TSG-RAN Meeting #6
Nice, France, 13 – 15 December 1999

TSGRP#6(99)623

Title: **Agreed CRs of category "D" (Editorial) to TS 25.302**

Source: **TSG-RAN WG2**

Agenda item: 5.2.3

Doc #	Status-	Spec	CR	Rev	Subject	Cat	Versio	Versio
R2-99g27	agreed	25.302	018		Compressed Mode description	D	3.1.0	3.2.0
R2-99k61	agreed	25.302	030	1	Editorial issues	D	3.1.0	3.2.0

CHANGE REQUEST

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| 25.302 | CR | 018 | 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**
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| for approval | **X** | | strategic | | *(for SMG* |
| for information | | | non-strategic | | *use only)* |

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Proposed change affects:
(at least one should be marked with an X)

(U)SIM [ ]   ME **[X]**   UTRAN / Radio **[X]**   Core Network [ ]

| **Source:** | TSG-RAN WG2 | **Date:** | 05/11/1999 |

| **Subject:** | Compressed Mode description |

| **Work item:** | |

Category:

(only one category shall be marked with an X)

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

| **Reason for change:** | It's proposed to add a reference on CM parameterisation limitations in TS25.215 and TS25.212 into the CM description of section 7.3. |

| **Clauses affected:** | 1 References, 7.3 Compressed Mode |

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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2   References

References may be made to:

2.´ specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply;

2.´ all versions up to and including the identified version (identified by "up to and including" before the version identity);

2.´ all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

2.´ publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1]   ETSI UMTS 23.10 : UMTS Access Stratum Services and Functions

[2]   3GPP TS 25.301 : Radio Interface Protocol Architecture

[3]   3GPP TS 25.212 : ~~UTRA FDD multiplexing, channel coding and interleaving description~~Multiplexing and channel coding (FDD)

[4]   3GPP TS 25.222 : ~~UTRA TDD multiplexing, channel coding and interleaving description~~Multiplexing and channel coding (TDD)

[5]   3GPP TS 25.224 : Physical Layer Procedures (TDD)

[6]   3GPP TS 25.215 : Physical Layer – Measurements (FDD)

7.3.   Compressed Mode

Compressed Mode is defined as the mechanism whereby certain idle periods are created in radio frames so that the UE can perform measurements during these periods (more details can be found in [3]).

Compressed Mode is obtained by layer 2 using transport channels provided by the layer 1 as follows :

- Compressed Mode is controlled by the RRC layer which configures the layer 2 and the physical layer

- The number of occurrences of compressed frames is controlled by RRC, and can be modified by RRC signalling

- Layer 2 instructs every Transmission Time Interval the Layer 1 on whether compressed mode should be applied for a given Transport Format Combination Set. The instruction may indicate also the type of compressed mode.

- The compression of frames can be either cyclic (typically for circuit services) in a compressed mode pattern (defined below) or a-periodic (typically for NRT services)

- It is under the responsibility of the layer 2 if necessary and if possible to either buffer some layer 2 PDUs (typically at the RLC layer for NRT services) or to rate adapt the data flow (similarly to GSM) so that there is no loss of data because of compressed mode. This will be service dependent and controlled by the RRC layer.

The following parameters characterize a transmission gap :

- TGL : Transmission Gap Length is the duration of no transmission, expressed in number of slots.

- CFN : The connection frame number when the transmission gap starts

- SN : The slot number when the transmission gap starts

With this definition, it is possible to have a flexible position of the transmission gap in the frame.

The following parameters characterize a compressed mode pattern (illustrated in Figure 1) :

- TGP : Transmission Gap Period is the period of repetition of a set of consecutive frames containing up to 2 transmission gaps (*).

- TGL : As defined above

- TGD : Transmission Gap Distance is the duration of transmission between two consecutive transmission gaps within a transmission gap period, expressed in number of frames. In case there is only one transmission gap in the transmission gap period, this parameter shall be set to zero.

- PD: Pattern duration is the total time of all TGPs expressed in number of frames.

- CFN : The connection frame number when the first transmission gap starts

- PCM: Power Control Mode specifies the uplink power control algorithm applied during recovery period after each transmission gap in compressed mode. PCM can take 2 values (0 or 1). The different power control modes are described in TS 25.214.

In a compressed mode pattern, the first transmission gap starts in the first frame of the pattern. The gaps have a fixed position in the frames, and start in the slot position defined in [3]. The length of the transmission gap has certain limitations defined in [3] and [6]

(*) : Optionally, the set of parameters may contain 2 values TGP1 and TGP2, where TGP1 is used for the 1st and the consecutive odd gap periods and TGP2 is used for the even ones. Note if TGP1=TGP2 this is equivalent to using only one TGP value.
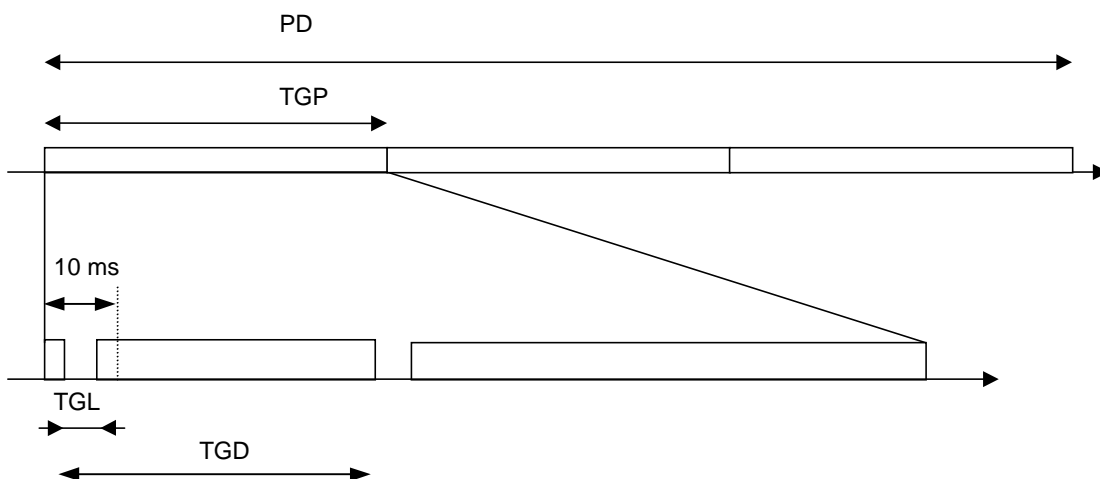
Figure 7. Illustration of compressed mode pattern parameters.

