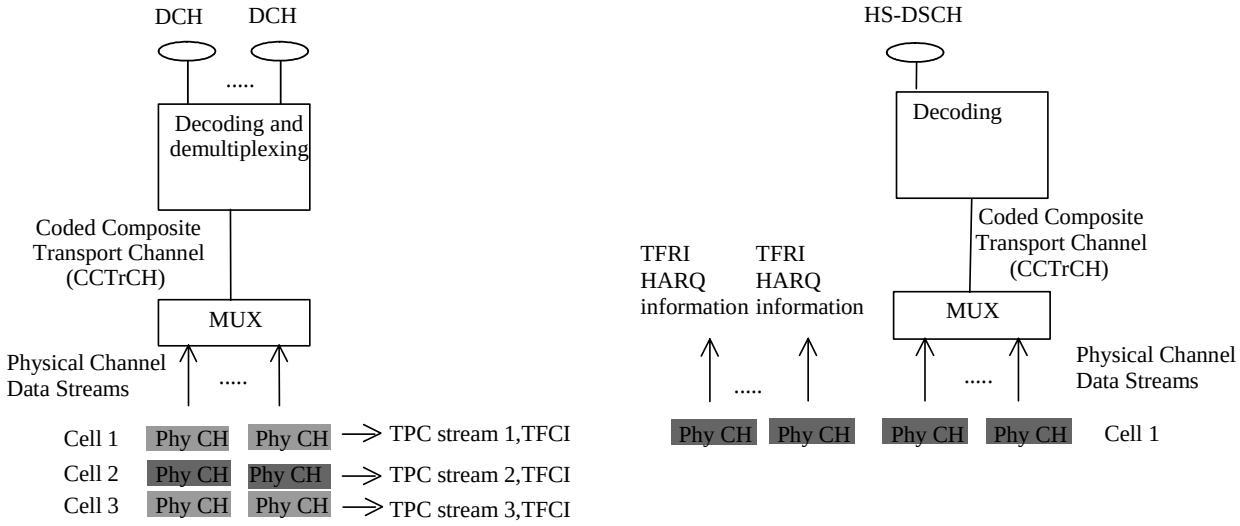




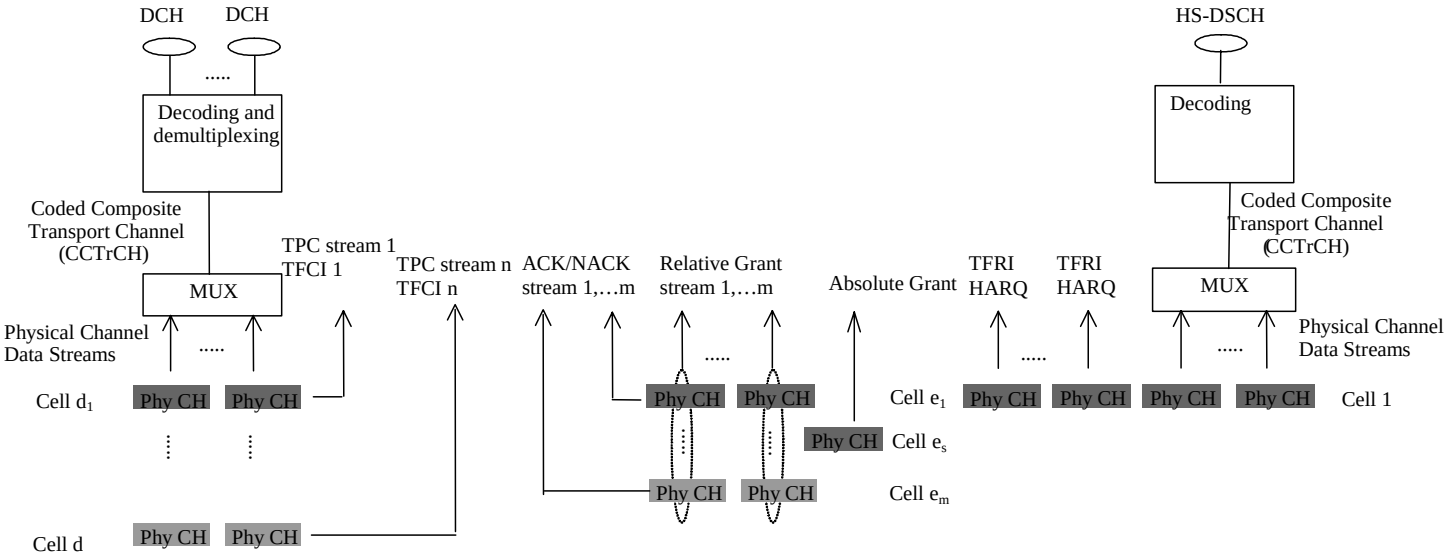
DCH associated with DSCH

Note (1) – TFCI1 indicates the DCH specific TFC and TFCI2 indicates the DSCH specific TFC and also the PDSCH channelisation code(s)

