

TSG-RAN Working Group 1 meeting #15
Berlin, Germany
August 22 –25, 2000

TSGR1#15(00)1078

Agenda item: AH 99
Source: InterDigital Communications Corporation
Title: Editorial corrections to the synchronisation channel (SCH) section.
Document for: Decision

This CR:

1. Corrects wrong reference to the Annex in the section 5.3.3.3
2. Corrects the Figure describing the synchronisation channel scheme, and clarifies the text in the section 5.3.4.
3. Clarifies the text in the section 6.2.1

CHANGE REQUEST

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

25.221 CR 033

Current Version: **3.3.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑

↑ CR number as allocated by MCC support team

For submission to: **RAN #9**

list expected approval meeting # here



for approval
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

UTRAN / Radio

Core Network

Source:

InterDigital Comm. Corp.

Date:

August 18, 2000

Subject:

Editorial corrections for 25.221

Work item:

TS 25.221

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
- C Functional modification of feature
- D Editorial modification

Release:

- Phase 2
- Release 96
- Release 97
- Release 98
- Release 99
- Release 00

Reason for change:

Incorrect reference to the Annex in section 5.3.3.3. The scheme of the synchronisation channel is not clear.

Clauses affected:

5.3.3.3, 5.3.4, 6.2.1

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:



help.doc

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

5.3.3.3 PRACH Training sequences

The training sequences, i.e. midambles, of different users active in the same time slot are time shifted versions of a single periodic basic code. The basic midamble codes used for PRACH bursts are the same as for burst type 1 and are shown in Annex A1. The necessary time shifts are obtained by choosing either *all* $k=1,2,3,\dots,K'$ (for cells with small radius) or *uneven* $k=1,3,5,\dots\leq K'$ (for cells with large radius). Different cells use different periodic basic codes, i.e. different midamble sets.

For cells with large radius additional midambles may be derived from the time-inverted Basic Midamble Sequence. Thus, the second Basic Midamble Code m_2 is the time inverted version of Basic Midamble Code m_1 .

In this way, a joint channel estimation for the channel impulse responses of all active users within one time slot can be performed by a maximum of two cyclic correlations (in cells with small radius, a single cyclic correlator suffices). The different user specific channel impulse response estimates are obtained sequentially in time at the output of the cyclic correlators.

5.3.3.4 RACH timeslot formats

For the RACH the timeslot format is only spreading factor dependent. Burst type 1 midamble is always used. The two data fields contain a different number of bits.

Table 4c: Timeslot formats for the RACH

Slot Format #	Spreading Factor	Midamble length (chips)	Bits/slot	$N_{\text{Data/Slot}}$ (bits)	$N_{\text{data/data field(1)}}$ (bits)	$N_{\text{data/data field(2)}}$ (bits)
0	16	512	232	232	122	110
1	8	512	464	464	244	220

5.3.3.5 Association between Training Sequences and Channelisation Codes

For the PRACH there exists a fixed association between the training sequence and the channelisation code. The generic rule to define this association is based on the order of the channelisation codes $c_Q^{(k)}$ given by k and the order of the midambles $m_j^{(k)}$ given by k , firstly, and j , secondly, with the constraint that the midamble for a spreading factor Q is the same as in the upper branch for the spreading factor $2Q$. The index $j=1$ or 2 indicates whether the original Basic Midamble Sequence ($j=1$) or the time-inverted Basic Midamble Sequence is used ($j=2$).

- For the case that all k are allowed and only one periodic basic code m_1 is available for the RACH, the association depicted in figure 12 is straightforward.
- For the case that only odd k are allowed the principle of the association is shown in figure 13. This association is applied for one and two basic periodic codes.