3GPP TSG-RAN Meeting #6
Nice, France, 13-15 December 1999

Document **(R2-99k61)**

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	25.302	CR	**030r1**	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	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:	TSG-RAN WG2	**Date:**	1999-12-03

Subject:	Editorial issues

Work item:	

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification	**X**		Release 99	**X**
					Release 00	

Reason for change:	Editorial modifications after review in RAN WG2#9. List of features that are not in R99.

Clauses affected:	

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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1 Scope

The present document is a technical specification of the services provided by the physical layer of UTRA to upper layers.

The following items are considered for releases beyond Release 99:

- Fast Uplink Signalling Channel (FAUSCH)

- Opportunity Driven Multiple Access (ODMA)

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 two models: DCH model and RACH model. Some restriction exist for the use of different types of transport channel at the same time, these restrictions are described in the chapter "UE Simultaneous Physical Channel combinations". More details can be found in [3] and [4].

NOTE: ~~Models for uplink transport channels currently marked ffs will be necessary if these channels are included in the description.~~
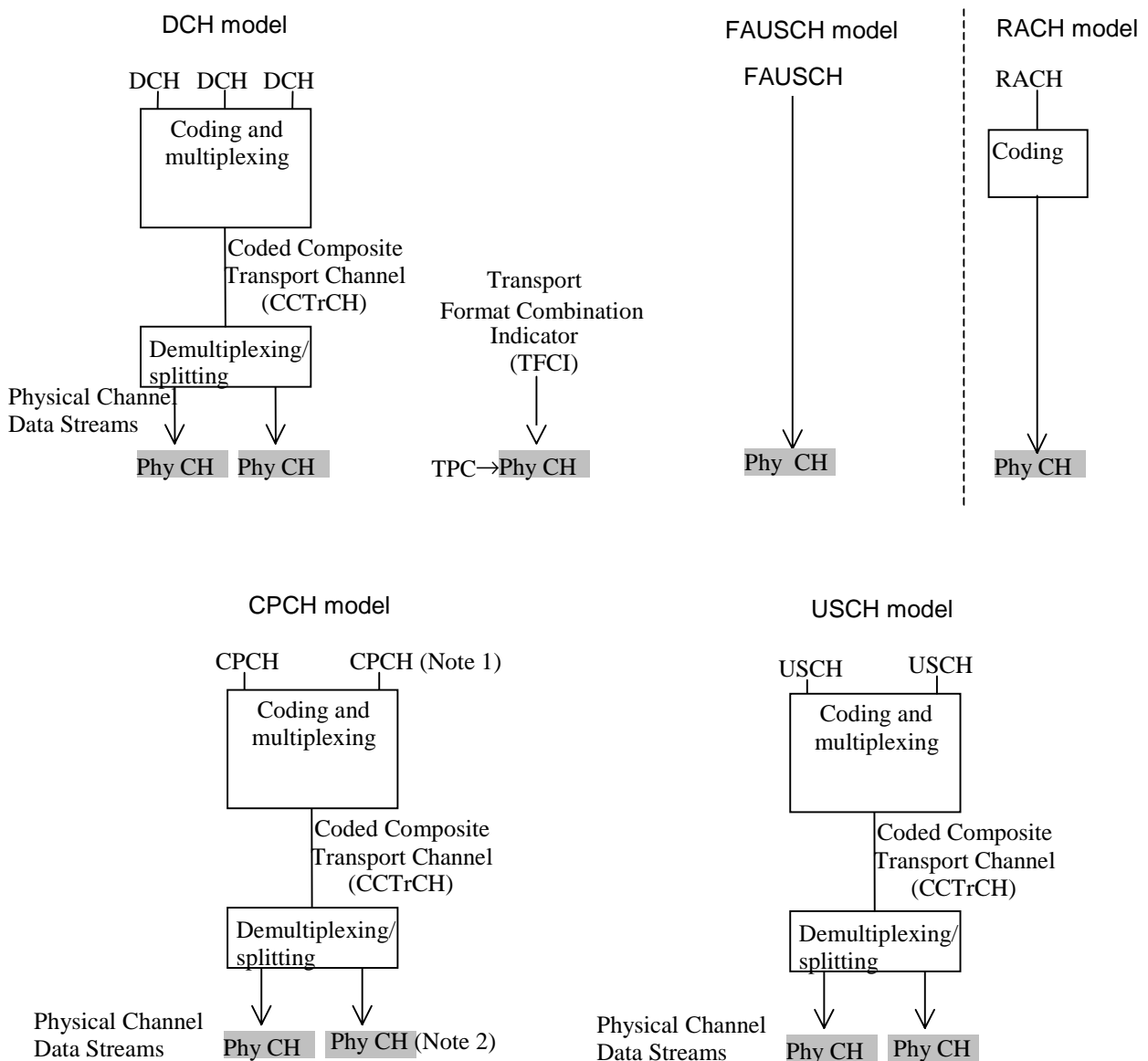
NOTE 1: The need to multiplex several CPCH transport channels is FFS
NOTE 2: Only the data part of the CPCH can be mapped on multiple physical channels
NOTE 3: FAUSCH and CPCH are for FDD only.
NOTE 4: USCH is for TDD only.

