TSG-RAN Meeting #6 **_TSGRP#6(99)692_**
Nice, France, 13 – 15 December 1999

Title: **Agreed CRs of category "C" (Modifications) and "F" (Corrections) to TS 25.221**

Source: **TSG-RAN WG1**

Agenda item: **5.1.3**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc
25.221	001	02	R99	Primary and Secondary CCPCH in TDD	F	3.0.0	3.1.0	R1-99k56
25.221	002	02	R99	Removal of Superframe for TDD	F	3.0.0	3.1.0	R1-99i81
25.221	006	-	R99	Corrections to TS25.221	F	3.0.0	3.1.0	R1-99i98
25.221	007	1	R99	Clarifications for Spreading in UTRA TDD	C	3.0.0	3.1.0	R1-99k61
25.221	008	-	R99	Transmission of TFCI bits for TDD	F	3.0.0	3.1.0	R1-99k58
25.221	009	-	R99	Midamble Allocation in UTRA TDD	C	3.0.0	3.1.0	R1-99k60

NOTE: The source of this document is TSG-RAN WG1. The source shown on each CR cover sheet is the originating organisation.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, 30 Nov – 3 Dec 1999

***Document* R1-99K56**
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.

25.221 CR 001r2 Current Version: 3.0.0

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

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

for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

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: Siemens AG, Motorola, Nokia **Date:** 1999-12-02

Subject: Primary and Secondary CCPCH in TDD

Work item:

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

F	Correction	X
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	X
Release 00	

Reason for change:
- Due to recent changes in WG2 (CR25.321-014 and CR25.301-018r1) the transport to physical channel mapping in TDD can be changed in order to facilitate the channel description and harmonize TDD and FDD mapping.
- TFCI is used for S-CCPCH
- Two beacons are provided in the case 3 of synchronisation schemes
- Block STTD for P-CCPCH

Clauses affected: 3, 5.3, 5.4, 5.5, 5.6, 5.7, 6, Annex B

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.223-001r1, 25.224-001r1, 25.225-001r1, 25.222-013, 25.224-004r1, 25.225-002r1
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: This CR contains several technical items, which influence the text of each other. Therefore the following Tdocs and CR's were merged in this CR: CR001r1-221, R1-99J62, R1-99I93, CR004-221.

help.doc

<--------- 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:

BCH	Broadcast Channel
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CDMA	Code Division Multiple Access
DPCH	Dedicated Physical Channel
DSCH	Downlink Shared Channel
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FEC	Forward Error Correction
GP	Guard Period
GSM	Global System for Mobile Communication
NRT	Non-Real Time
ODCH	ODMA Dedicated Transport Channel
ODMA	Opportunity Driven Multiple Access
ORACH	ODMA Random Access Channel
OVSF	Orthogonal Variable Spreading Factor
P-CCPCH	Primary CCPCH
PCH	Paging Channel
PDSCH	Physical Downlink Shared Channel
PICH	Page Indicator Channel
PDU	Protocol Data Unit
PRACH	Physical Random Access Channel
PSCH	Physical Synchronisation Channel
PUSCH	Physical Uplink Shared Channel
RACH	Random Access Channel
RLC	Radio Link Control
RF	Radio Frame
RT	Real Time
S-CCPCH	Secondary CCPCH
SCH	Synchronisation Channel
SFN	Cell System Frame Number
TCH	Traffic Channel
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
USCH	Uplink Shared Channel

5.3 Common physical channels

5.3.1 Primary common control physical channel (P-CCPCH)

The BCH as described in section 4.1.2 is mapped onto the Primary Common Control Physical Channel (P-CCPCH). The position (time slot / code) of the P-CCPCH is known from the Physical Synchronisation Channel (PSCH), see section 5.3.4.

5.3.1.1 P-CCPCH Spreading

The P-CCPCH uses fixed spreading with a spreading factor SF = 16 as described in section 5.2.1.1. The P-CCPCH always uses channelisation code $a_{Q=16}^{(k=1)}$.

5.3.1.2 P-CCPCH Burst Types

The burst type 1 as described in section 5.2.2 is used for the P-CCPCH. No TFCI is applied for the P-CCPCH.

5.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in section 5.2.3 are used for the P-CCPCH. For those timeslots in which the P-CCPCH is transmitted, the midambles $m^{(1)}$, $m^{(2)}$, $m^{(9)}$ and $m^{(10)}$ are reserved for P-CCPCH in order to support Block STTD antenna diversity and the beacon function, see 5.3.1.4 and 5.4. The use of midambles depends on whether Block STTD is applied to P-CCPCH, see 5.3.1.4.

5.3.1.4 Block STTD antenna diversity for P-CCPCH

Block STTD antenna diversity can be optionally applied for the P-CCPCH. Its support is mandatory for the UE. Two possibilities exist :

- If no antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used and $m^{(2)}$ is left unused.
- If Block STTD antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna.

5.3.2 Secondary common control physical channel (S-CCPCH)

PCH and FACH as described in section 4.1.2 are mapped onto one or more secondary common control physical channels (S-CCPCH). In this way the capacity of PCH and FACH can be adapted to the different requirements.

5.3.2.1 S-CCPCH Spreading

The S-CCPCH uses fixed spreading with a spreading factor SF = 16 as described in section 5.2.1.1.

5.3.2.2 S-CCPCH Burst Types

The burst types 1 or 2 as described in section 5.2.2 are used for the S-CCPCHs. TFCI may be applied for S-CCPCHs.

5.3.2.3 S-CCPCH Training sequences

The training sequences, i.e. midambles, as described in section 5.2.3 are used for the S-CCPCH.

5.3.3 The physical random access channel (PRACH)

The RACH or in case of ODMA networks the ORACH as described in section 4.1.2 are mapped onto one or more uplink physical random access channels (PRACH). In such a way the capacity of RACH and ORACH can be flexibly scaled depending on the operators need.

This description of the physical properties of the PRACH also applies to bursts carrying other signaling or user traffic if they are scheduled on a time slot which is (partly) allocated to the RACH or ORACH.

5.3.3.1 PRACH Spreading

The uplink PRACH uses either spreading factor SF=16 or SF=8 as described in section 5.2.1.1. The set of admissible spreading codes for use on the PRACH and the associated spreading factors are broadcast on the BCH (within the RACH configuration parameters on the BCH).

5.3.3.2 PRACH Burst Types

The mobile stations send the uplink access bursts randomly in the PRACH. The PRACH burst consists of two data symbol fields, a midamble and a guard period. The second data symbol field is shorter than the first symbol data field by 96 chips in order to provide additional guard time at the end of the PRACH time slot.

The precise number of collision groups depends on the spreading codes (i.e. the selected RACH configuration. The access burst is depicted in figure 10, the contents of the access burst fields are listed in table 7 and table 8.

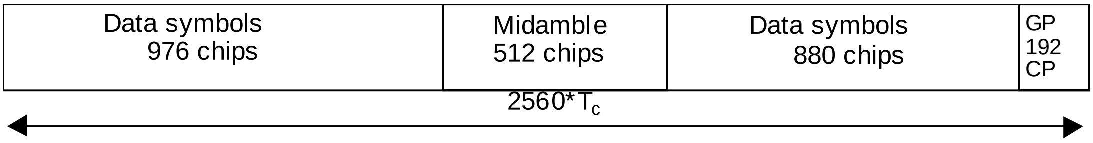


Figure 12: PRACH burst, GP denotes the guard period

Table 7: number of symbols per data field in PRACH burst

Spreading factor (Q)	Number of symbols in data field 1	Number of symbols in data field 2
8	122	110
16	61	55

Table 8: The contents of the PRACH burst field

Chip number (CN)	Length of field in chips	Length of field in symbols	Contents of field
0-975	976	cf table 1	Data symbols
976-1487	512	-	Midamble
1488-2367	880	cf table 1	Data symbols
2368-2559	192	-	Guard period

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 A. The necessary time shifts are obtained by choosing either *all* k=1,2,3...,K' (for cells with small radius) or *uneven* k=1,3,5,...≤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 Association between Training Sequences and Spreading Codes

For the PRACH there exists a fixed association between the training sequence and the spreading code. The generic rule to define this association is based on the order of the spreading codes $\mathbf{a}_Q^{(k)}$ given by *k* and the order of the midambles $\mathbf{m}_j^{(k)}$ 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 2*Q*. 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 13 is straightforward.

- For the case that only odd *k* are allowed the principle of the association is shown in figure 14. This association is applied for one and two basic periodic codes.