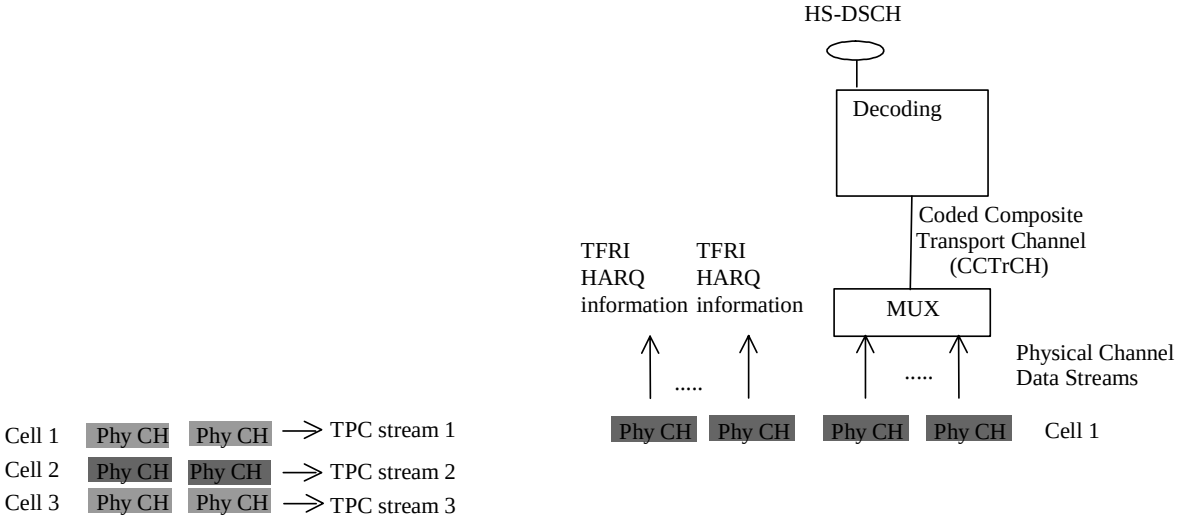
DCH model with HS-DSCH(s)