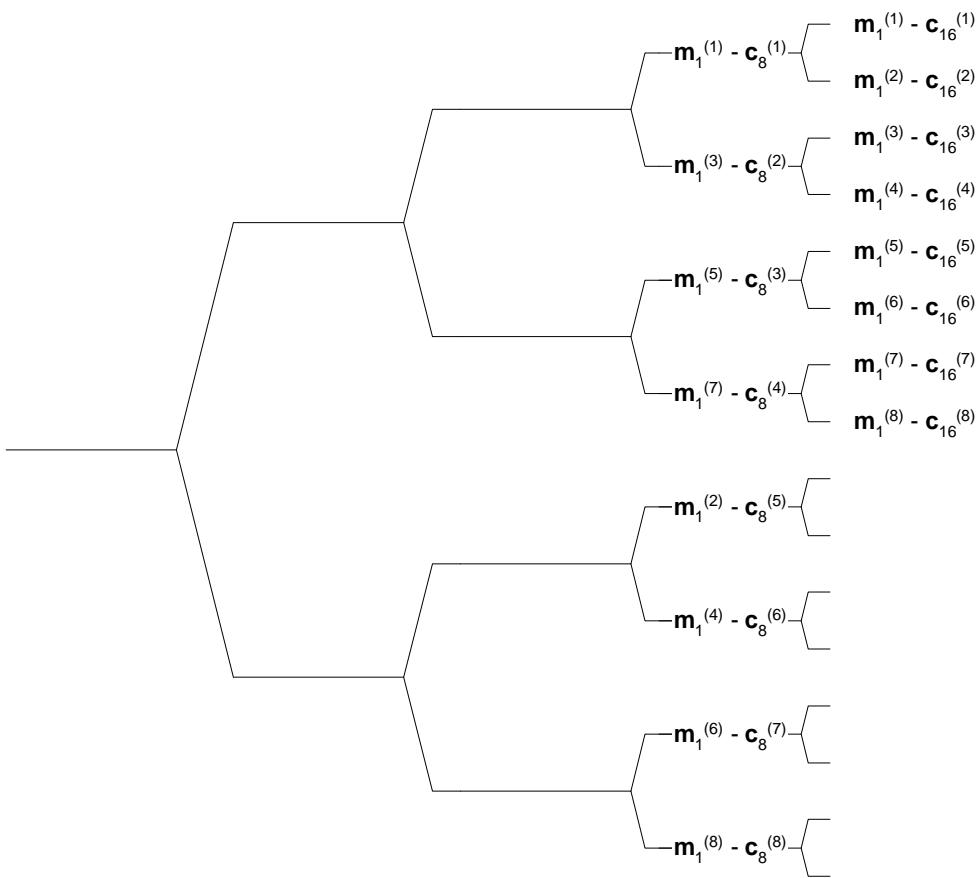


Figure 12: Association of Midambles to Channelisation Codes in the OVFS tree for all k