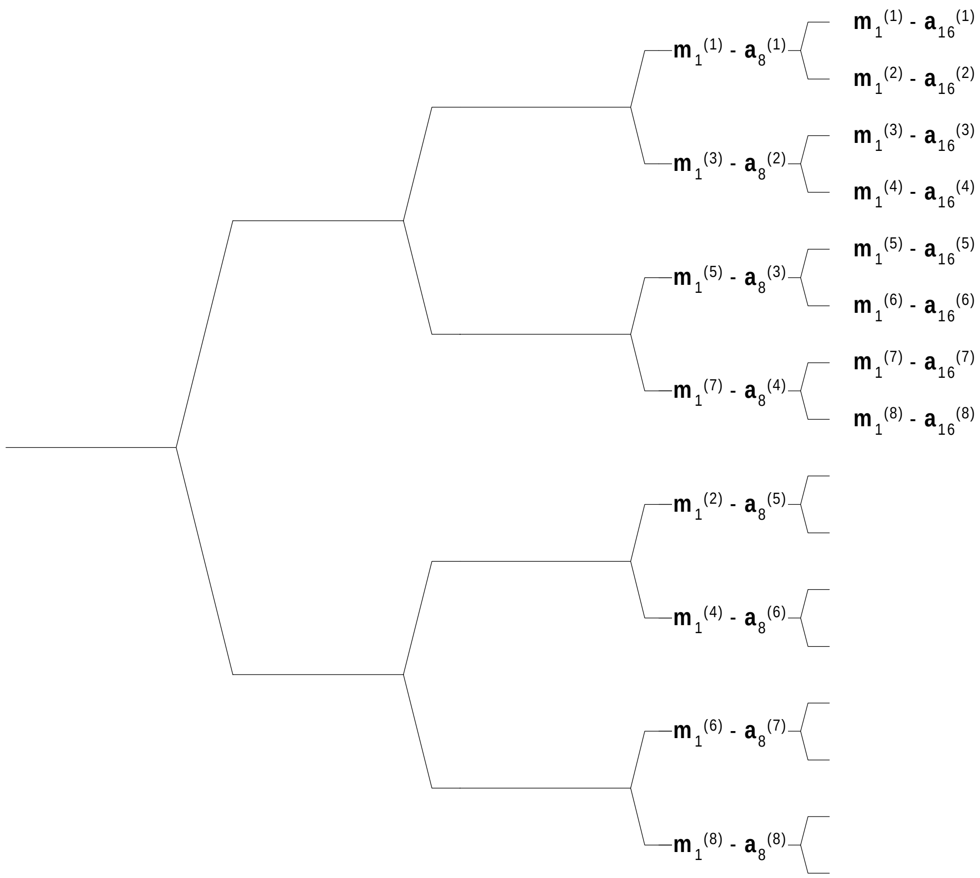


Figure 13: Association of Midambles to Spreading Codes in the OVSF tree for all *k*

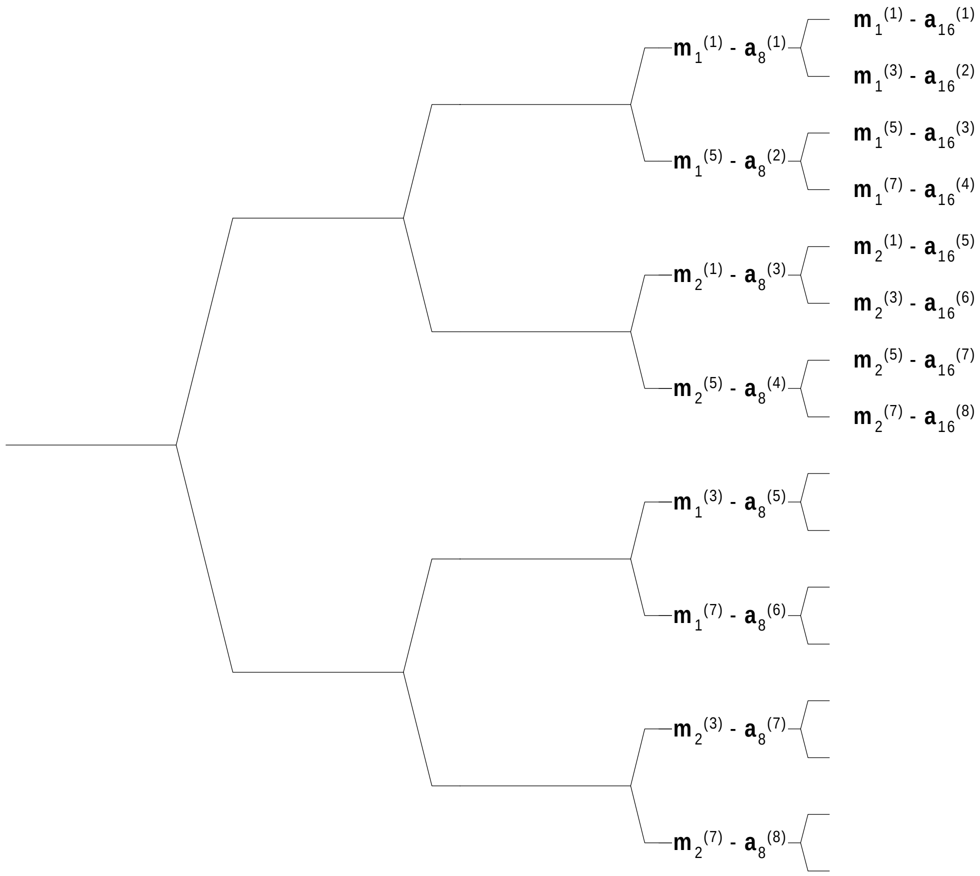


Figure 14: Association of Midambles to Spreading Codes in the OVSF tree for odd *k*

5.3.4 The physical synchronisation channel (PSCH)

In TDD mode code group of a cell can be derived from the synchronisation channel. Additional information, received from higher layers on SCH transport channel, is also transmitted to the UE in PSCH in case 3 from below. In order not to limit the uplink/downlink asymmetry the PSCH is mapped on one or two downlink slots per frame only.

There are three cases of PSCH and P-CCPCH allocation as follows:

Case 1) PSCH and P-CCPCH allocated in TS#k, k=0….14

Case 2) PSCH allocated in two TS: TS#k and TS#k+8, k=0…6; P-CCPCH allocated in TS#k.

Case 3) PSCH allocated in two TS, TS#k and TS#k+8, k=0…6, and the P-CCPCH allocated in TS#i, i=0…6, pointed by PSCH. Pointing is determined via the SCH from the higher layers.

These three cases are addressed by higher layers using the SCCH in TDD Mode. The position of PSCH (value of k) in frame can change on a long term basis in any case.

Due to this PSCH scheme, the position of P-CCPCH is known from the PSCH. EMBEDEMBED

Figure 15 is an example for transmission of PSCH, k=0, of Case 2 or Case 3.

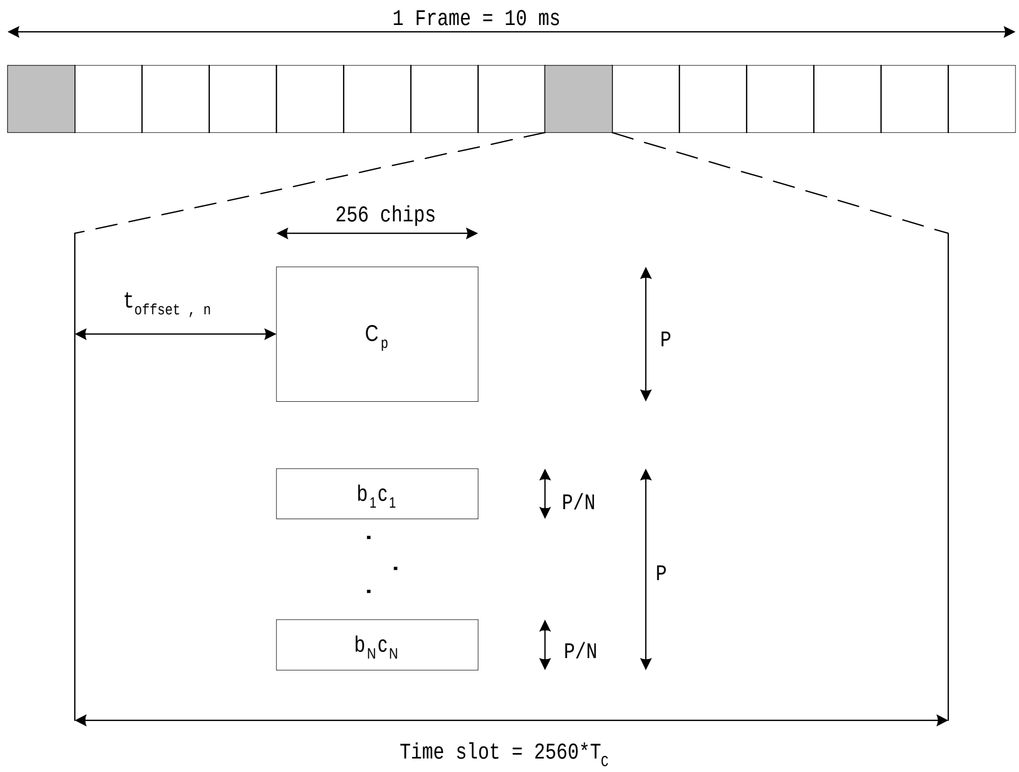


Figure 15: Scheme for Physical Synchronisation channel PSCH consisting of one primary sequence C_p and N=3 parallel secondary sequences in slot k and k+8

(example for k=0 in Case 2 or Case 3)

As depicted in figure 15, the PSCH consists of a primary and three secondary code sequences with 256 chips length. The primary and secondary code sequences are defined in [8] chapter 7 'Synchronisation codes'. The secondary codes are transmitted either in the I channel or the Q channel, depending on the code group.

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 PSCH can arise. The time offset t_{offset} enables the system to overcome the capture effect.

The time offset t_{offset} is one of 32 values, depending on the cell parameter, thus on the code group of the cell, cf. ‘table 7 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and t_{offset}’ in [8]. The exact value for t_{offset}, regarding column ‘Associated t_{offset}’ in table 7 from [8] is given by:

$$t_{offset,n} = n \cdot T_c \left\lfloor \frac{2560 - 96 - 256}{31} \right\rfloor$$
$$= n \cdot 71 T_c \;; \quad n = 0, \ldots, 31$$

Please note that $\lfloor x \rfloor$ 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 section 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 section 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 indicated for the UE by UTRAN.

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 substitutes one or more paging sub-channels that are mapped on a S-CCPCH, see 6.2.2. The page indicator indicates a paging message for one or more UEs that are associated with it.

The page indicators of length L_{PI}=2, L_{PI}=4 or L_{PI}=8 symbols are transmitted in a normal burst (type 1 or 2) as seen in figure 16. The PI may be repeated within one superframe. The number of repetitions within one superframe is given by the repetition factor RF_{PI}. The number of page indicators N_{PI} per superframe is given by the number of time slots per superframe N_{PICH}, used for the PICH, the number L_{PI} of symbols for the page indicators, the burst type BT and the repetition factor of the paging indicators, RF_{PI}. The same burst type is used for the PICH in every cell. In case of L_{PI}=4 or L_{PI}=8, one symbol in each data part adjacent to the midamble is left over. These symbols are filled by dummy bits that are transmitted with the same power as the PI. Figure 16 shows an example for L_{PI}=4, BT 1, N_{PICH}=4, RF_{PI}=2.