DCH and HS-DSCH model with E-DCH support



HS-DSCH(s) with F-DPCH model



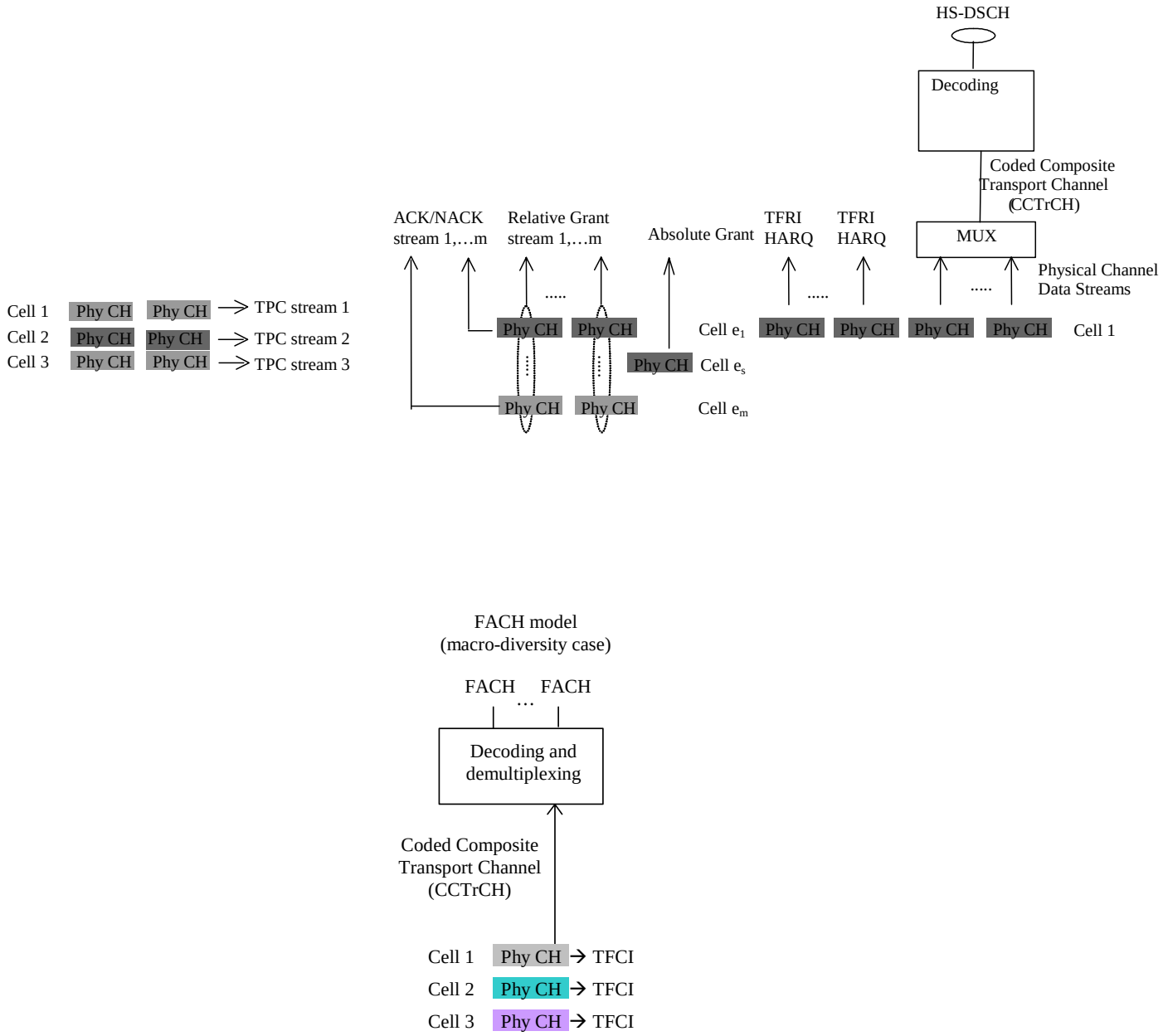
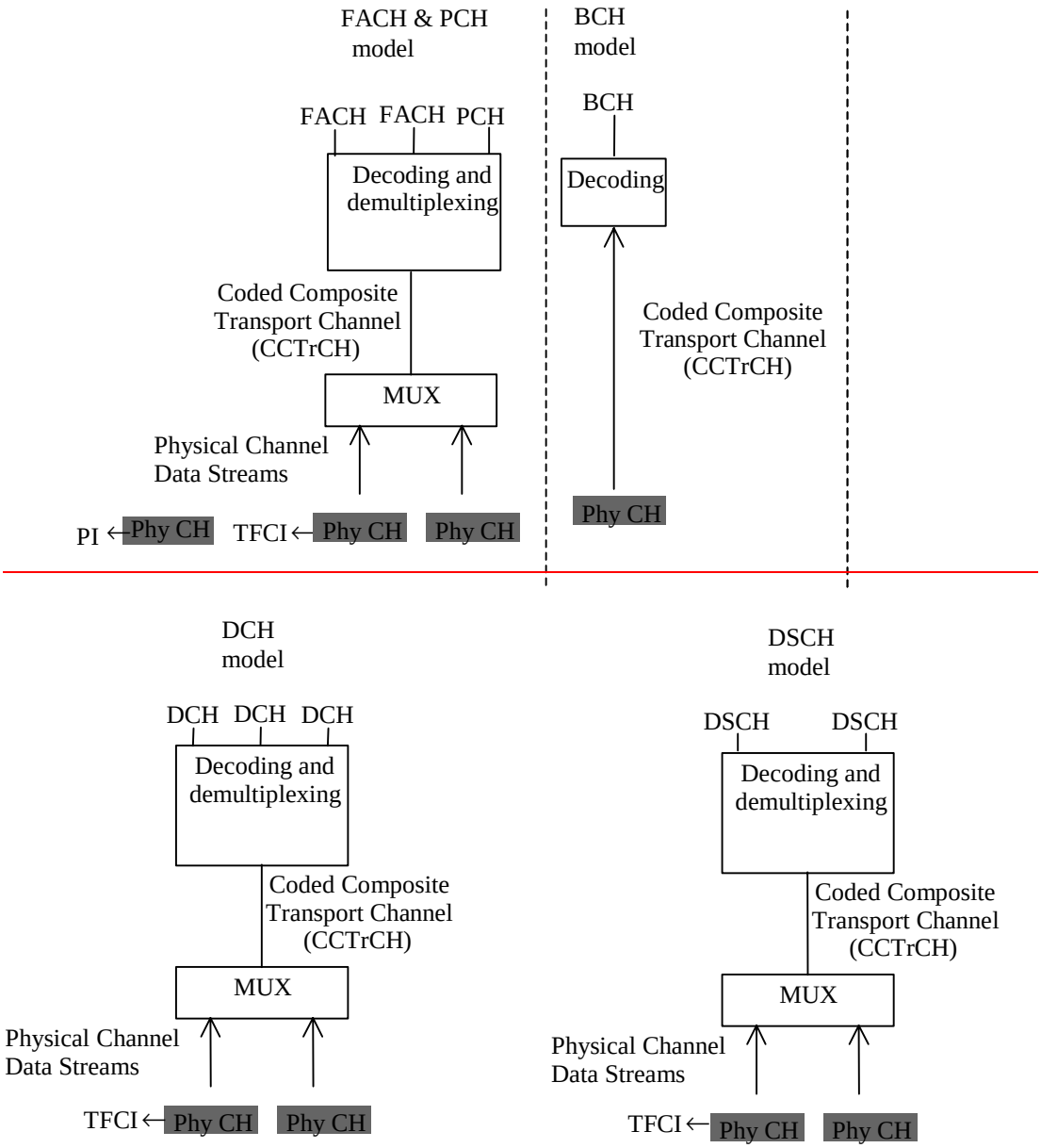