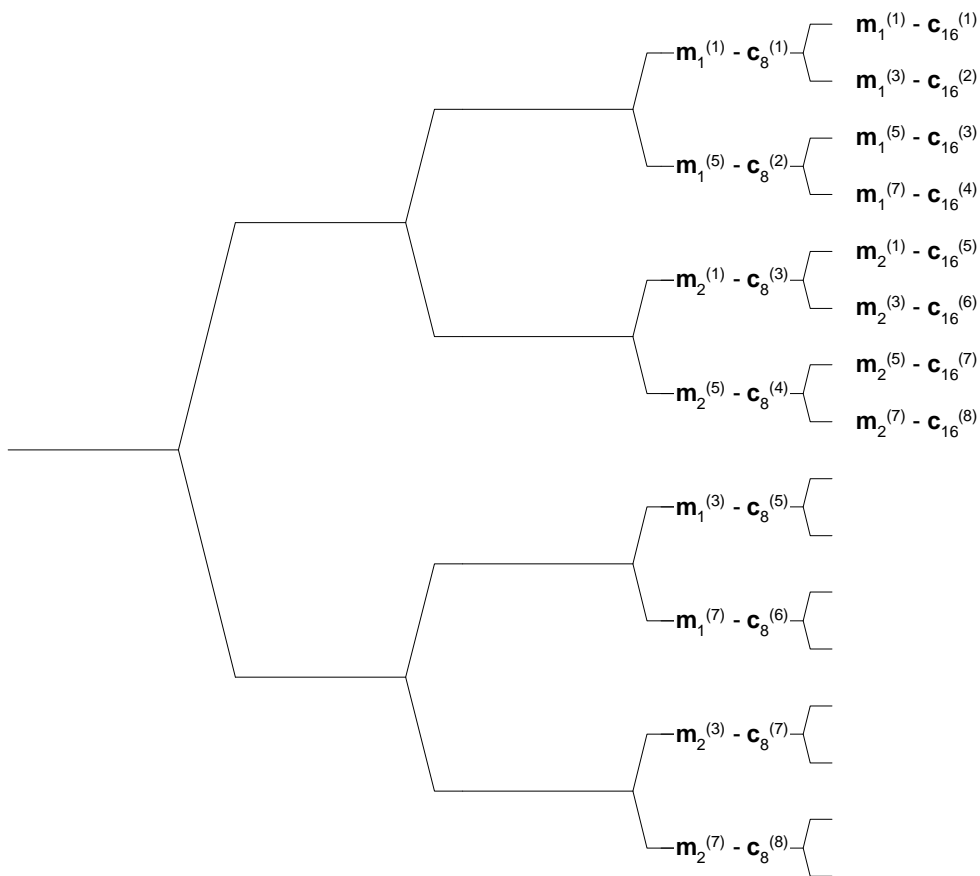


Figure 13: Association of Midambles to Channelisation Codes in the OVSF tree for odd k

5.3.4 The synchronisation channel (SCH)

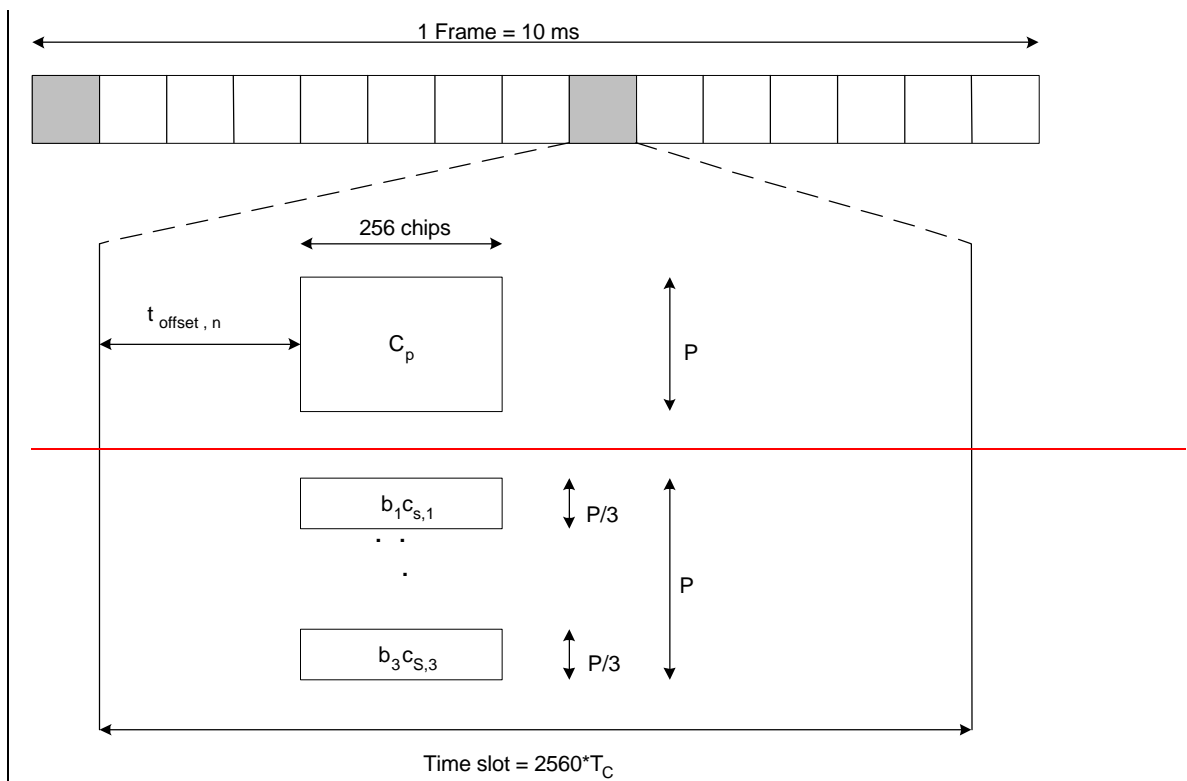
In TDD mode code group of a cell can be derived from the synchronisation channel. In order not to limit the uplink/downlink asymmetry the SCH is mapped on one or two downlink slots per frame only.