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 this 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, only one CCTrCH can be used simultaneously. On the uplink and in the case of TDD, multiple CCTrCH can be used simultaneously.

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 TFCI 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*.

NOTE: The term "splitting" used for above function in FDD mode has been replaced by "demultiplexing/splitting". The intention of using the term splitting is to express that this function is performed on bit level not on some block level. The term demultiplexing/splitting shall cover both cases, block or bit level demultiplexing, where block lengths larger than 1 bit may be applied in the TDD mode. This needs to be confirmed by the L1 group

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.

The DCH and USCH have the possibility to perform Timing Advance in TDD mode.

For the FAUSCH, there is no coding, since the FAUSCH is only used for the transmission of a reservation request by sending an up-link signalling code (USC) at the time-offset allocated for the specific UE during the 10 ms frame. Due to the fixed time-offset allotted to a specific UE, the FAUSCH is a dedicated control channel.
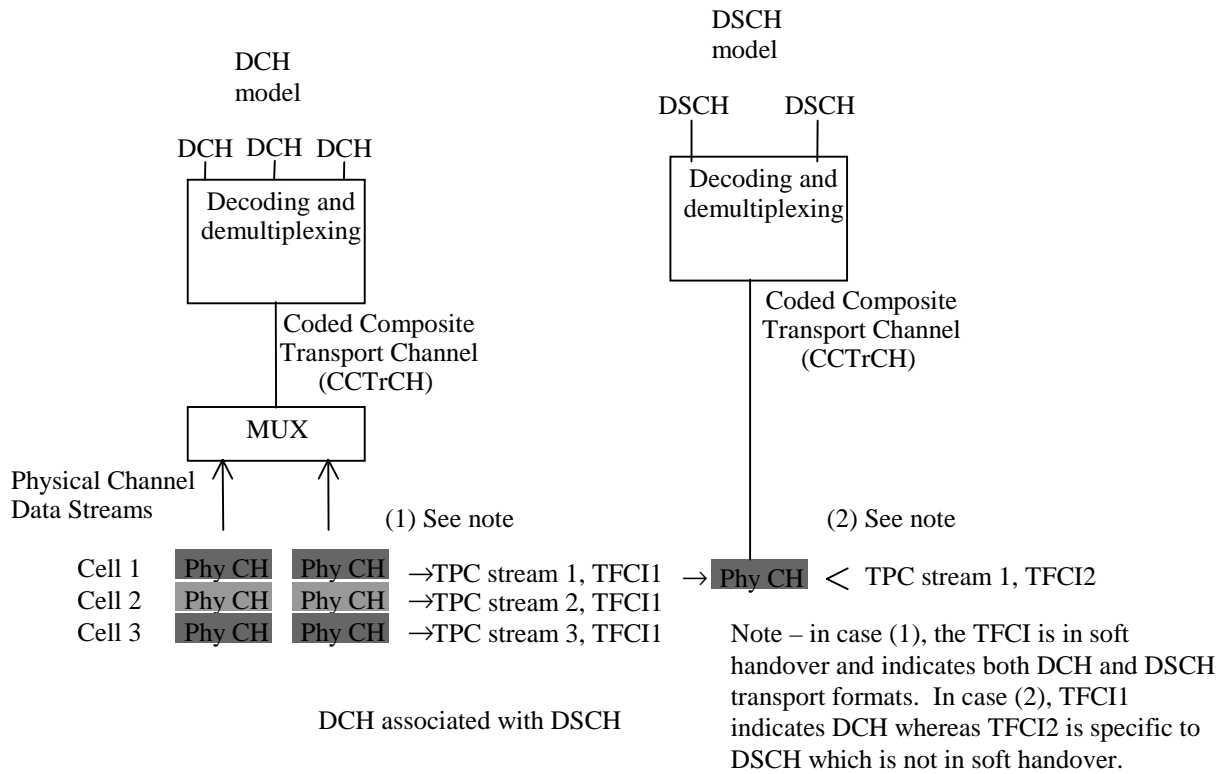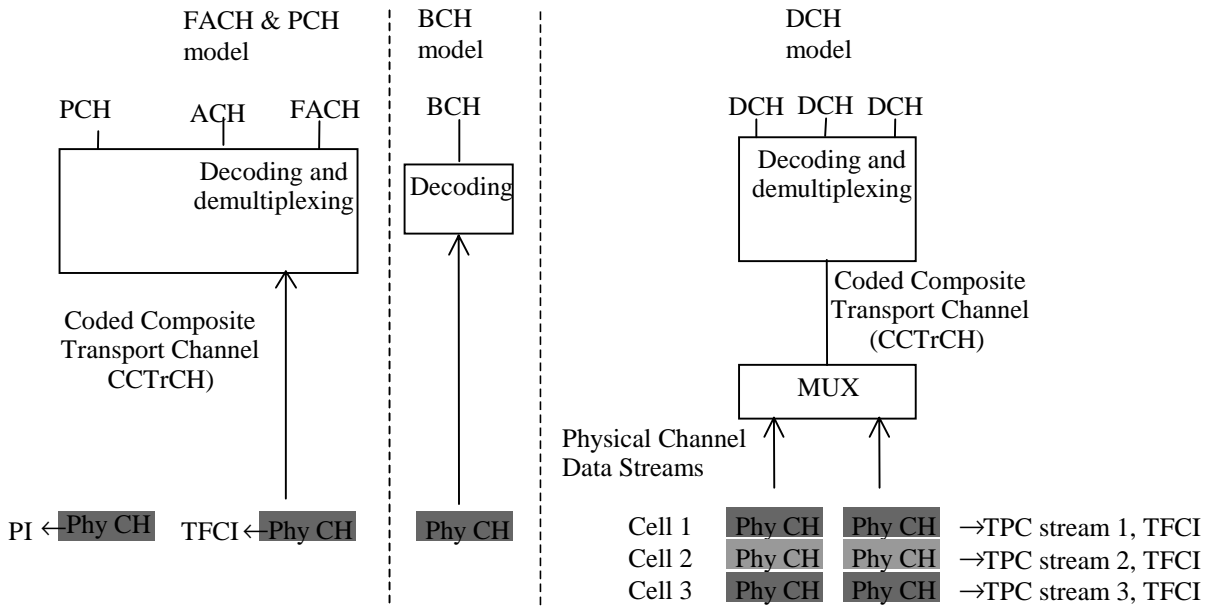
The model for the RACH case shows that RACH is a common type transport channel in the uplink. RACHs are always mapped one-to-one onto physical channels, i.e. there is no physical layer multiplexing of RACH. Service multiplexing is handled by the MAC layer. The CPCH which is another common type transport channel has a physical layer model as shown in the above figure.
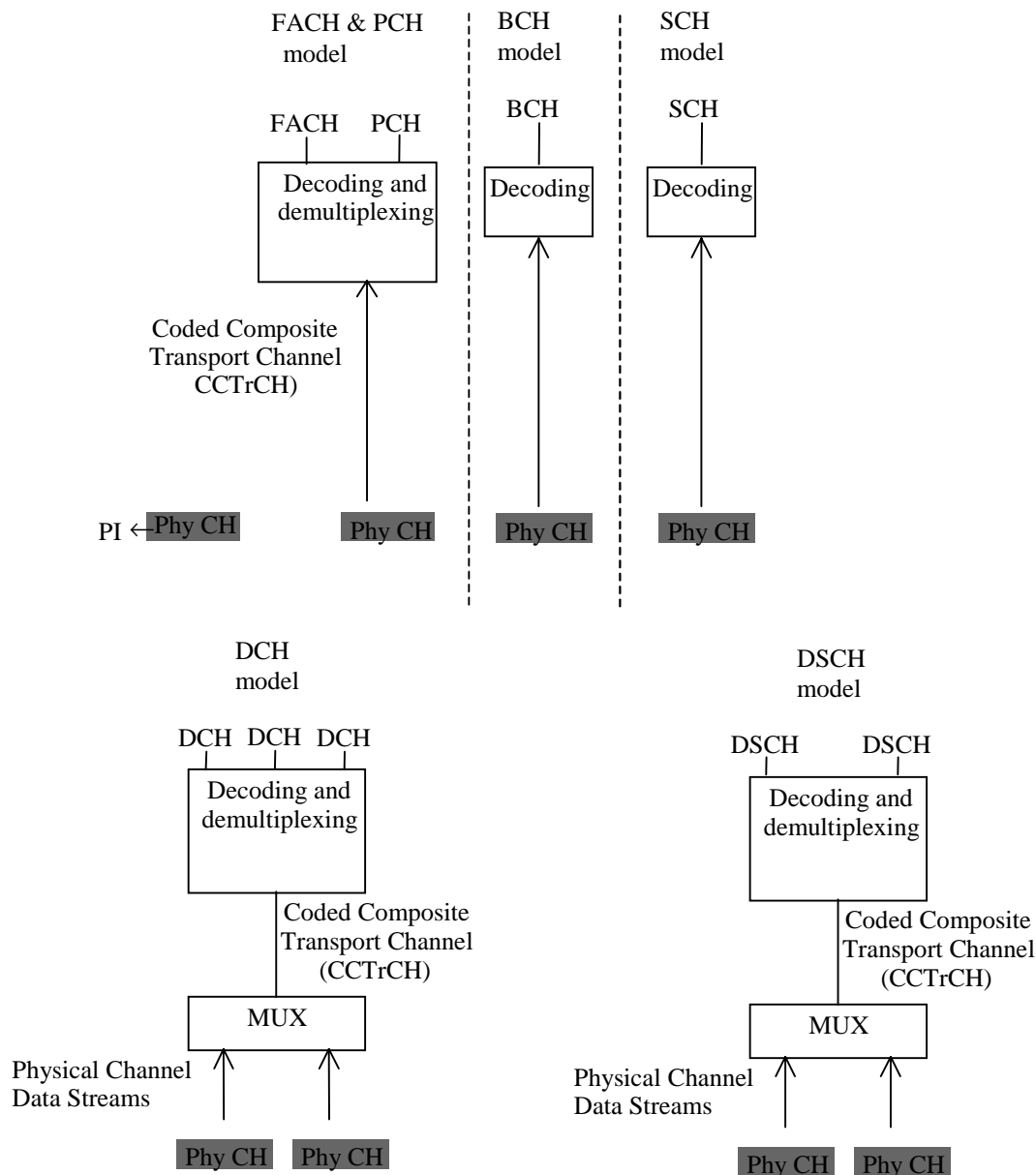
6.2   Downlink models