Figure 3: Model of the UE's physical layer - downlink FDD mode


FACH & PCH
model
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Decoding and
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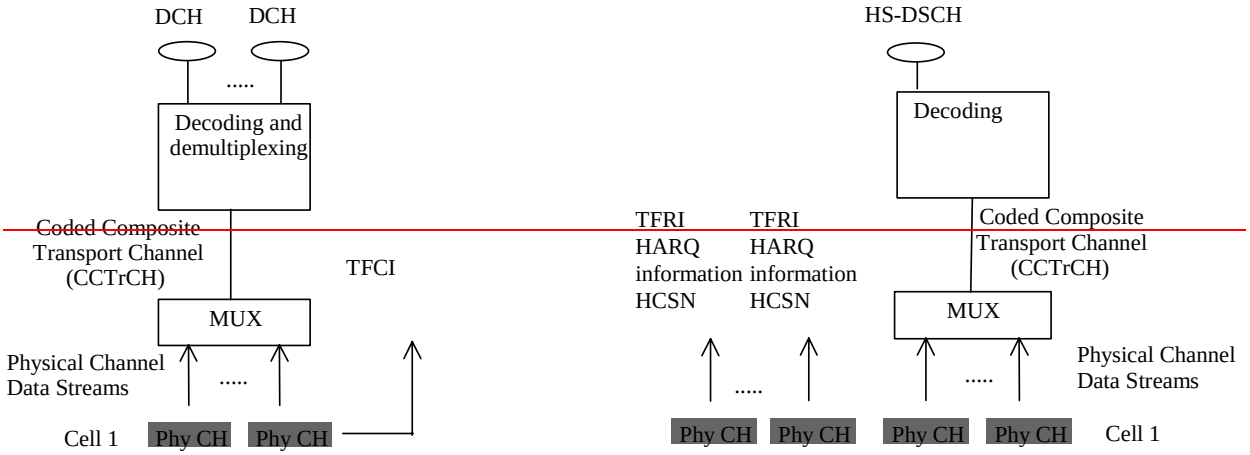
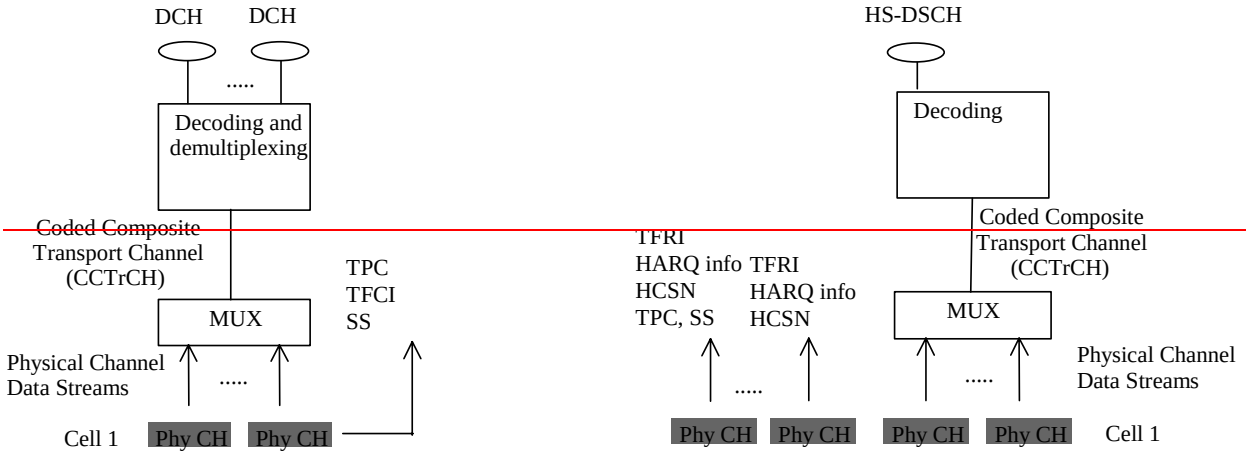
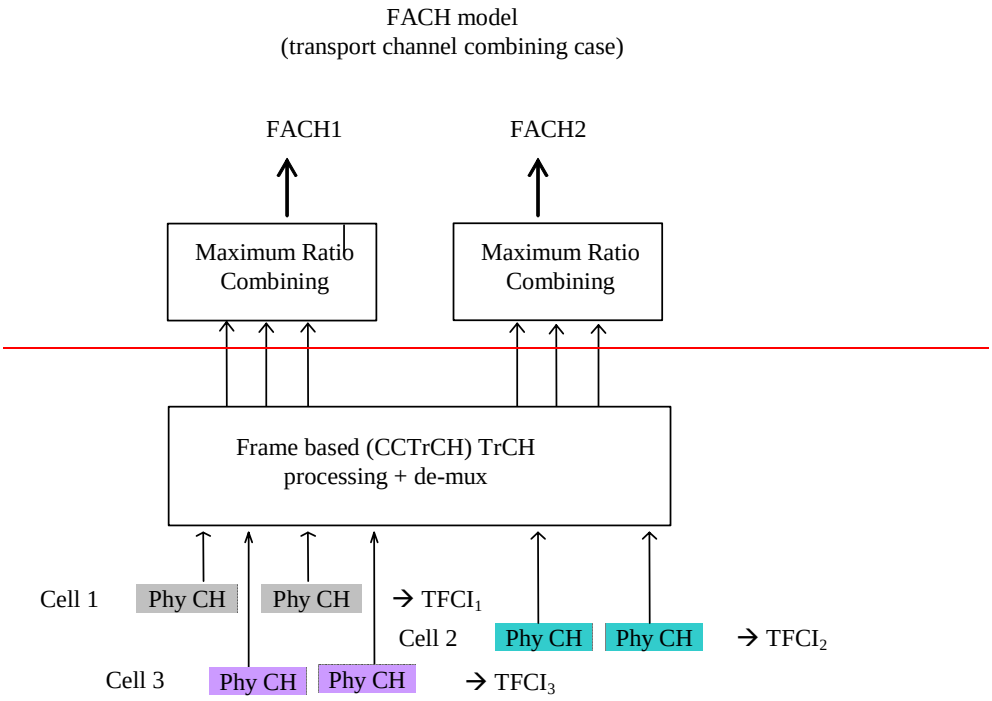
DCH model with HS-DSCH(s)
for 3.84 Mcps TDD