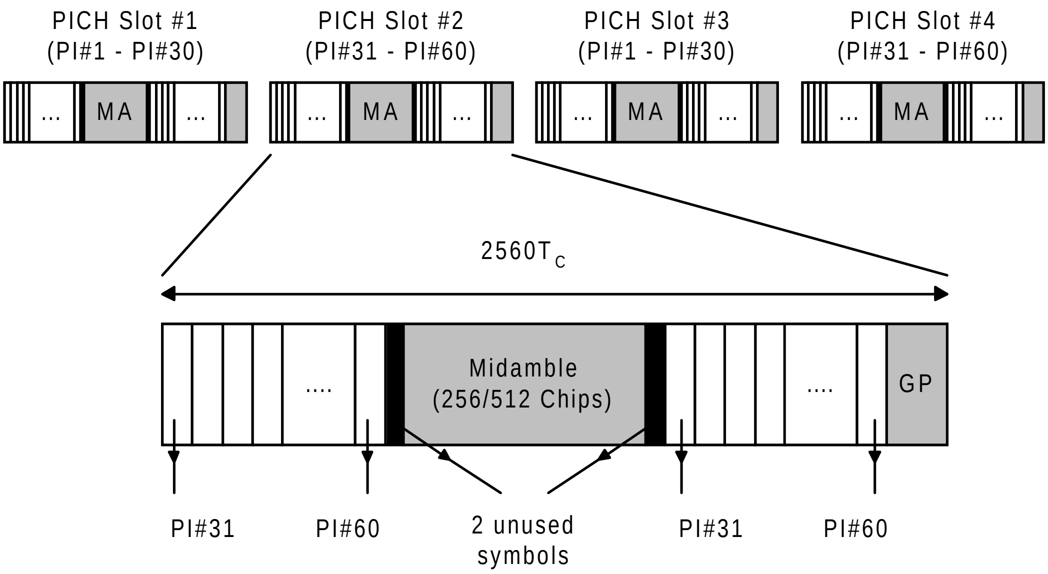


Figure 16: Example of PI Transmission in the PICH

5.4 Beacon function of physical channels

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

5.4.1 Location of physical channels with beacon function

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

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

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

Case 3) All physical channels that are allocated to channelisation code $a_{Q=16}^{(k=1)}$ and in TS#i and TS#i+8, i=0…6, pointed by PSCH, shall provide the beacon function.

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

5.4.2 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.

6 Mapping of transport channels to physical channels

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

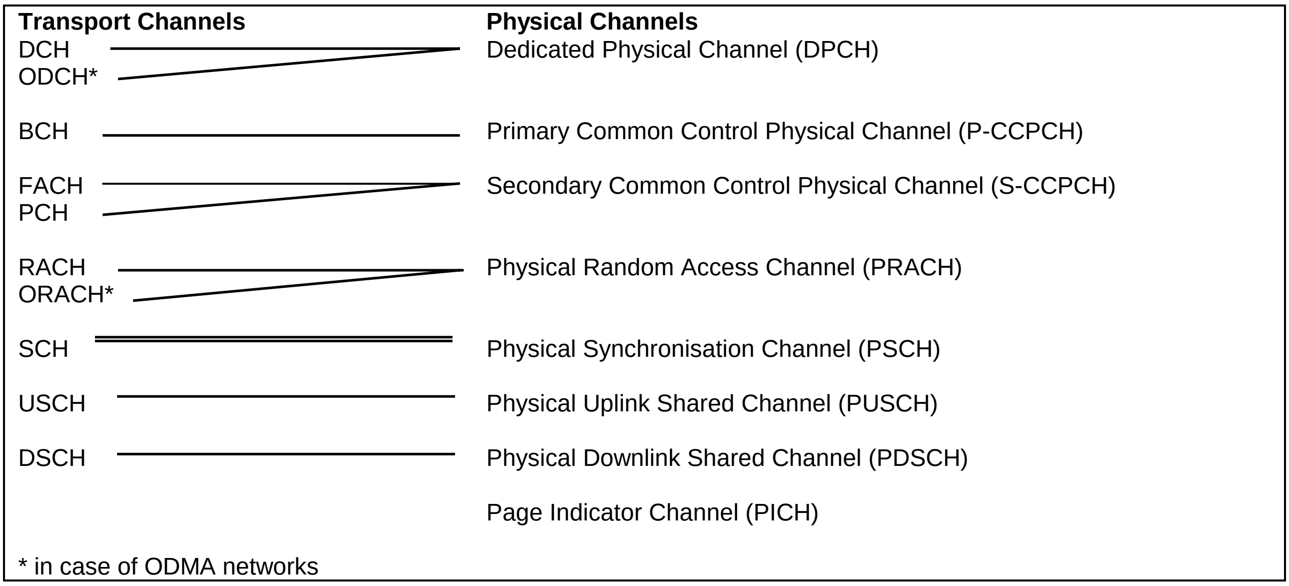


Figure 17: Transport channel to physical channel mapping

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 TS25.222 (“multiplexing and channel coding”).

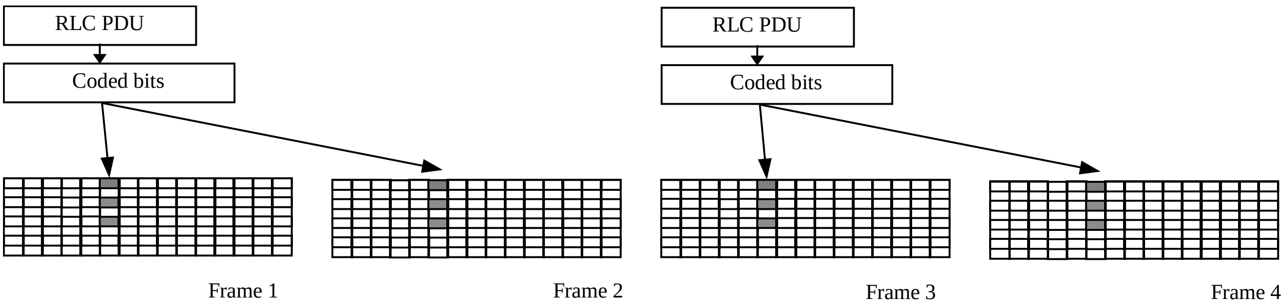


Figure 19: Mapping of PDU onto the physical bearer

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

An ODCH is also mapped onto one or more sets of slots and codes within a TDD frame as shown in figure 4. The actual transmission mode (i.e. combination of slots, codes, TX power, interleaving depth etc.) chosen for a relay link will be negotiated between nodes prior to transmission. Several of these transmission mode parameters can be adapted during transmission due to changes in propagation and data traffic.

6.2 Common Transport Channels

6.2.1 The Broadcast Channel (BCH)

The BCH is mapped onto the P-CCPCH. The secondary SCH indicates in which timeslot a mobile can find the P-CCPCH containing BCH. If the broadcast information requires more resources than provided by the P-CCPCH, the BCH in P-CCPCH will comprise a pointer to additional S-CCPCH resources for FACH in which this additional broadcast information shall be sent.

6.2.2 The Paging Channel (PCH)

The PCH is mapped onto one or several S-CCPCHs so that capacity can be matched to requirements. The location of the PCH is indicated on the BCH. It is always transmitted at a reference power level.

To allow an efficient DRX, the PCH is divided into several paging sub-channels within the multiframe structure of one superframe. Examples of multiframe structures are given in the Annex B of this document. Each paging sub-channel is mapped on 2 consecutive frames that are allocated to the PCH on the same S-CCPCH. Thus, the number of paging sub-channels per S-CCPCH is half of the number of frames used for the PCH in one superframe. Layer 3 information to a particular paging group is transmitted only in the associated paging sub-channel. The assignment of UEs to paging groups is independent of the assignment of UEs to page indicators.

6.2.3 The Forward Channel (FACH)

The FACH is mapped onto one or several S-CCPCHs. The location of the FACH is indicated on the BCH and both, capacity and location can be changed, if required. FACH may or may not be power controlled.

Annex B (Informative): CCPCH Multiframe Structure

In the following figures B.1 to B.3 some examples for Multiframe Structures on Primary and Secondary CCPCH are given. The figures show the placement of Common Transport Channels on the Common Control Physical Channels. Additional S-CCPCH capacity can be allocated on other codes and timeslots of course, e.g. FACH capacity is related to overall cell capacity and can be configured according to the actual needs. Channel capacities in the annex are derived using bursts with long midambles (Burst format 1). Every TrCH-box in the figures is assumed to be valid for two frames (see row ‘Frame #’), i.e. the transport channels in CCPCHs have an interleaving time of 20msec.

The actual CCPCH Multiframe Scheme used in the cell is described and broadcast on BCH. Thus the system information structure has its roots in this particular transport channel and allocations of other Common Channels can be handled this way, i.e. by pointing from BCH.

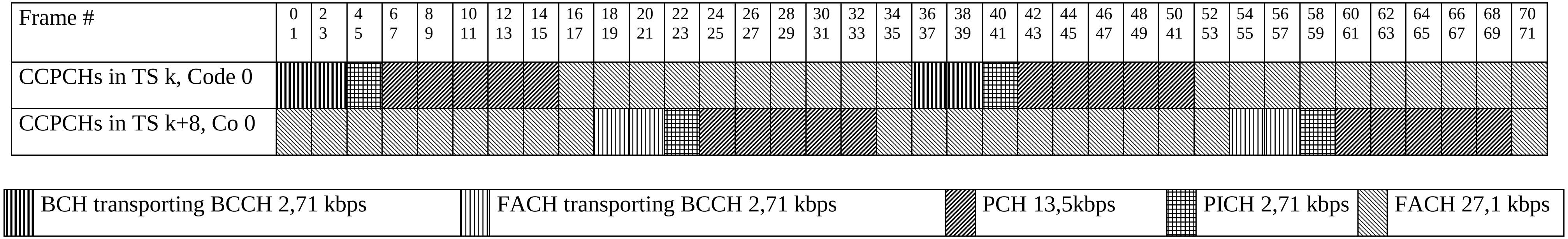


Figure B.1: Example for a multiframe structure for CCPCHs that is repeated every 72th frame.