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.

NOTE: Models for downlink transport channels currently marked ffs will be necessary if these channels are included in the description.

FACH & PCH model

PCH   ACH   FACH

Decoding and demultiplexing

Coded Composite Transport Channel CCTrCH)

PI ← Phy CH   TFCI ← Phy CH

BCH model

BCH

Decoding

Phy CH

DCH model

DCH DCH DCH

Decoding and demultiplexing

Coded Composite Transport Channel (CCTrCH)

MUX

Physical Channel Data Streams

Cell 1 Phy CH Phy CH →TPC stream 1, TFCI
Cell 2 Phy CH Phy CH →TPC stream 2, TFCI
Cell 3 Phy CH Phy CH →TPC stream 3, TFCI

DCH model

DCH DCH DCH

Decoding and demultiplexing

Coded Composite Transport Channel (CCTrCH)

MUX

Physical Channel Data Streams

(1) See note

Cell 1 Phy CH Phy CH →TPC stream 1, TFCI1
Cell 2 Phy CH Phy CH →TPC stream 2, TFCI1
Cell 3 Phy CH Phy CH →TPC stream 3, TFCI1

DCH associated with DSCH

DSCH model

DSCH   DSCH

Decoding and demultiplexing

Coded Composite Transport Channel (CCTrCH)

(2) See note

→ Phy CH < TPC stream 1, TFCI2

Note – in case (1), the TFCI is in soft handover and indicates both DCH and DSCH transport formats. In case (2), TFCI1 indicates DCH whereas TFCI2 is specific to DSCH which is not in soft handover.