There are two cases of SCH and P-CCPCH allocation as follows:

- Case 1) SCH and P-CCPCH allocated in TS# k , $k=0\dots14$
- Case 2) SCH allocated in two TS: TS# k and TS# $k+8$, $k=0\dots6$; P-CCPCH allocated in TS# k .

The position of SCH (value of k) in frame can change on a long term basis in any case. Due to this SCH scheme, the position of P-CCPCH is known from the SCH.

Figure 14 is an example for transmission of SCH, $k=0$, of Case 2.



$C_{s,i} \in \{C_0, C_1, C_3, C_4, C_5, C_6, C_8, C_{10}, C_{12}, C_{13}, C_{14}, C_{15}\}$, $i=1,2,3$; see [8]

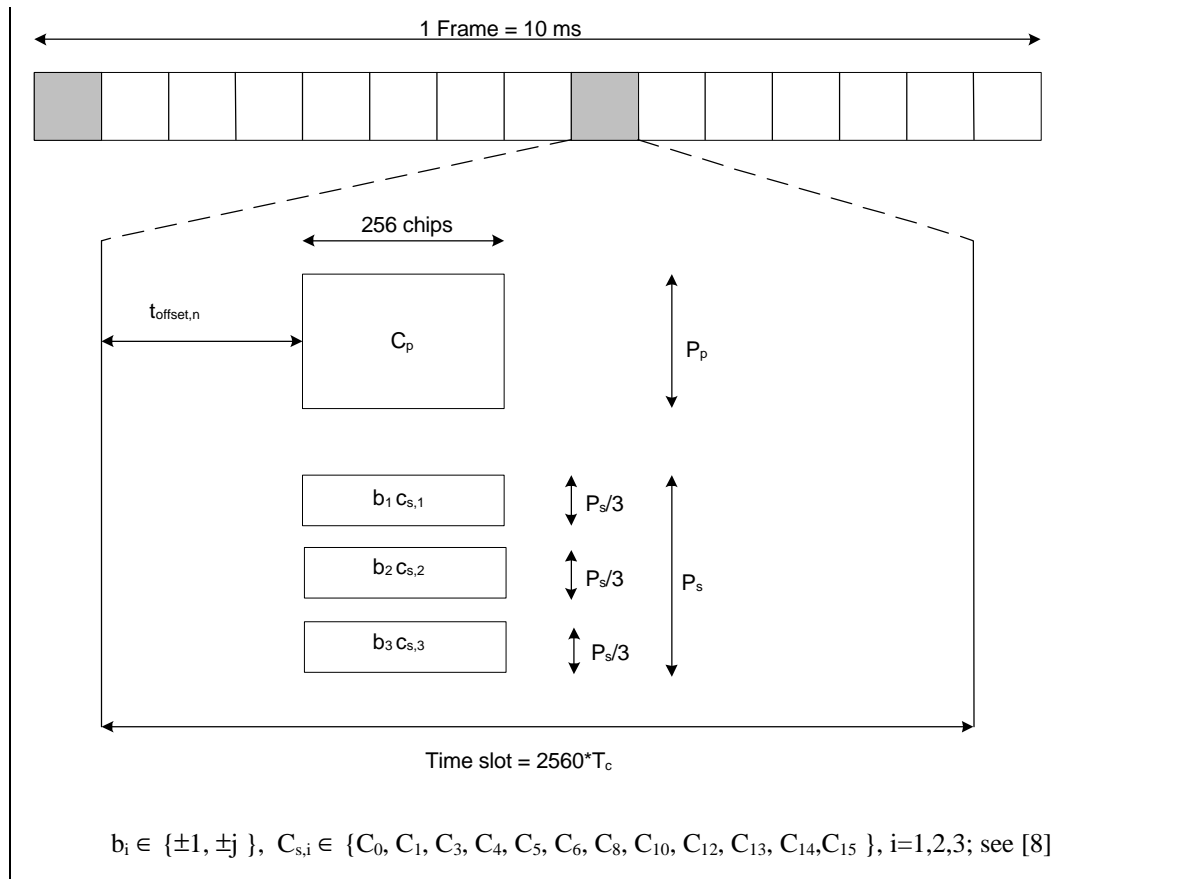


Figure 14: Scheme for Synchronisation channel SCH consisting of one primary sequence C_p and 3 parallel secondary sequences $C_{s,i}$ in slot k and $k+8$ (example for $k=0$ in Case 2)

As depicted in figure 14, the SCH consists of a primary and three secondary code sequences with each 256 chips length long. The primary and secondary code sequences are defined in [8] clause 7 'Synchronisation codes'.