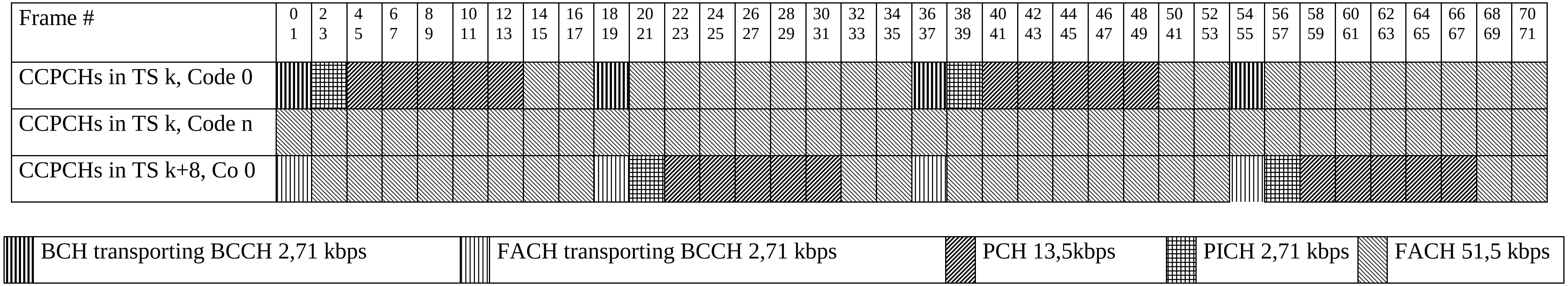


Figure B.2: Example for a multiframe structure for CCPCHs that is repeated every 72th frame, n=1…7

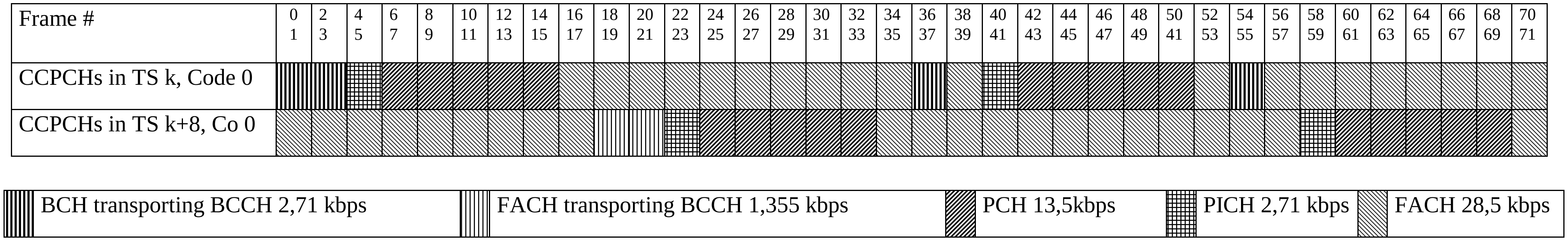


Figure B.3: Example for a multiframe structure for CCPCHs that is repeated every 72th frame.

3GPP TSG RAN WG1 (Radio) Meeting #9
Dresden, Germany, 30 NOV 1999 - 03 DEC 1999

Document R1-99l81
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.

25.221	**CR**	**002r2**	Current Version: V3.0.0

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	
list expected approval meeting # here ↑		for information		non-strategic	

(for SMG use only)

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form :* 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: Siemens AG **Date:** 19 Nov 1999

Subject: Removal of Superframe for TDD

Work item: TS25.221

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

F	Correction	X	
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	X
Release 00	

Reason for change: There is no need to keep the superframe structure in TDD.

Clauses affected: 2, 5, 5.7, 6.2.2

Other specs affected:

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

Other comments:

help.doc

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

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] TS 25.201: "Physical layer - general description"

[2] TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)"

[3] TS 25.212: "Multiplexing and channel coding (FDD)"

[4] TS 25.213: "Spreading and modulation (FDD)"

[5] TS 25.214: "Physical layer procedures (FDD)"

[6] TS 25.215: "Physical layer – Measurements (FDD)"

[7] TS 25.222: "Multiplexing and channel coding (TDD)"

[8] TS 25.223: "Spreading and modulation (TDD)"

[9] TS 25.224: "Physical layer procedures (TDD)"

[10] TS 25.225: "Physical layer – Measurements (TDD)"

[11] TS 25.301: "Radio Interface Protocol Architecture"

[12] TS 25.302: "Services Provided by the Physical Layer"

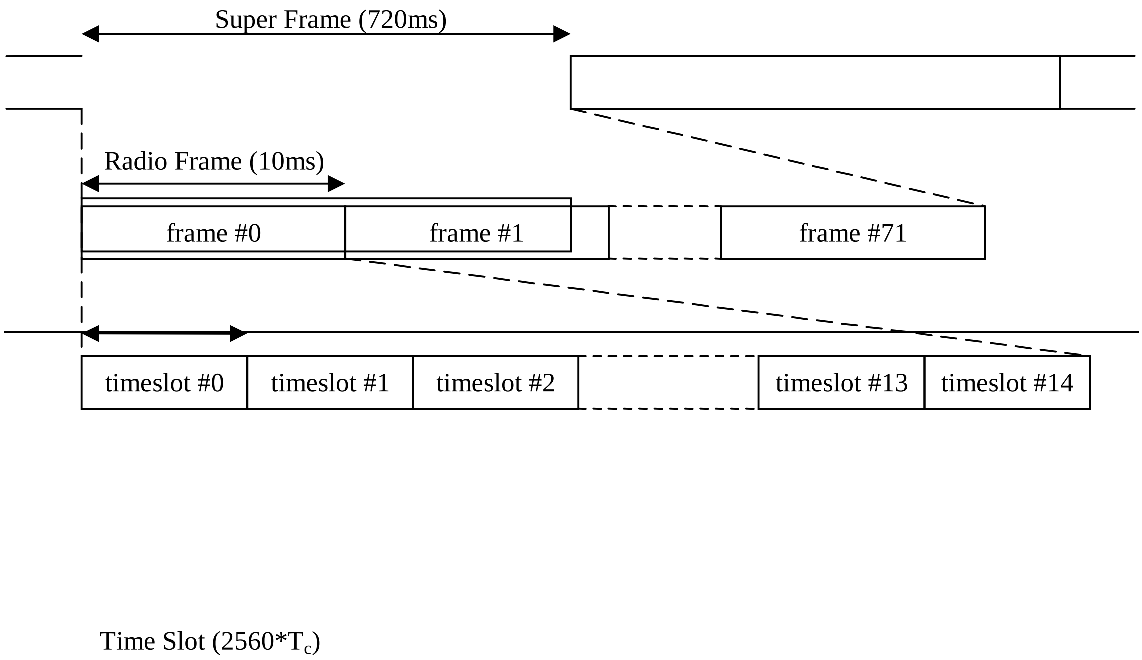
[13] TS 25.401: "UTRAN Overall Description"

[14] TS 25.402: "Synchronisation in UTRAN, Stage 2"

5 Physical channels

All physical channels take three-layer structure ~~of superframes~~with respect to timeslots, radio frames and system frame numbering (SFN), see [14]~~radio frames, and timeslots~~. Depending on the resource allocation, the configuration of radio frames or timeslots becomes different. All physical channels need guard symbols in every timeslot. The time slots are used in the sense of a TDMA component to separate different user signals in the time and the code domain. The physical channel signal format is presented in figure 1.

A physical channel in TDD is a burst, which is transmitted in a particular timeslot within allocated Radio Frames. The allocation can be continuous, i.e. the time slot in every frame is allocated to the physical channel or discontinuous, i.e. the time slot in a subset of all frames is allocated only. A burst is the combination of a data part, a midamble and a guard period. The duration of a burst is one time slot. Several bursts can be transmitted at the same time from one transmitter. In this case, the data part must use different OVSF channelisation codes, but the same scrambling code. The midamble part has to use the same basic midamble code, but can use different midambles.



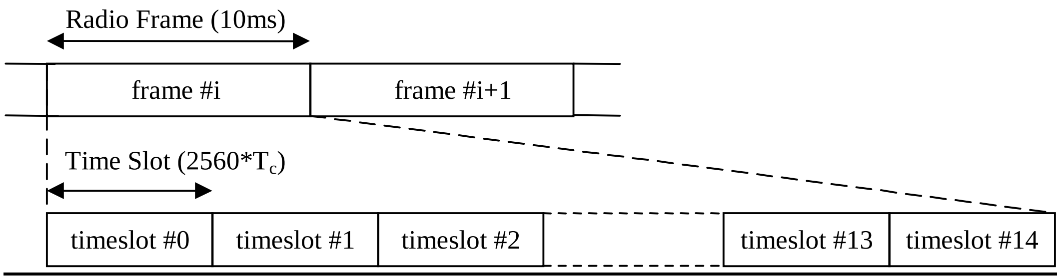


Figure 1: Physical channel signal format

~~A physical channel in TDD is a burst, which is repeated in the same timeslot with a certain repetition length of consecutive RF in and after each RF defined by a repetition period, starting at a certain frame number defined by the superframe offset in the multiframe, where the repetition period is a submultiple of 72, i.e. 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, or 72, and the superframe offset is in the interval 0...(repetition period-1). The repetition length of each repeated allocation can have the values 1, 2, 4 or 8 frames. It should be equal to the longest interleaving depth of all transport channels on this physical channel.~~

The data part of the burst is spread with a channelisation code. This channelisation code is a OVSF code, that can have a spreading factor of 1, 2, 4, 8, or 16. The data rate of the physical channel is depending on the used spreading factor of the used OVSF code.