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

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. Further, the definition of physical channel data stream is somewhat different from the uplink.

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.

In the TDD mode, a PCH and a FACH can be encoded and multiplexed together forming a CCTrCH. 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 separate physical channels. The BCH is always mapped onto one physical channel without any multiplexing with other transport channels.

NOTE: in the TDD mode there is the SCH in addition (not shown in Figure 4).

In the FDD mode, 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, as for TDD, always mapped onto one physical channel without any multiplexing with other transport channels.

6.3   Relay link Model

The Relay link applies to the TDD mode only. ~~The applicability to the FDD mode is FFS~~.

Figure 4 illustrates the model of the UE's physical layer for the TDD mode.
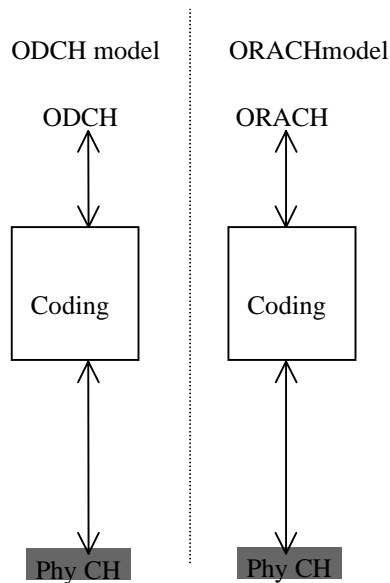
Figure 5: Model of the UE's physical lay–r - relay link TDD mode.

The ORACH is a channel used within UE's to transmit and receive probing messages, and also to transmit and receive small packets of information. The ODCH is used to transmit larger amounts of data over a number of hops between UE's.

7.2   Types of Transport Channels

A general classification of transport channels is into two groups:

- common channels and

- dedicated channels (where the UEs can be unambiguously identified by the physical channel, i.e. code and frequency)

Common transport channel types are:

1. Random Access Channel(s) (RACH) characterized by:

    - existence in uplink only,

    - limited data field. ~~The exact number of allowed bits is FFS.~~

    - collision risk,

    - open loop power control,

2. ODMA Random Access Channel(s) (ORACH) characterized by:

    - used in TDD mode only ~~(FDD is for FFS)~~

    - existence in relay-link

    - collision risk,

    - open loop power control,

    - no timing advance control

3. Forward Access Channel(s) (FACH) characterized by:

    - existence in downlink only,

    - possibility to use beam forming,

    - possibility to use slow power control,

    - possibility to change rate fast (each 10ms),

    - lack of fast power control and

4. Broadcast Channel (BCH) characterized by:

    - existence in downlink only,

    - low fixed bit rate and

    - requirement to be broadcast in the entire coverage area of the cell.

5. Paging Channel (PCH) characterized by:

    - existence in downlink only,

    - association with a physical layer signal, the Page Indicator, to support efficient sleep mode procedures and

    - requirement to be broadcast in the entire coverage area of the cell.

6. Synchronisation channel (SCH) characterised by :

    - existence in TDD and downlink only

    - low fixed bit rate

- requirement to be broadcast in the entire coverage area of the cell

7. Downlink Shared Channel(s) (DSCH) characterised by:

    - existence in downlink only,

    - possibility to use beamforming,

    - possibility to use slow power control,

    - possibility to use fast power control, when associated with dedicated channel(s)

    - possibility to be broadcast in the entire cell

    - always associated with another channel (DCH or DSCH Control Channel).

8. ~~DSCH Control Channel characterised by:~~

    - ~~existence in downlink only,~~

    - ~~possibility to use beam forming,~~

    - ~~possibility to use slow power control,~~

    - ~~lack of fast power control~~

~~NOTE: It is for further study whether or not the DSCH Control Channel needs to be regarded as separate transport channel type from FACH. Seen from the upper layers, the current requirements are identical to a FACH, but some extra L1 information (e.g.TPC bits) may lead to a different physical channel.~~

9. CPCH Channel characterised by:

    - existence in FDD only,

    - existence in uplink only,

    - fast power control on the message part,

    - possibility to use beam forming,

    - possibility to change rate fast,

    - collision detection,

    - open loop power estimate for pre-amble power ramp-up

    - possibility to use timing advance

10. Uplink Shared channel (USCH) characterised by:

    - used in TDD only

    - existence in uplink only,

    - possibility to use beam forming,

    - possibility to use power control,

    - possibility to change rate fast

    - possibility to use Uplink Synchronization

Dedicated transport channel types are:

1. Dedicated Channel (DCH) characterized by:

    - existing in uplink or downlink

    - possibility to use beam forming,

- possibility to change rate fast (each 10ms),

- fast power control

- possibility to use timing advance (TDD only)

- possibility to use Uplink Synchronization

2. Fast Uplink Signaling Channel (FAUSCH) to allocate, in conjunction with FACH, dedicated channels; the FAUSCH is characterized by:

- existing in uplink only,

- inherent addressing of a UE by a unique time-offset (indicating to a UE when to send an uplink signalling code, USC) related to the beginning of the 10 ms frame,

- allowing for a UE to notify (by sending an USC) a request for a DCH, the allocation of which is messaged via the FACH. No further information is conveyed via the FAUSCH,

NOTE: applicability for TDD mode is FFS

3. ODMA Dedicated Channel (ODCH) characterized by:

- used in TDD mode only ~~(FDD is for FFS)~~,

- possibility to use beam forming,

- possibility to change rate fast (each 10ms),

- closed loop power control,

- closed loop timing advance control

To each transport channel (except for the FAUSCH, since it only conveys a reservation request),, there is an associated Transport Format (for transport channels with a fixed or slow changing rate) or an associated Transport Format Set (for transport channels with fast changing rate).