Due to mobile to mobile interference, it is mandatory for public TDD systems to keep synchronisation between base stations. As a consequence of this, a capture effect concerning SCH can arise. The time offset $t_{offset,n}$ enables the system to overcome the capture effect.

The time offset $t_{offset,n}$ is one of 32 values, depending on the cell parameter, thus on the code group of the cell, n , cf. 'table 6 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and t_{offset} ' in [8]. Note that the cell parameter will change from frame to frame, cf. 'Table 7 Alignment of cell parameter cycling and system frame number' in [8], but the cell will belong to only one code group and thus have one time offset $t_{offset,n}$. The exact value for $t_{offset,n}$ regarding column 'Associated t_{offset} ' in table 6 in [8] is given by:

$$t_{offset,n} = n \cdot T_c \left\lfloor \frac{2560 - 96 - 256}{31} \right\rfloor$$

$$= n \cdot 71T_c ; \quad n = 0, \dots, 31$$

~~Please note that~~where $\lfloor x \rfloor$ denotes the largest integer number less or equal to x and ~~that~~
 T_c denotes the chip duration.

5.3.5 Physical Uplink Shared Channel (PUSCH)

For Physical Uplink Shared Channel (PUSCH) the burst structure of DPCH as described in subclause 5.2 shall be used. User specific physical layer parameters like power control, timing advance or directive antenna settings are derived from the associated channel (FACH or DCH). PUSCH provides the possibility for transmission of TFCI in uplink.

5.3.6 Physical Downlink Shared Channel (PDSCH)

For Physical Downlink Shared Channel (PDSCH) the burst structure of DPCH as described in subclause 5.2 shall be used. User specific physical layer parameters like power control or directive antenna settings are derived from the associated channel (FACH or DCH). PDSCH provides the possibility for transmission of TFCI in downlink. To indicate to the UE that there is data to decode on the DSCH, three signalling methods are available:

- 1) using the TFCI field of the associated channel or PDSCH;
- 2) using on the DSCH user specific midamble derived from the set of midambles used for that cell;
- 3) using higher layer signalling.

When the midamble based method is used, the UE shall decode the PDSCH if the PDSCH was transmitted with the midamble assigned to the UE by UTRAN, see 5.5.1.1.2. For this method no other physical channels may use the same time slot as the PDSCH and only one UE may share the PDSCH time slot at the same time.

5.3.7 The Page Indicator Channel (PICH)

The Page Indicator Channel (PICH) is a physical channel used to carry the Page Indicators (PI). The PICH is always transmitted at the same reference power level as the P-CCPCH.

Figure 15 depicts the structure of a PICH burst and the numbering of the bits within the burst. The same burst type is used for the PICH in every cell. N_{PIB} bits in a normal burst of type 1 or 2 are used to carry the PI, where N_{PIB} depends on the burst type: $N_{PIB}=240$ for burst type 1 and $N_{PIB}=272$ for burst type 2. The bits $b_{N_{PIB}, \dots}, b_{N_{PIB}+3}$ adjacent to the midamble are reserved for possible future use. They shall be set to 0 and transmitted with the same power as the PI carrying bits.