The midamble part of the burst can contain two different types of midambles: a short one of length 256 chips, or a long one of 512 chips. The data rate of the physical channel is depending on the used midamble length.

So a physical channel is defined by frequency, timeslot, channelisation code, burst type and Radio Frame allocation., repetition period, superframe offset and repetition length. The scrambling code and the basic midamble code are broadcasted and may be constant within a cell. When a physical channel is established, a start frame is given. The physical channels can either be of infinite duration, or a duration for the allocation can be defined.

5.7 The Page Indicator Channel (PICH)

The Page Indicator Channel (PICH) is a physical channel used to carry the Page Indicators (PI). The PICH substitutes one or more paging sub-channels that are mapped on a CCPCH, see 6.2.2. The page indicator indicates a paging message for one or more UEs that are associated with it.

The page indicators of length L_{PI}=2, L_{PI}=4 or L_{PI}=8 symbols are transmitted in a normal burst (type 1 or 2) as seen in figure 16. ~~The PI may be repeated within one superframe. The number of repetitions within one superframe is given by the repetition factor RF_{PI}.~~ The number of page indicators N_{PI} per ~~superframe~~ time slot is given by ~~the number of time slots per superframe N_{PICH}, used for the PICH,~~ the number L_{PI} of symbols for the page indicators and~~,~~ the burst type ~~BT and the repetition factor of the paging indicators, RF_{PI}~~. In Table 5 this number is shown for the different possibilities of burst types and PI lengths.

Table 5 Number N_{PI} of PI per time slot for the different burst types and PI lengths L_{PI}

	L_{PI}=2	L_{PI}=4	L_{PI}=8
Burst Type 1	61	30	15
Burst Type 2	69	34	17

The same burst type is used for the PICH in every cell. In case of L_{PI}=4 or L_{PI}=8, one symbol in each data part adjacent to the midamble is left over. These symbols are filled by dummy bits that are transmitted with the same power as the PI. Figure 16 shows ~~an~~ examples for the transmission of page indicators in the different burst types for L_{PI}=4~~, BT 1, N_{PICH}=4, RF_{PI}=2~~.

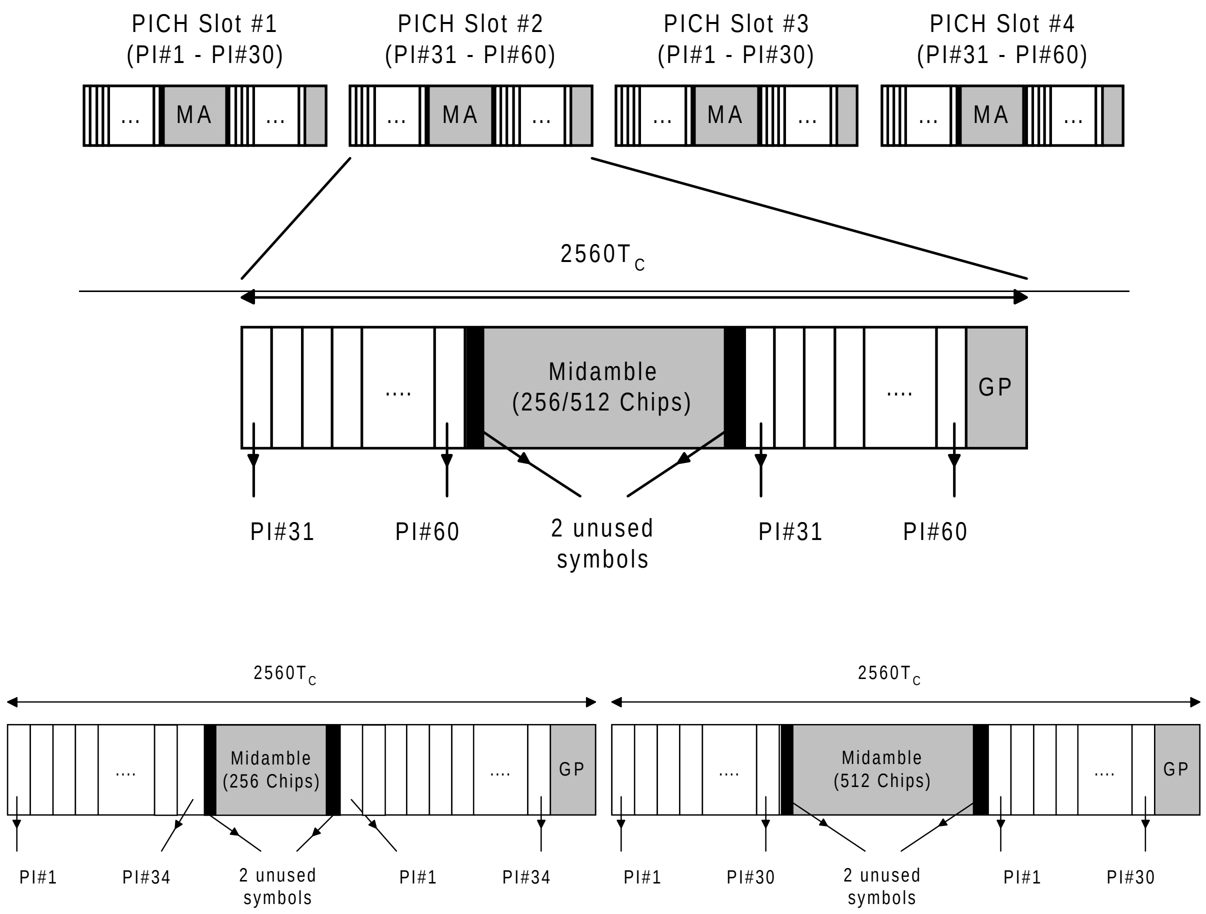


Figure 16: Example of PI Transmission in ~~the~~ PICH bursts of different types for L_{PI}=4

6.2.2 The Paging Channel (PCH)

The PCH is mapped onto one or several CCPCHs so that capacity can be matched to requirements. The location of the PCH is indicated on the BCH. It is always transmitted at a reference power level.

To allow an efficient DRX, the PCH is divided into several paging sub-channels within the allocated multiframe structure of one superframe. Examples of multiframe structures are given in the Annex B of this document. Each paging sub-channel is mapped onto 2 consecutive frames that are allocated to the PCH on the same CCPCH. Thus, the number of paging sub-channels per CCPCH is half of the number of frames used for the PCH in one superframe. Layer 3 information to a particular paging group is transmitted only in the associated paging sub-channel. The assignment of UEs to paging groups is independent of the assignment of UEs to page indicators.

3GPP TSG RAN WG1 (Radio) Meeting #9
Dresden, Germany, 30 NOV 1999 – 3 DEC 1999

Document R1-99l98
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.

25.221 CR 006 Current Version: V 3.0.0

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

For submission to: RAN #6	for approval: X	strategic:	*(for SMG use only)*
list expected approval meeting # here ↑	for information:	non-strategic:	

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: Siemens AG **Date:** 19 Nov 1999

Subject: Corrections to TS25.221

Work item: TS25.221

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

F	Correction	X	
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	X
Release 00	

Reason for change: 5.2.3 correction of formulas

Clauses affected: 5.2.3

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.

5.2.3 Training sequences for spread bursts

As explained in the section 5.2.1, two options are being considered for the spreading. The training sequences presented here are common to both options.

The training sequences, i.e. midambles, of different users active in the same time slot are time shifted versions of one single periodic basic code. Different cells use different periodic basic codes, i.e. different midamble sets. In this way a joint channel estimation for the channel impulse responses of all active users within one time slot can be done by one single cyclic correlation. The different user specific channel impulse response estimates are obtained sequentially in time at the output of the correlator. Following this principle it is shown hereafter how to derive the midambles from the periodic basic code.

Section 5.2.2 contains a description of the spread speech/data bursts. These bursts contain Lm midamble chips, which are also termed midamble elements. The Lm elements $\underline{m}_i^{(k)}$; i=1,...,Lm; k=1,...,K; of the midamble codes $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; are taken from the complex set

$$\underline{\mathrm{V}}_{\mathrm{m}} = \{1, \mathrm{j}, -1, -\mathrm{j}\}. \qquad (1)$$

K is the maximum number of users, i.e. the available number of spreading codes per time slot.

The elements $\underline{m}_i^{(k)}$ of the complex midamble codes $\underline{\mathbf{m}}^{(k)}$ fulfil the relation

$$\underline{m}_i^{(k)} = (\mathrm{j})^i \cdot m_i^{(k)} \quad m_i^{(k)} \in \{1, -1\}; i = 1,...,L_m; k = 1,...,K. \qquad (2)$$

Hence, the elements $\underline{m}_i^{(k)}$ of the complex midamble codes $\underline{\mathbf{m}}^{(k)}$ of the K users are alternating real and imaginary.

With W being the number of taps of the impulse response of the mobile radio channels, the Lm binary elements $m_i^{(k)}; \mathrm{i} = 1,..., L_{\mathrm{m}}; k = 1,..., K;$ of (2) for the complex midambles $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; of the K users are generated according to the following method from a single periodic basic code

$$\mathbf{m} = \left(m_1, m_2, ..., m_{L_m + (K'-1)W + \lfloor P/K \rfloor}\right)^{\mathrm{T}} \quad m_i \in \{1, -1\}; \; i = 1,...,(L_m + (K'-1)W + \lfloor P/K \rfloor). \qquad (3)$$

$\lfloor x \rfloor$ denotes the largest integer smaller or equal to x, K' = K/2.