8.2   FDD Downlink

The table describes the possible combinations of FDD physical channels that can be supported in the downlink by one UE at any one time.

Table 2: FDD Downlink

	Physical Channel Combination	Transport Channel Combination	Baseline Capability or Service dependent	Comment
1	PCCPCH	BCH	Baseline	
2	SCCPCH	FACH + PCH	Baseline	The maximum channel bit rate that can be supported is dependent on the UE Service Capability
3	SCCPCH + AICH	FACH + PCH + RACH in uplink Or FACH + PCH + CPCH in uplink	Baseline	The maximum channel bit rate that can be supported is dependent on the UE Service Capability. This physical channel combination facilitates the preamble portion of the CPCH in the uplink
4	SCCPCH + DPCCH	FACH + PCH + CPCH in uplink	Service dependent	This physical channel combination facilitates the message portion of the CPCH in the uplink
5	More than one SCCPCH	More than one FACH + PCH	Service dependent	
6	PICH	N/A	Baseline	
7	DPCCH + DPDCH	One or more DCH coded into a single CCTrCH	Service dependant	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability
8	DPCCH + more than one DPDCH	One or more DCH coded into a single CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability
9	PDSCH + DPCCH + one or more DPDCH	DSCH + one or more DCH coded into a single CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability
10	SCCPCH + DPCCH + one or more DPDCH	FACH + one or more DCH coded into a single CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability This combination of physical channels is used for DRAC control of an uplink DCH and for receiving services such as cell broadcast or multicast whilst in connected mode.
11	SCCPCH + PDSCH + DPCCH + one or more DPDCH	FACH + DSCH + one or more DCH coded into a single CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability This combination of physical channels is used for simultaneous DSCH and DRAC control of an uplink DCH.
12	~~More than~~ one DPCCH + more than one DPDCH	More than one DCH coded into one or more CCTrCH	Service dependent	~~See note 1~~

~~NOTE 1: The use of more than one DPCCH and/or more than one CCTrCH are currently for FFS within TSG RAN WG1.~~

8.4   TDD Downlink

The table describes the possible combinations of TDD physical channels that can be supported in the downlink by one UE in any one 10ms frame, where a TDD physical channel corresponds to one code, one timeslot, one frequency and is mapped to one resource unit (RU). This table addresses combinations of downlink physical channels in the same 10ms frame.

Table 4: TDD Downlink

	Physical Channel Combination	Transport Channel Combination	Baseline Capability or Service dependent	Comment
1	One or two PSCH	SCH	Baseline	SCH can map to one or two PSCH in a frame depending on the synchronization case as defined in 25.221 (see note 1)
2	One or more CCPCH	BCH and/or PCH and/or one or more FACH	Baseline	BCH can map to multiple CCPCH in a frame. FACH can map to multiple CCPCH in a frame. PCH can map to multiple CCPCH in a frame. ~~See note 2.~~
3	One or more DPCH	One or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability
4	One or more CCPCH + one or more DPCH	BCH and/or PCH and/or one or more FACH + one or more DCH coded into one or more CCTrCH	Service dependent	The number of DCHs and the maximum channel bit rate are dependent on the UE Service Capability. BCH can map to multiple CCPCH in a frame. FACH can map to multiple CCPCH in a frame. ~~See note 2.~~
5	One or more PDSCH	One or more DSCH coded onto one or more CCTrCH	Service dependent	It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. DSCH requires a control channel (FACH or DCH); however, it is not required to be in the same 10ms frame as the DSCH.
6	One or more PDSCH + one or more CCPCH	BCH and/or PCH and/or one or more FACH + one or more DSCH coded onto one or more CCTrCH	Service dependent	BCH can map to multiple CCPCH in a frame. Each FACH can map to multiple CCPCH in a frame. It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. For the case of DSCH + BCH, DSCH requires a control channel (FACH or DCH); however, it is not required to be in the same 10ms frame as the DSCH. ~~See note 2.~~
7	One or more PDSCH + one or more DPCH	One or more DSCH coded onto one or more CCTrCH + one or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration.
8	One or more PDSCH + one or more CCPCH + one or more DPCH	BCH and/or PCH and/or one or more FACH + one or more DSCH coded onto one or more CCTrCH + one or more DCH coded into one or more CCTrCH	Service dependent	BCH can map to multiple CCPCH in a frame. Each FACH can map to multiple CCPCH in a frame. The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. ~~See note 2.~~

NOTE 1: Reference: TS25.221: Physical Channels and Mapping of Transport Channels Onto Physical Channels (TDD).

~~NOTE 2: The possibility to multiplex PCH and one or more FACH on one or more CCTrCHs is FFS~~

NOTE 2̶3̶: The PSCH synchronization channel can co-exist with all listed combinations

8.5 TDD UE Uplink and Downlink Combinations (within 10 ms air frames)

This table describes the possible uplink and downlink physical channel combinations that can be supported by a UE in TDD mode.

Table 5: TDD UE Uplink and Downlink Combinations (within 10 ms air frames)

	DL Physical Channel Combination	DL Transport Channel Combination	UL Physical Channel Combination	UL Transport Channel Combination	Baseline Capability or Service Dependent	Comment
1			PRACH	RACH	Baseline	One RACH transport channel maps to one PRACH physical channel
2	One or more CCPCH	BCH and/or PCH and/or One or more FACH			Baseline	BCH or FACH, or PCH can map to multiple CCPCH in a frame.
3	One or more CCPCH	BCH and/or PCH and/or One or more FACH	PRACH	RACH	Baseline	One RACH transport channel maps to one PRACH physical channel BCH or FACH, or PCH can map to multiple CCPCH in a frame.
4	One or more CCPCH	BCH and/or PCH and/or One or more FACH	PRACH and one or more DPCH	RACH and one or more DCH coded into one or more CCTrCH	Service Dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability. BCH or FACH, or PCH can map to multiple CCPCH in a frame.
5	One or more CCPCH and one or more DPCH	BCH and/or PCH and/or One or more FACH and one or more DCH coded onto one or more CCTrCH	PRACH and one or more DPCH	RACH and one or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability. See Note 1. BCH or FACH, or PCH can map to multiple CCPCH in a frame.
6			One or more DPCH	One or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability.
7	One or more DPCH	One or more DCH coded onto one or more CCTrCH	One or more DPCH	One or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability. See Note 1.