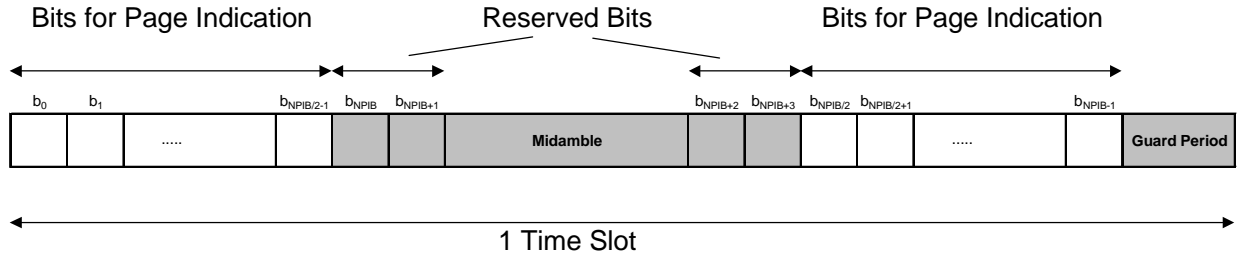


Figure 15: Transmission and Numbering of PI carrying Bits in a PICH burst

N_{PI} page indicators of length $L_{PI}=4$, $L_{PI}=8$ or $L_{PI}=16$ bits are transmitted in one time slot. The number of page indicators N_{PI} per time slot is given by the number L_{PI} of bits for the page indicators and the burst type. In table 8 this number is shown for the different possibilities of burst types and PI lengths.

Table 8: Number N_{PI} of PI per time slot for the different burst types and PI lengths L_{PI}

	$L_{PI}=4$	$L_{PI}=8$	$L_{PI}=16$
Burst Type 1	$N_{PI}=60$	$N_{PI}=30$	$N_{PI}=15$
Burst Type 2	$N_{PI}=68$	$N_{PI}=34$	$N_{PI}=17$

As shown in figure 16, the Page Indicators of N_{PICH} consecutive frames form a PICH block, N_{PICH} is configured by higher layers. Thus, $N=N_{PICH} \cdot N_{PI}$ Page Indicators are transmitted in each PICH block.

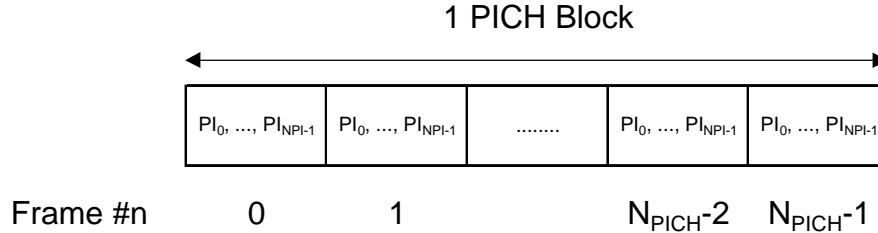


Figure 16: Structure of a PICH block

The PI calculated by higher layers for use for a certain UE, see [15], is mapped to the Page Indicator PI_p in the n th frame of one PICH block, where p is given by

$$p = PI \bmod N_{PI}$$

and n is given by

$$n = PI \text{ div } N_{PI}.$$

The Page Indicator PI_p in one time slot is mapped to the bits $\{b_{L_{PI} \cdot p}, \dots, b_{L_{PI} \cdot p + L_{PI} - 1}, b_{N_{PIB}/2 + L_{PI} \cdot p}, \dots, b_{N_{PIB}/2 + L_{PI} \cdot p + L_{PI} - 1}\}$ within this time slot.

5.4 Transmit Diversity for DL Physical Channels

Table 9 summarizes the different transmit diversity schemes for different downlink physical channel types that are described in [9].

Table 9: Application of Tx diversity schemes on downlink physical channel types
"X" – can be applied, "-" – must not be applied

Physical channel type	Open loop TxDiversity		Closed loop TxDiversity
	TSTD	Block STTD	
P-CCPCH	–	X	–
SCH	X	–	–
DPCH	–	–	X

5.5 Beacon function of physical channels

For the purpose of measurements, a beacon function shall be provided by particular physical channels.

5.5.1 Location of physical channels with beacon function

The location of the physical channels with beacon function is determined by the SCH and depends on the SCH allocation case, see 5.3.4:

Case 1) All physical channels that are allocated to channelisation code $c_{Q=16}^{(k=1)}$ and in TS#k, k=0...14 shall provide the beacon function.

Case 2) All physical channels that are allocated to channelisation code $c_{Q=16}^{(k=1)}$ and in TS#k and TS#k+8, k=0...6, shall provide the beacon function.

Note that by this definition the P-CCPCH always provides the beacon function.