The elements $m_i; i = 1,...,(L_m + (K'-1)W + \lfloor P/K \rfloor)$, of (3) fulfil the relation

$$m_i = m_{i-P} \text{ for the subset } i = (P+1),...,(L_m + (K'-1)W + \lfloor P/K \rfloor). \qquad (4)$$

The P elements $m_i; i = 1,..., P,$ of one period of m according to (3) are contained in the vector

$$\mathbf{m}_{\mathrm{P}} = (m_1, m_2, ..., m_P)^{\mathrm{T}}. \qquad (5)$$

With $\mathbf{m}$ according to (3) the Lm binary elements $m_i^{(k)}; \mathrm{i} = 1,..., \mathrm{L}_{\mathrm{m}}; k = 1,..., K;$ of (2) for the midambles of the first K' users are generated based on the following formula

$$\text{EMBED } m_i^{(k)} = m_{i+(K'-k)W} \quad i = 1,..., L_m; k = 1,..., K'. \qquad (6)$$

The midambles for the second K' users are generated based on a slight modification of this formula introducing intermediate shifts

$$\text{EMBED } m_i^{(k)} = m_{i+(K-k)W+\lfloor P/K \rfloor} \quad i = 1,..., L_m; k = K'+1,..., K. \qquad (7)$$

Whether intermediate shifts are allowed in a cell is broadcast on the BCH.

In the following the term ’a midamble code set’ or ’a midamble code family’ denotes K specific midamble codes $\underline{\mathbf{m}}^{(k)}$; k=1,...,K. Different midamble code sets $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; are specified based on different periods $\mathbf{m}_P$ according (5).

In adjacent cells of the cellular mobile radio system, different midamble codes sets $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; should be used to guarantee a proper channel estimation.

As mentioned above a single midamble code set $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; consisting of K midamble codes is based on a single period $\mathbf{m}_P$ according to (5).

In the Annex A the periods $\mathbf{m}_P$ according to (5), i.e. the Basic Midamble Codes, which shall be used to generate different midamble code sets $\underline{\mathbf{m}}^{(k)}$; k=1,...,K; are listed in tables in a hexadecimal representation. As shown in table 4 always 4 binary elements m_i are mapped on a single hexadecimal digit.

Table 4: Mapping of 4 binary elements m_i on a single hexadecimal digits

4 binary elements m_i	Mapped on hexadecimal digit
-1 -1 -1 -1	0
-1 -1 -1 1	1
-1 -1 1 –1	2
-1 -1 1 1	3
-1 1 -1 –1	4
-1 1 -1 1	5
-1 1 1 –1	6
-1 1 1 1	7
1 -1 -1 –1	8
1 -1 -1 1	9
1 -1 1 –1	A
1 -1 1 1	B
1 1 -1 –1	C
1 1 -1 1	D
1 1 1 –1	E
1 1 1 1	F

As different Basic Midamble Codes are required for different burst formats, the Annex A shows the codes m_{PL} for burst type 1 and m_{PS} for burst type 2. It should be noted that the different burst types must not be mixed in the same timeslot of one cell.

3GPP TSG RAN WG1 (Radio) Meeting #9
Dresden, Germany, 30 Nov-03 Dec 1999

Document R1-99k61
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.

25.221 CR 007r1 Current Version: V3.0.0

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

For submission to:	RAN #6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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: Nokia, Siemens **Date:** 01 Dec 1999

Subject: Clarifications for Spreading in UTRA TDD

Work item: Spreading/Channelisation/Scrambling Issues

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	X	Release 98	
D	Editorial modification		Release 99	X
			Release 00	

Reason for change: Alignment of the terms 'Spreading', 'Channelisation' and 'Scrambling' according to usage in FDD mode. Clarification on usage of Multicode / Variable Spreading Factor

Clauses affected: 5, 5.2.1, 5.2.2, 5.2.2.2, 5.3.2.4, 5.4

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.223-CR003r1, 25.224-CR005r1
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 Physical channels

All physical channels take three-layer structure of superframes, radio frames, and timeslots. Depending on the resource allocation, the configuration of radio frames or timeslots becomes different. All physical channels need guard symbols in every timeslot. The time slots are used in the sense of a TDMA component to separate different user signals in the time and the code domain. The physical channel signal format is presented in figure 1.

A burst is the combination of a data part, a midamble and a guard period. The duration of a burst is one time slot. Several bursts can be transmitted at the same time from one transmitter. In this case, the data part must use different OVSF channelisation codes, but the same scrambling code. The midamble part has to use the same basic midamble code, but can use different midambles.

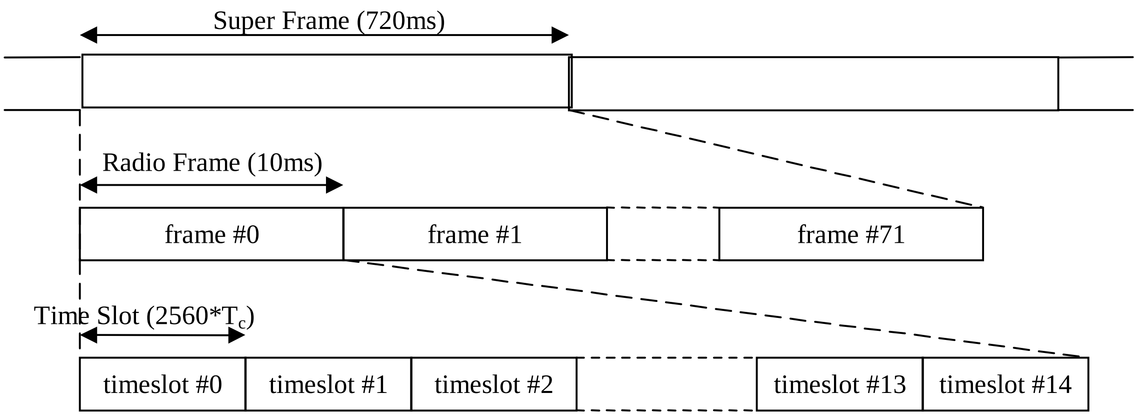


Figure 1: Physical channel signal format

A physical channel in TDD is a burst, which is repeated in the same timeslot with a certain repetition length of consecutive RF in and after each RF defined by a repetition period, starting at a certain frame number defined by the superframe offset in the multiframe, where the repetition period is a submultiple of 72, i.e. 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, or 72, and the superframe offset is in the interval 0...(repetition period-1). The repetition length of each repeated allocation can have the values 1, 2, 4 or 8 frames. It should be equal to the longest interleaving depth of all transport channels on this physical channel.

The data part of the burst is spread with a combination of channelisation code and scrambling code. ~~This~~The channelisation code is a OVSF code, that can have a spreading factor of 1, 2, 4, 8, or 16. The data rate of the physical channel is depending on the used spreading factor of the used OVSF code.

The midamble part of the burst can contain two different types of midambles: a short one of length 256 chips, or a long one of 512 chips. The data rate of the physical channel is depending on the used midamble length.

5.2.1 Spreading codes

Spreading is applied to the data part of the physical channels and consists of two operations. The first is the channelisation operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF). The second operation is the scrambling operation, where a scrambling code is applied to the spread signal. Details on channelisation and scrambling operation can be found in [8].

5.2.1.1 Spreading for Downlink Physical Channels

Downlink physical channels shall use SF =16. Multiple parallel physical channels can be used to support higher data rates. These parallel physical channels shall be transmitted using different channelisation codes, see [8]. These codes with SF =16 are generated as described in [8].

Operation with a single code with spreading factor 1 is possible for the downlink physical channels.

5.2.1.2 Spreading for Uplink Physical Channels

The range of spreading factor that may be used for uplink physical channels shall range from 16 down to 1.

For multicode transmission a UE shall use a maximum of two physical channels per timeslot simultaneously. These two parallel physical channels shall be transmitted using different channelisation codes, see [8].

Two options are being considered for the bursts that can be sent as described below. Both options allow a high degree of bit rate granularity and flexibility, thus allowing the implementation of the whole service range from low to high bit rates.

Spreading factor of and the number of codes for multicode transmission are assigned independently for uplink and downlink. The number of timeslots is also assigned independently for uplink and downlink.

5.2.1.1 Multicode transmission with fixed spreading

Within each time slot of length $2560*T_c$, an additional separation of user signals by spreading codes is used. This means, that within one time slot of length $2560*T_c$, more than one burst of corresponding length as described in section 5.2.2 can be transmitted. These multiple bursts within the same time slot can be allocated to different users as well as partly or all to a single user. For the multiple bursts within the same time slot, different spreading codes are used to allow the distinction of the multiple bursts.

5.2.1.2 Single code transmission with variable spreading

Within each time slot of $2560*T_c$ duration,

- a UE always uses single code transmission by adapting the spreading factor as a function of the data rate. This limits the peak-to-average ratio of the modulated signal and consequently the stress imposed to the power amplifier resulting in an improved terminal autonomy. Several mobiles can be received in the same time slot by the base station, they are separated by their codes and the individual decoding can take profit of the joint detection.
- a base station should broadcast a single burst per mobile again by adapting the spreading as a function of the data rate. High rate data transmissions requiring more than one timeslot per mobile can be supported by terminals having the processing power for joint detection on a single slot : the required throughput occupies in a general way an integer number of slots plus a fraction of an extra slot. Single burst transmission should occur in the integer number of slots, while the extra slot can be occupied by a burst for the considered mobile plus extra bursts for other mobiles, joint detection is only needed for this last time slot in the considered mobile.

5.2.2 Burst Types

As explained in the section 5.2.1, two options are being considered for the spreading. The bursts described in this section can be used for both options.

Two types of bursts for dedicated physical channels are defined: The burst type 1 and the burst type 2. Both consist of two data symbol fields, a midamble and a guard period. The bursts type 1 has a longer midamble of 512 chips than the burst type 2 with a midamble of 256 chips. Sample sets of midambles are given in section 5.2.3.1.