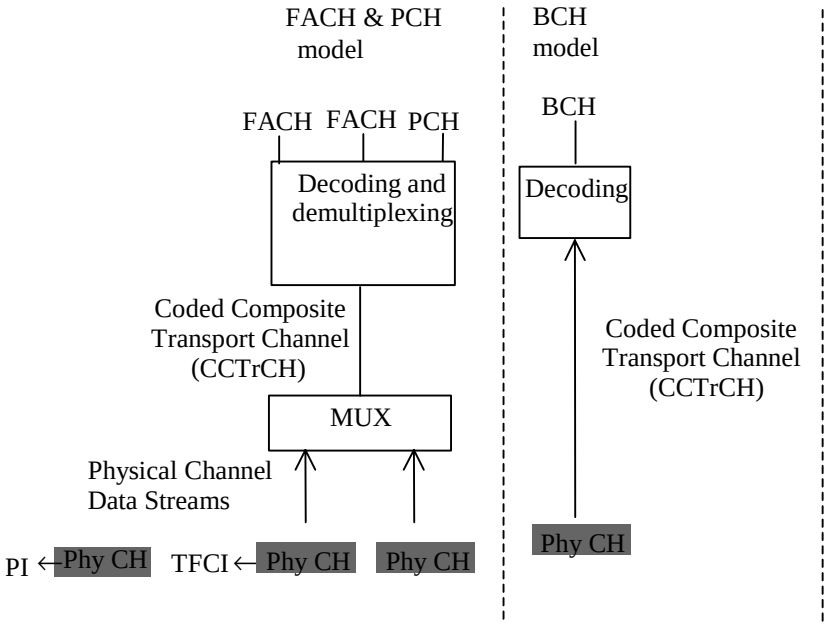


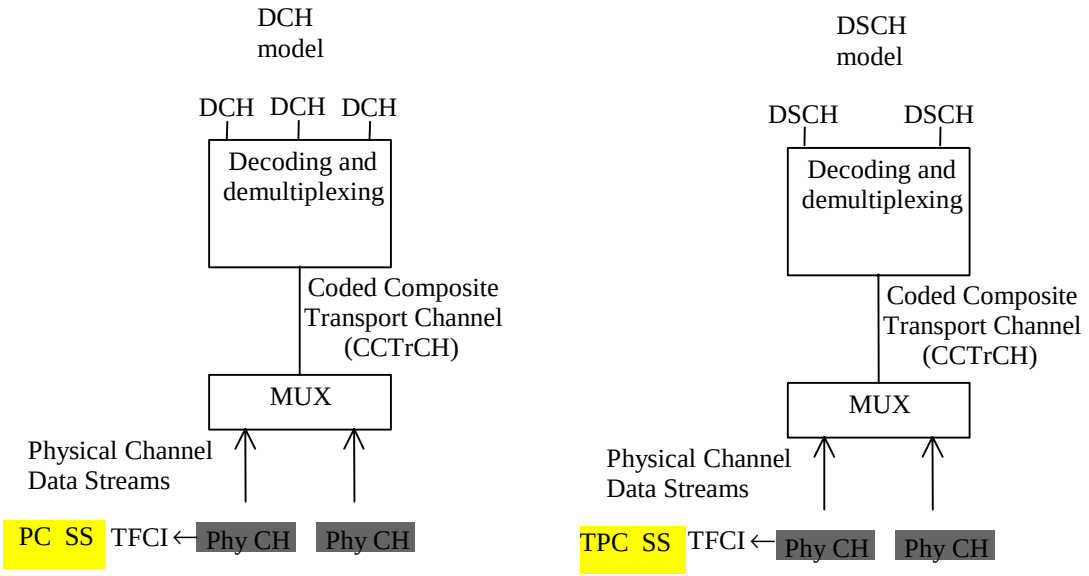
DCH model with HS-DSCH(s)
for 1.28 Mcps TDD