5.5.2 Physical characteristics of the beacon function

The physical channels providing the beacon function:

- are transmitted with reference power;
- are transmitted without beamforming;
- use burst type 1;
- use midamble $m^{(1)}$ and $m^{(2)}$ exclusively in this time slot; and
- midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot, if 16 midambles are allowed in that cell.

The reference power corresponds to the sum of the power allocated to both midambles $m^{(1)}$ and $m^{(2)}$. Two possibilities exist:

- If no Block STTD antenna diversity is applied to P-CCPCH, all the reference power of any physical channel providing the beacon function is allocated to $m^{(1)}$.
- If Block STTD antenna diversity is applied to P-CCPCH, for any physical channel providing the beacon function midambles $m^{(1)}$ and $m^{(2)}$ are each allocated half of the reference power. Midamble $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna. Block STTD encoding is used for the data in P-CCPCH, see [9]; for all other physical channels identical data sequences are transmitted on both antennas.

5.6 Midamble Allocation for Physical Channels

In general, midambles are part of the physical channel configuration which is performed by higher layers.

Optionally, if no midamble is allocated by higher layers, a default midamble allocation shall be used. This default midamble allocation is given by a fixed association between midambles and channelisation codes, see clause A.3, and shall be applied individually to all channelisation codes within one time slot. Different associations apply for different burst types and cell configurations with respect to the maximum number of midambles.

5.6.1 Midamble Allocation for DL Physical Channels

Physical channels providing the beacon function shall always use the reserved midambles, see 5.4. For all other DL physical channels the midamble allocation is signalled or given by default.

5.6.1.1 Midamble Allocation by signalling

Either a common or a UE specific midamble shall be signalled to the UE as a part of the physical channel configuration. Common or UE specific midambles may be applied only if the conditions in subclauses 5.6.1.1.1 and subclause 5.6.1.1.2 hold respectively. If the midamble is not signalled as a part of the physical channel configuration, midamble allocation by default shall be used.

5.6.1.1.1 Common Midamble

A common midamble may be assigned to all physical channels in one time slot, if:

- a single UE uses all physical channels in one time slot (as in the case of high rate service);

or

- multiple UEs use the physical channels in one time slot; and
- no beamforming is applied to any of these DL physical channels; and
- no closed loop TxDiversity is applied to any of these DL physical channels; and
- midambles are not used for PDSCH physical layer signalling.

5.6.1.1.2 UE specific Midamble

An individual midamble may be assigned to each of the UEs in one time slot, if:

- multiple UEs use the physical channels in one time slot; and
- beamforming is applied to all of these DL physical channels; and
- no closed loop TxDiversity is applied to any of these DL physical channels;

or

- PDSCH physical layer signalling based on the midamble is used.

5.6.1.2 Midamble Allocation by default

If no midamble is allocated by signalling, the UE shall derive the midamble from the associated channelisation code and shall use an individual midamble for each channelisation code. For each association between midambles and channelisation codes in annex A.3, there is one primary channelisation code associated to each midamble. A set of secondary channelisation codes is associated to each primary channelisation code.

All the secondary channelisation codes within a set use the same midamble as the primary channelisation code to which they are associated.

Higher layers shall allocate the channelisation codes in a particular order. Primary channelisation codes shall be allocated prior to associated secondary channelisation codes. If midambles are reserved for the beacon function, all primary and secondary channelisation codes that are associated with the reserved midambles shall not be used. Primary and its associated secondary channelisation codes shall not be allocated to different UE's.

In the case that secondary channelisation codes are used, secondary channelisation codes of one set shall be allocated in ascending order, with respect to their numbering.

5.6.2 Midamble Allocation for UL Physical Channels

If the midamble is part of the physical channel configuration, an individual midamble shall be assigned to all UE's in one time slot.

If no midamble is allocated by higher layers, the UE shall derive the midamble from the assigned channelisation code as for DL physical channels. If the UE changes the SF according to the data rate, it shall always vary the channelisation code along the lower branch of the OVSF tree.

6 Mapping of transport channels to physical channels

This clause describes the way in which transport channels are mapped onto physical resources, see figure 17.