NOTE 1: The requirement for an UL DPCH to exist in every 10 ms frame for DL Power Control, Transmit Diversity, and Joint Pre-distortion is FFS.

NOTE 2: The PSCH synchronization channel can co-exist with all listed combinations

NOTE 3: USCH and DSCH combinations are FFS

8.6 TDD UE Uplink Timeslot Combinations

This table describes possible uplink physical channels that can be supported by a UE within a specific time slot.

Table 6: TDD UE Uplink Timeslot Combinations

	Physical Channel Combination	Transport Channel Combination	Baseline Capability or Service Dependent	Comment
1	PRACH	RACH	Baseline	Time slots supporting RACH do not support other channel types. One RACH transport channel maps to one PRACH physical channel.
2	One or more DPCH	One or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability.
3	One or more PUSCH	One or more USCH coded onto one or more CCTrCH	Service dependent	It is assumed here that a USCH transport channel may map to one or more PUSCH physical channels based on system configuration. USCH requires a control channel (RACH/FACH or DCH); however, it is not required to be in the same 10ms frame as the USCH.
4	One or more PUSCH + one or more DPCH	One or more USCH coded onto one or more CCTrCH + one or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability. It is assumed here that a USCH transport channel may map to one or more PUSCH physical channels based on system configuration.

8.7 TDD UE Downlink Timeslot Combinations

This table describes possible downlink physical channels that can be supported by a UE within a specific time slot.

Table 7: TDD UE Downlink Timeslot Combinations

	Physical Channel Combination	Transport Channel Combination	Baseline Capability or Service dependent	Comment
1	One PSCH	SCH	Baseline	SCH can map to one or two PSCH in a frame depending on the synchronization case as defined in 25.221 (see note 1)
2	One or more CCPCH	BCH and/or PCH and/or One or more FACH	Baseline	BCH can map to multiple CCPCH in a frame. FACH can map to multiple CCPCH in a frame. PCH can map to multiple CCPCH in a frame. ~~See note 2.~~
3	One or more DPCH	One or more DCH coded into one or more CCTrCH	Service dependant	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability
4	One or more CCPCH + one or more DPCH	BCH and/or PCH and/or One or more FACH and one or more DCH coded into one or more CCTrCH	Service dependent	The number of DCHs and the maximum channel bit rate are dependent on the UE Service Capability. BCH can map to multiple CCPCH in a frame. FACH can map to multiple CCPCH in a frame. ~~See note 2.~~
5	One or more PDSCH	One or more DSCH coded onto one or more CCTrCH	Service dependent	It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. DSCH requires a control channel (FACH or DCH); however, it is not required to be in the same 10ms frame as the DSCH.
6	One or more PDSCH + one or more CCPCH	BCH and/or PCH and/or One or more FACH and one or more DSCH coded onto one or more CCTrCH	Service dependant	BCH can map to multiple CCPCH in a frame. Each FACH can map to multiple CCPCH in a frame. It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. For the case of DSCH + BCH, DSCH requires a control channel (FACH or DCH); however, it is not required to be in the same 10ms frame as the DSCH. ~~See note 2.~~
7	One or more PDSCH + one or more DPCH	One or more DSCH coded onto one or more CCTrCH + one or more DCH coded into one or more CCTrCH	Service dependent	The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration.
8	One or more PDSCH + one or more CCPCH + one or more DPCH	BCH and/or PCH and/or One or more FACH and one or more DSCH coded onto one or more CCTrCH and one or more DCH coded into one or more CCTrCH	Service dependent	BCH can map to multiple CCPCH in a frame. Each FACH can map to multiple CCPCH in a frame. The maximum number of DCHs and the maximum channel bit rate are dependent on UE Service Capability It is assumed here that a DSCH transport channel may map to one or more PDSCH physical channels based on system configuration. ~~See note 2.~~

NOTE 1: Reference: TS25.221: Physical Channels and Mapping of Transport Channels Onto Physical Channels (TDD).

~~NOTE 2: The possibility to multiplex PCH and one or more FACH on one or more CCTrCHs is FFS~~

NOTE 2~~3~~:The PSCH synchronization channel can co-exist with all listed combinations

9 Measurements provided by the physical layer

One of the key services provided by the physical layer is the measurement of various quantities which are used to trigger or perform a multitude of functions. Both the UE and the UTRAN are required to perform a variety of measurements. The standard will not specify the method to perform these measurements or stipulate that the list of measurements provided in this section must all be performed. While some of the measurements are critical to the functioning of the network and are mandatory for delivering the basic functionality (e.g., handover measurements, power control measurements), others may be used by the network operators in optimising the network (e.g., radio environment).

Measurements may be made periodically and reported to the upper layers or may be event-triggered (e.g., primary CCPCH becomes better than the previous best primary CCPCH). Another reporting strategy may combine the event triggered and the periodical approach (e.g. falling of link quality below a certain threshold initiates periodical reporting). The measurements are tightly coupled with the service primitives in that the primitives' parameters may constitute some of the measurements.

The list and frequency of measurements which the physical layer reports to higher layers is described in this section. The precision requirements of the measurements are specified in TS25.103.