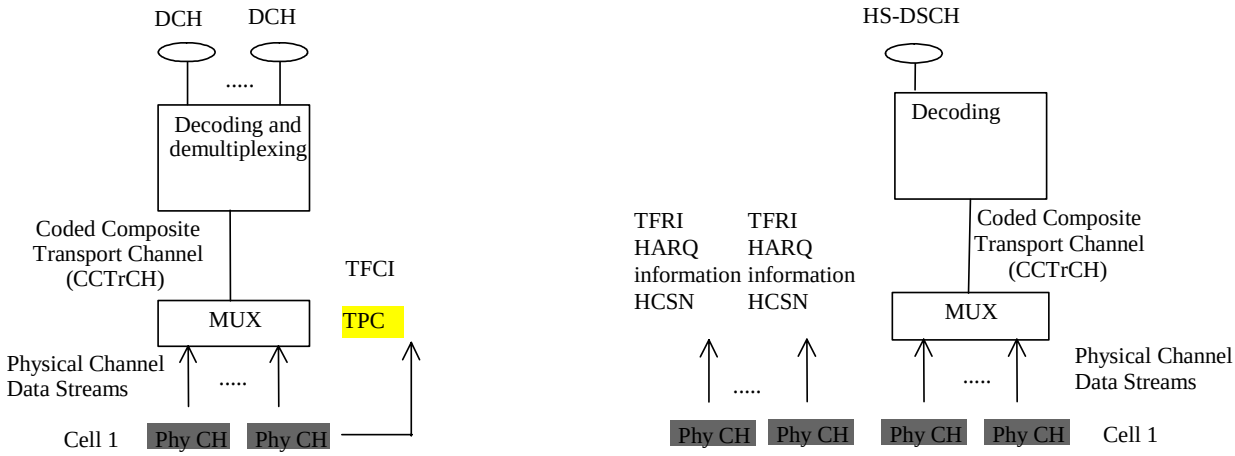


~~**Figure 4: Model of the UE's physical layer – downlink TDD mode**~~





DCH model with HS-DSCH(s)
for 3.84 Mcps TDD



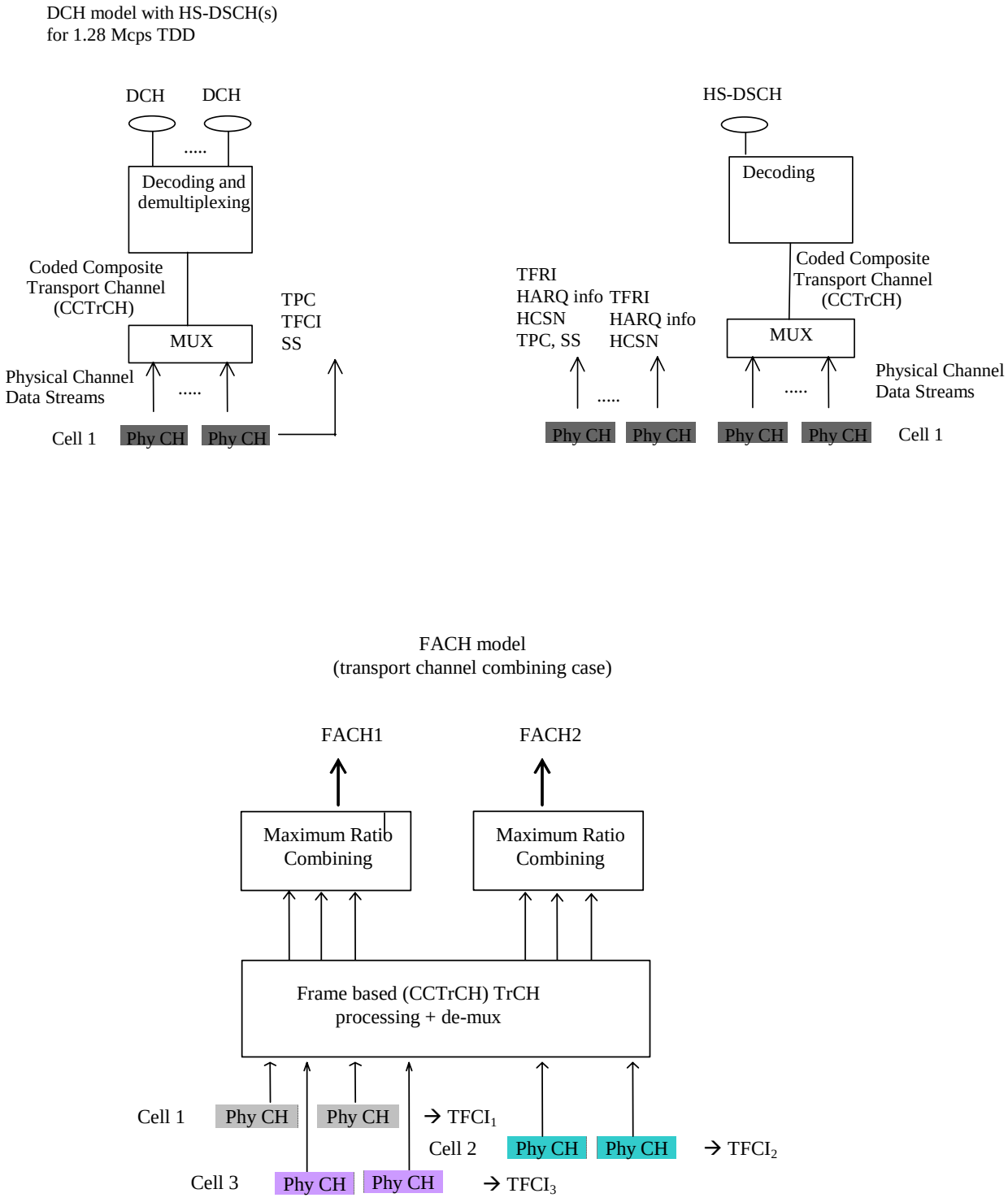


Figure 4: Model of the UE's physical layer – downlink TDD mode

For the DCH case, the mapping between DCHs and physical channel data streams works in the same way as for the uplink. Note however, that the number of DCHs, the coding and multiplexing etc. may be different in uplink and downlink.

In the FDD mode, the differences are mainly due to the soft and softer handover. Further, the pilot, TPC bits and TFCI are time multiplexed onto the same physical channel(s) as the DCHs, in case of HS-DSCH(s) without a DCH in the DL TPC bits are carried onto F-DPCH(s). Further, the definition of physical channel data stream is somewhat different from the uplink. In TDD mode the TFCI is time multiplexed onto the same physical channel(s) as the DCHs. The exact locations and coding of the TFCI are signalled by higher layers.

Note that it is logically one and the same physical data stream in the active set of cells, even though physically

there is one stream for each cell. The same processing and multiplexing is done in each cell. The only difference between the cells is the actual codes, and these codes correspond to the same spreading factor.
The physical channels carrying the same physical channel data stream are combined in the UE receiver, excluding the pilot, and in some cases the TPC bits. TPC bits received on certain physical channels may be combined provided that UTRAN has informed the UE that the TPC information on these channels is identical.
A PCH and one or several FACH can be encoded and multiplexed together forming a CCTrCH. Similarly as in the DCH model there is one TFCI for each CCTrCH for indication of the transport formats used on each PCH and FACH. The PCH is associated with a separate physical channel carrying page indicators (PIs) which are used to trigger UE reception of the physical channel that carries PCH. A FACH or a PCH can also be individually mapped onto a separate physical channel. The BCH is always mapped onto one physical channel without any multiplexing with other transport channels, and there can only be one BCH TrCH and no other TrCH in a BCH CCTrCH.