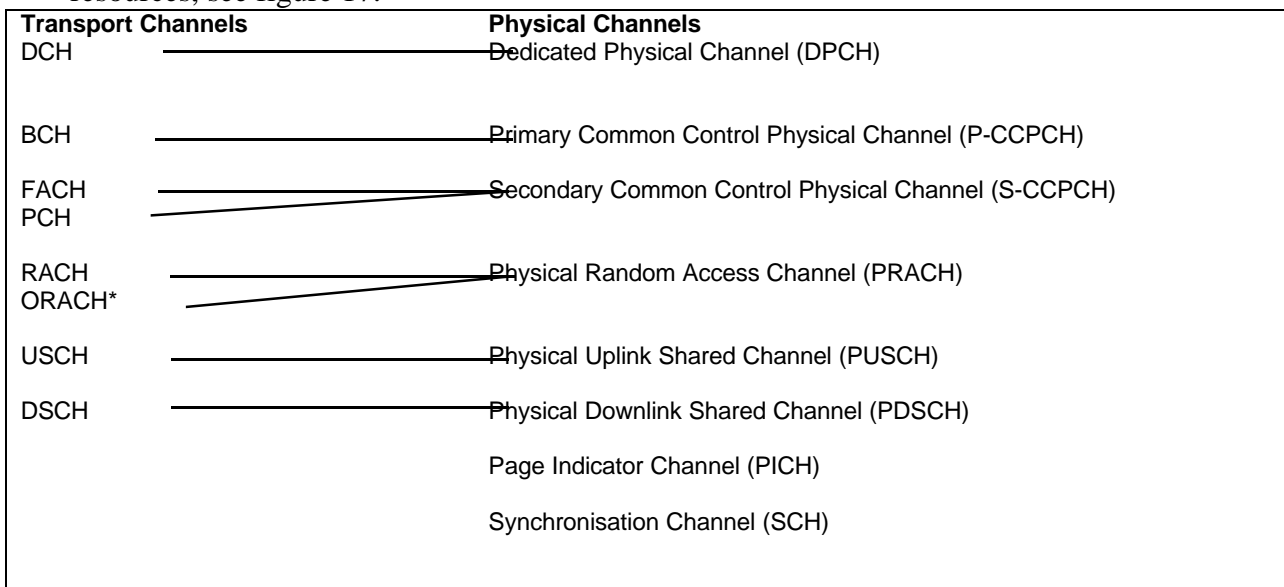


Figure 17: Transport channel to physical channel mapping

6.1 Dedicated Transport Channels

A dedicated transport channel is mapped onto one or more physical channels. An interleaving period is associated with each allocation. The frame is subdivided into slots that are available for uplink and downlink information transfer. The mapping of transport blocks on physical channels is described in TS 25.222 ("multiplexing and channel coding").

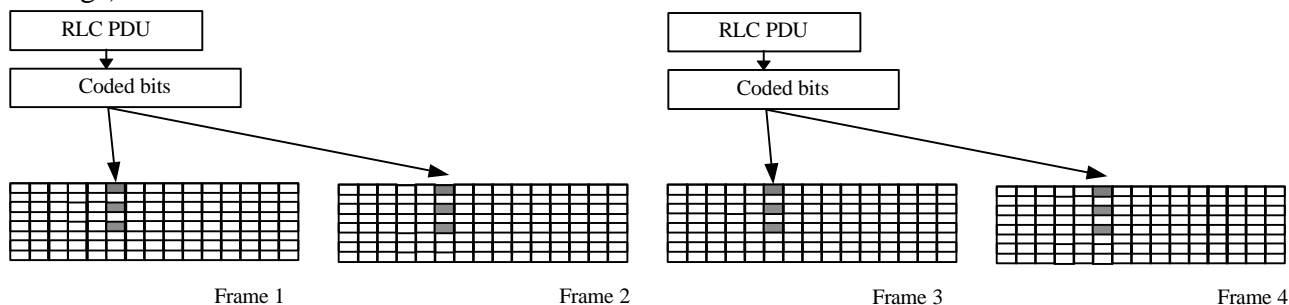


Figure 18: Mapping of PDU onto the physical bearer

For NRT packet data services, shared channels (USCH and DSCH) can be used to allow efficient allocations for a short period of time.

6.2 Common Transport Channels

6.2.1 The Broadcast Channel (BCH)

The BCH is mapped onto the P-CCPCH. The secondary SCH codes indicates in which timeslot a mobile can find the P-CCPCH containing BCH.