The measurement quantities measured by the physical layer shall be such that the following principles are applied:

For handover measurements, the decoding of parameters on the BCCH logical channel of monitored neighbouring cells, should not, in general, be needed for calculating the measurement result. If there is a need to adjust the measurement result with parameters broadcast on the PCCPCH, these parameters shall be provided by the UTRAN in inband measurement control messages. There may be some exceptions to this rule. *For example, it may be necessary to decode the SFN of the measured neighbouring cell for time difference measurements.*

NOTE: ~~It should be decided whether the SFN is a L3 or L1 parameter. WG1 has approved that SFN is a L1 parameter.In a LS sent to WG2, they also indicate that the SFN is encoded together with the BCH transport blocks, with a joint CRC. However WG2 had questions regarding the advantage of this method, compared to having the SFN as a L3 parameter, and have sent back a LS to WG1.~~

In idle mode or in RRC connected mode using common Transport Channels, the UE shall be able to monitor cells for cell reselection, without being required to frequently decode parameters on the BCCH logical channel of the monitored neighbouring cells. The decoding frequency of these parameters, set by the cell reselection algorithm, should be such that UE standby times are not significantly decreased.

9.1 Measurements of downlink channels

9.1.1 Observed time difference to UTRA cell

This measure is mandatory for the UE.

Measurement	Measured time difference to UTRA cell
Source	L1 (UE)
Destination	RRC (RNC) for handover
Reporting Trigger	On-demand, Event-triggered
Definition	**For FDD:** The 'Observed time difference to UTRA cell' indicates the time difference which is measured by UE between CFN in the UE and the SFN of the target neighbouring cell. It is notified to SRNC by Measurement Report message or Measurement Information Element in other RRC messages. **For TDD:** This is the relative time difference in the frame timing between the serving and the target cell measured at the UE.

9.1.2 Observed time difference to GSM cell

This measure is mandatory for the UE if the handover to GSM service is to be supported.

Measurement	Measured time difference to GSM cell
Source	L1 (UE)
Destination	RRC (RNC) for maintenance and handover to GSM
Reporting Trigger	On-demand, Event-triggered
Definition	Time difference between the Primary CCPCH of the current cell and the timing of the GSMcell.

9.1.3 CPICH RX E_c/I_0

This measure is mandatory for the UE.

Measurement	CPICHRx Ec/Io
Source	L1(UE)
Destination	RRC (UE, RNC),
Reporting Trigger	Periodic, on demand and event triggered
Definition	$-20\log_{10}(E_c/I_o)$ where E_c is the energy per chip of the CPICH (for FDD: measured in the searcher) and I_o is the received spectral density.

9.1.4 CPICH Rx SIR

NOTE: WG1 has not yet come to any agreement on the impact on terminal complexity if L1 should support measurement of RX CPICH SIR. Therefore, this measurement is currently not supported by L1. However, it is too early to rule out the possibility that it will eventually be included also in the WG1 specifications.

This measure is mandatory for the UE.

Measurement	CPICH Rx SIR
Source	L1 (UE)
Destination	RRC (UE, RNC)
Reporting Trigger	Periodic or event triggered
Definition	This quantity is a ratio of the CPICH Received Signal Code Power (RSCP) to the Interference Signal Code Power (ISCP). The RSCP is the measured symbol power of the CPICH at the demodulator output and the ISCP is the measured interference symbol power.

9.1.5 CPICH Rx RSCP

This measure is mandatory for the UE.

Measurement	CPICH Rx RSCP
Source	L1(UE)
Destination	RRC (UE, RNC)
Reporting Trigger	Periodic or event triggered
Definition	Received Signal Code Power, is received power on one code, defined on the pilot symbols after despreading for FDD and on the midamble for TDD.

9.1.6 CPICH Rx ISCP

NOTE: WG1 has not yet come to any agreement on the impact on terminal complexity if L1 should support measurement of RX CPICH ISCP. Therefore, this measurement is currently not supported by L1. However, it is too early to rule out the possibility that it will eventually be included also in the WG1 specifications.

This measure is mandatory for the UE.

Measurement	CPICH Rx ISCP
Source	L1(UE)
Destination	RRC (UE, RNC)
Reporting Trigger	Periodic or event triggered
Definition	Interference on Signal Code Power, is the interference after despreading. Thereby only the non-orthogonal part of the interference is included. For FDD this is measured on the Primary CCPCH. For TDD this is measured in specified timeslots.

Measurement	CPICH Rx ISCP
Source	L1(UE)
Destination	RRC (UE, RNC)
Reporting Trigger	Periodic or event triggered

10.3.3.10   AICH

- Scrambling code

- Channelisation code

- Tx diversity mode

NOTE: the value for the parameters needs to be consistent with the corresponding PRACH. ~~This needs to be confirmed by WG1.~~

11   Radio Frame transmission

11.1   Downlink Frame format

11.2   Uplink Frame format

11.3   Order of bit transmission

Annex A (normative):
Description of Transport Formats

The following table describes the characterisation of a Transport Format. ~~The possible values for the attributes will be defined by the L1 experts group based on the requirements identified by the L23 experts group. Note that the allowed Transport Format Combinations are not described here, and will need to be covered also.~~

Table A.1: Characterisation of Transport Format

		Attribute values
Dynamic part	Transport Block Size	1 to 5000 1 bit granularity
	Transport Block Set Size	1 to 200000 1 bit granularity
	Transmission Time Interval (option for TDD only)	10, 20 ms, 40 and 80 ms
Semi-static part	Transmission Time Interval (FDD, option for TDD NRT bearers)	10, 20 ms, 40 and 80 ms
	Type of channel coding	Turbo Convolutional coding
	code rates	1/2, 1/3
	CRC size	0, 8, 16, 24
	Resulting ratio after static rate matching	0.5 to 4

NOTE: The maximum size of the Transport Block has been chosen so as to avoid any need for segmentation in the physical layer into sub-blocks (segmentation should be avoided in the physical layer).