For point-to-multipoint transmission [14], FACH can be distributed on a set of physical layer combinable CCTrCHs, i.e., for macro-diversity combining: soft combining (FDD and TDD) or transport channel combining (TDD only). The physical layer combinable CCTrCHs shall have the same TFC during the TTIs in which soft combining can be used. The physical layer combinable CCTrCHs need not have the same TFC during the TTIs in which transport channel combining can be used. The possibility of performing macro-diversity combining (either soft combining or transport channel combining) shall be signalled to the UE.
In the TDD mode a CCTrCh carrying PCH and one or several FACH can be multiplexed onto one or several physical channel data streams.
For each HS-DSCH TTI, each HS-SCCH carries HS-DSCH-related downlink signalling for one UE. The following information is carried on the HS-SCCH:

- Transport Format and Resource Indicator (TFRI);
- Hybrid-ARQ-related Information (HARQ information);
- UE Identity via a UE specific CRC;
- HS-SCCH Cyclic Sequence Number (HCSN) for TDD.

In addition, for the case of 1.28 Mcps TDD, the HS-SCCH also carries Transmit Power Control and Synchronisation Shift symbols.

In FDD mode, the E-DCH active set can be identical or a subset of the DCH active set.
The E-DCH ACK/NACKs are transmitted by each cell of the E-DCH active set on a physical channel called E-HICH. The E-HICHs of the cells belonging to the same RLS (same MAC-e entity i.e. same Node B) shall have the same content and be combined by the UE. The set of cells transmitting identical ACK/NACK information is the same as the set of cells sending identical TPC bits (excluding the cells which are not in the E-DCH active set).
The E-DCH Absolute Grant is transmitted by a single cell, the Serving E-DCH cell (Cell e_s on figure 4) on a physical channel called E-AGCH. The relationship between the Serving E-DCH cell and the HS-DSCH Serving cell is FFS.
The E-DCH Relative Grants are transmitted by each cell of the E-DCH active set on a physical channel called E-RGCH. The E-RGCHs of the cells belonging to the same RLS shall have the same content and be combined by the UE. There is one Serving E-DCH RLS (containing the Serving E-DCH cell) and optionally one or several Non-serving E-DCH RLS.