Because of the longer midamble, the burst type 1 is suited for the uplink, where up to 16 different channel impulse responses can be estimated. The burst type 2 can be used for the downlink and, if the bursts within a time slot are allocated to less than four users, also for the uplink.

5.2.2.2 Transmission of TPC

Both burst types 1 and 2 for dedicated channels provide the possibility for transmission of TPC in uplink.

The transmission of TPC is negotiated at call setup and can be re-negotiated during the call. If applied, transmission of TPC is done in the data parts of the traffic burst. Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after the midamble. Figure 11 shows the position of the TPC in a traffic burst.

For every user the TPC information is to be transmitted once per frame. The TPC is spread with the same spreading factor (SF) and spreading code as the data parts. TPC and TFCI are always transmitted in the same physical channel.

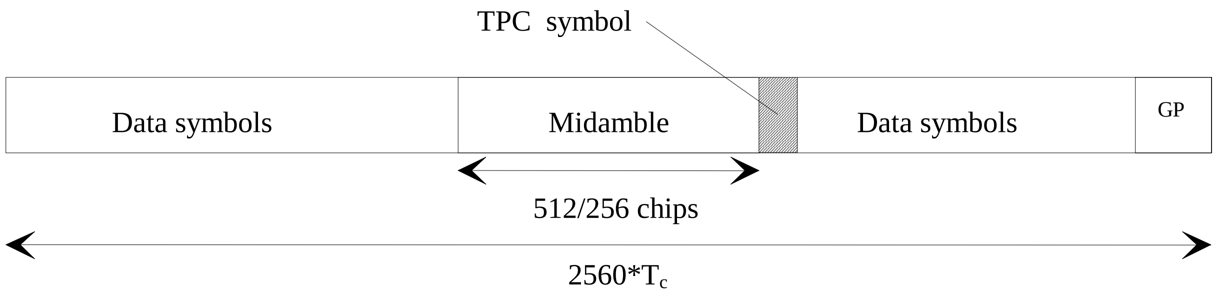


Figure 11: Position of TPC information in the traffic burst

5.3.2.4 Association between Training Sequences and ~~Spreading~~ Channelisation Codes

For the PRACH there exists a fixed association between the training sequence and the ~~spreading~~ channelisation code. The generic rule to define this association is based on the order of the ~~spreading~~ channelisation codes $\mathbf{a}_Q^{(k)}$ given by *k* and the order of the midambles $\mathbf{m}_j^{(k)}$ 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 2*Q*. 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 13 is straightforward.
- For the case that only odd *k* are allowed the principle of the association is shown in figure 14. This association is applied for one and two basic periodic codes.

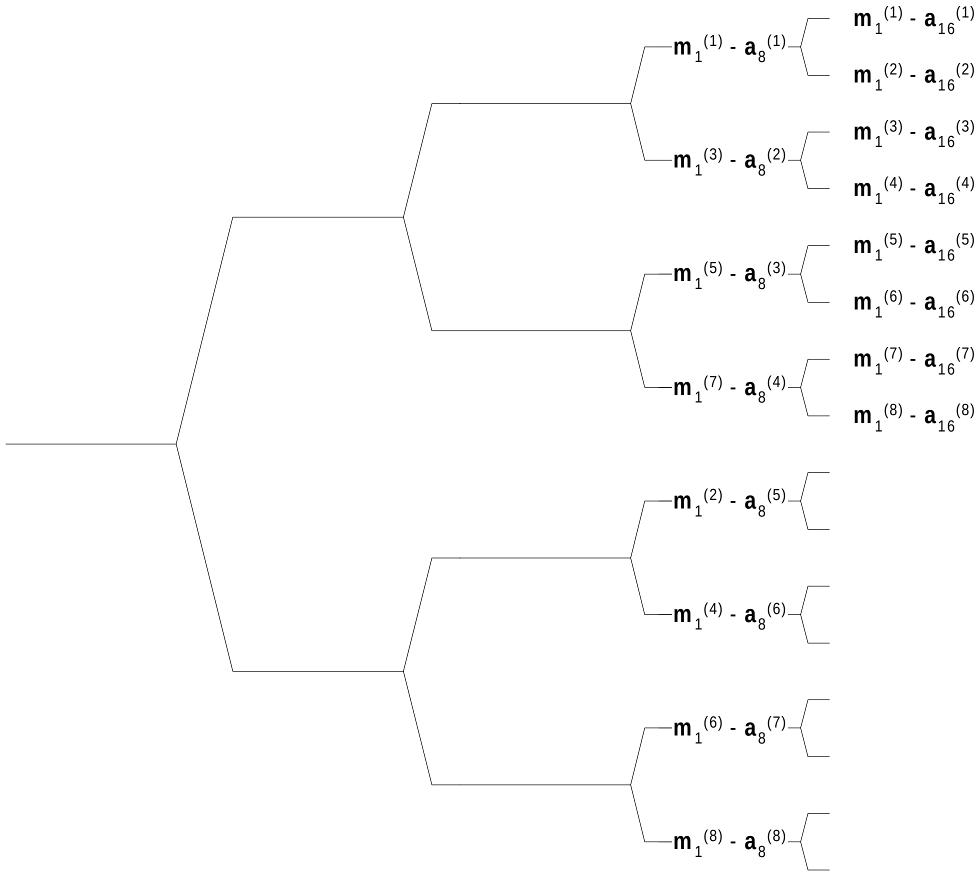


Figure 13: Association of Midambles to ~~Spreading~~ Channelisation Codes in the OVSF tree for all *k*

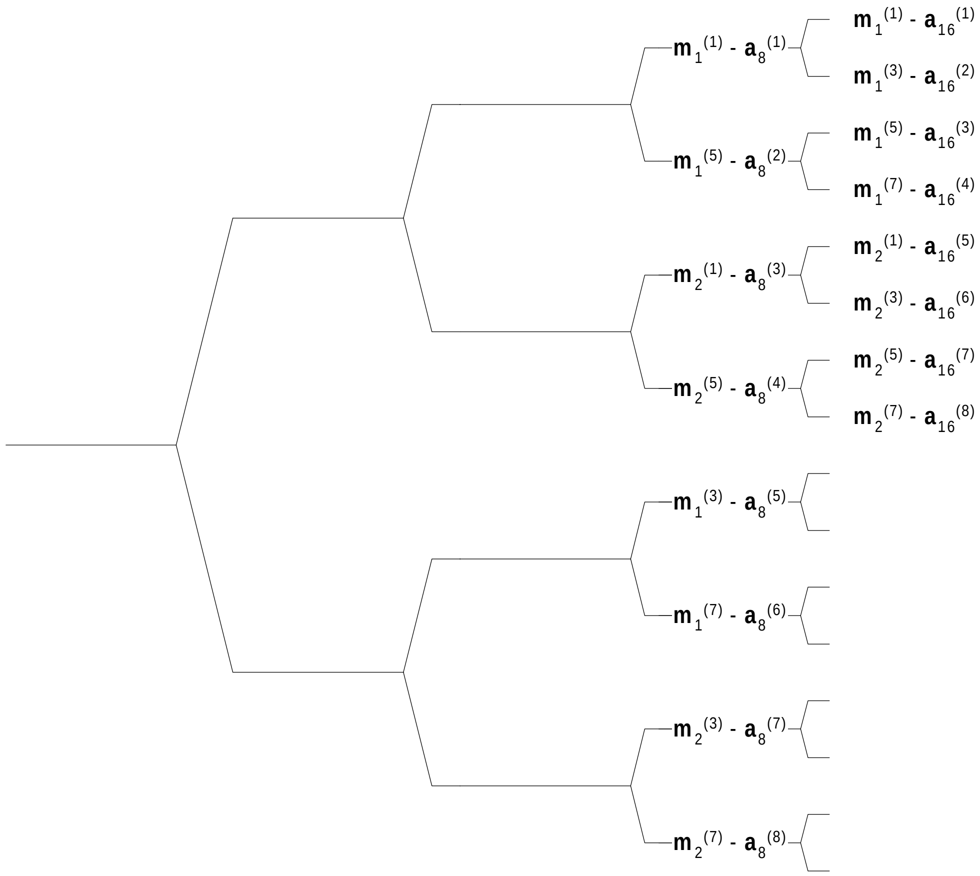


Figure 14: Association of Midambles to ~~Spreading~~ Channelisation Codes in the OVSF tree for odd *k*

5.4 The physical synchronisation channel (PSCH)

In TDD mode code group of a cell can be derived from the synchronisation channel. Additional information, received from higher layers on SCH transport channel, is also transmitted to the UE in PSCH in case 3 from below. In order not to limit the uplink/downlink asymmetry the PSCH is mapped on one or two downlink slots per frame only.

There are three cases of PSCH and PCCPCH allocation as follows:

Case 1) PSCH and PCCPCH allocated in TS#k, k=0….14

Case 2) PSCH in two TS and PCCPCH in the same two TS: TS#k and TS#k+8, k=0…6

Case 3) PSCH in two TS, TS#k and TS#k+8, k=0…6, and the PCCPCH in TS#i, i=0…14, pointed by PSCH. Pointing is determined via the SCH from the higher layers.

These three cases are addressed by higher layers using the SCCH in TDD Mode. The position of PSCH (value of k) in frame can change on a long term basis in any case.

Due to this PSCH scheme, the position of PCCPCH is known from the PSCH. The PCCPCH are using burst type 1, ~~spreading~~ channelisation code $a_{Q=16}^{(k=1)}$ and midamble $m_1^{(1)}$. To simplify measurements of PCCPCH power, this midamble shall not be used by other physical channels in the same timeslot.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, 30 Nov - 03 Dec 1999

Document R1-99K58
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.

25.221 CR 008 Current Version: 3.0.0

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

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

for approval	X	strategic		*(for SMG*
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: Siemens AG **Date:** 02.12.1999

Subject: Transmission of TFCI bits for TDD

Work item: TS 25.221

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

F	Correction	X
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	X
Release 00	

Reason for change: It should be possible to repeat the TFCI in multiple timeslots within one frame to guarantee its reliable transmission

Clauses affected: 5.2.2.1 5.2.2.2

Other specs affected:

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

Other comments:

help.doc

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

5.2.2.1 Transmission of TFCI

Both burst types 1 and 2 provide the possibility for transmission of TFCI both in up- and downlink.

The transmission of TFCI is negotiated at call setup and can be re-negotiated during the call. For each CCTrCH it is indicated by higher layer signalling, which TFCI format is applied. ~~This means,~~Additionally for each allocated timeslot it is ~~indicated~~signalled individually whether th~~e~~at timeslot carries the TFCI~~ is applied~~ or not. If ~~applied~~a time slot contains the TFCI, then it is always transmitted using the first allocated channelisation code in the timeslot, according to the order in the higher layer allocation message.

The transmission of TFCI is done in the data parts of the respective physical channel~~traffic burst~~, this means TFCI and data bits are subject to the same spreading procedure as depicted in [8]. Hence the midamble structure and length is not changed. The TFCI information is to be transmitted directly adjacent to the midamble, possibly after the TPC. Figure 7 shows the position of the TFCI in a traffic burst, if no TPC is transmitted. Figure 8 shows the position of the TFCI in a traffic burst, if TPC is transmitted.

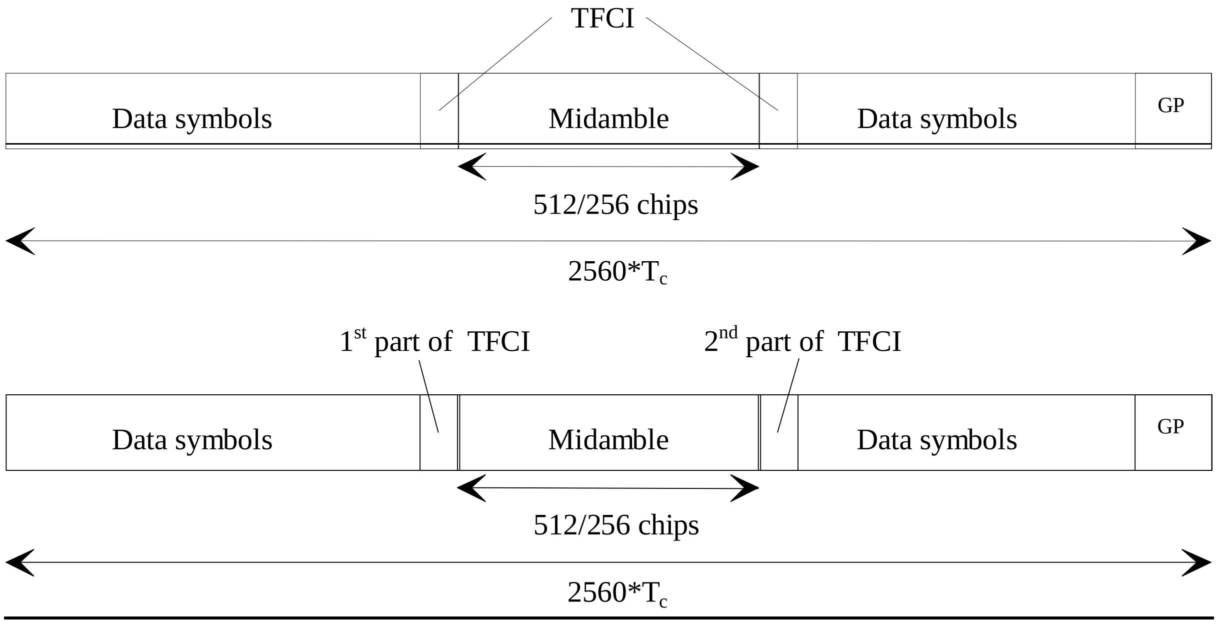


Figure 7: Position of TFCI information in the traffic burst in case of no TPC

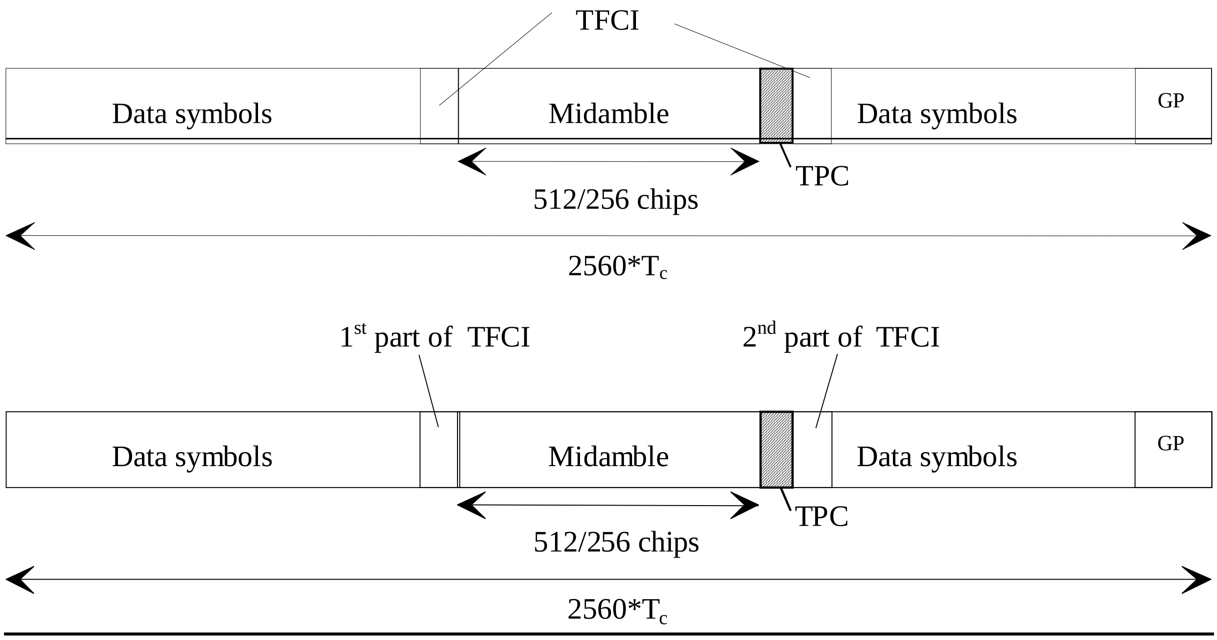


Figure 8: Position of TFCI information in the traffic burst in case of TPC

~~For every user the TFCI information is to be transmitted once per frame. Different numbers of symbols can be allocated for TFCI. The TFCI is spread with the same spreading factor (SF) as the data parts. The SF of the bursts which contains the TFCI is applied to both data and signalling and shall be constant, except when a negotiation between transmitter and receiver initiates a change of the SF. Variable Data Rates shall be handled by DTX.~~

Two examples of TFCI transmission in the case of multiple DPCHs used for a connection are given in the figure 9 and figure 10 below. Combinations of the two schemes shown are also applicable. It should be noted that the SF can vary for the DPCHs not carrying TFCI information.

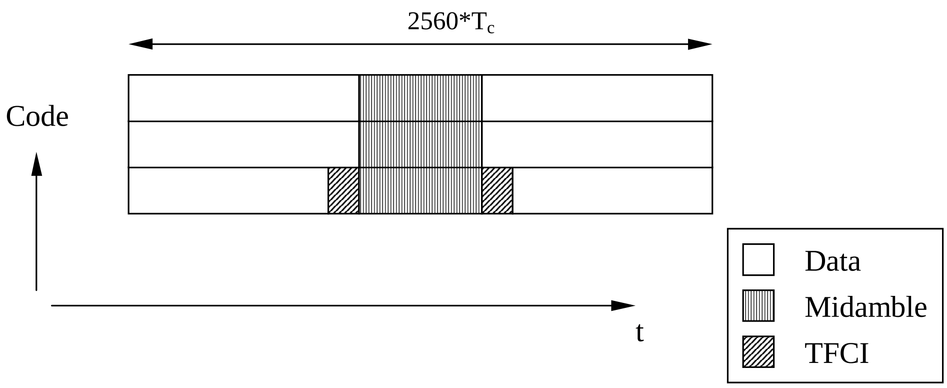


Figure 9: Example of TFCI transmission with physical channels multiplexed in code domain

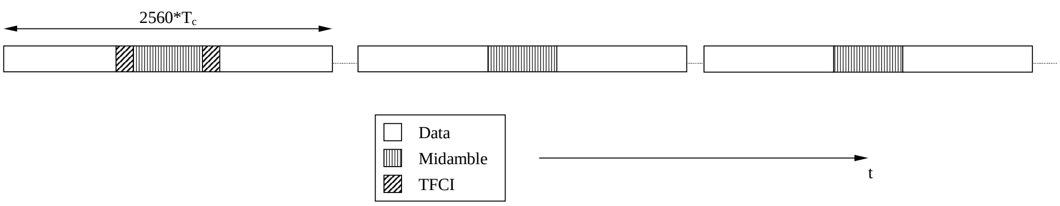


Figure 10: Example of TFCI transmission with physical channels multiplexed in time domain

5.2.2.2 Transmission of TPC

Both burst types 1 and 2 for dedicated channels provide the possibility for transmission of TPC in uplink.

The transmission of TPC is negotiated at call setup and can be re-negotiated during the call. If applied, transmission of TPC is done in the data parts of the traffic burst. Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after the midamble. Figure 11 shows the position of the TPC in a traffic burst.

For every user the TPC information is to be transmitted once per frame. If the TPC is applied, then it is always transmitted using the first allocated channelisation code and the first allocated timeslot, according to the order in the higher layer allocation message. The TPC is spread with the same spreading factor (SF) as the data parts of the respective physical channel. ~~TPC and TFCI are always transmitted in the same physical channel.~~

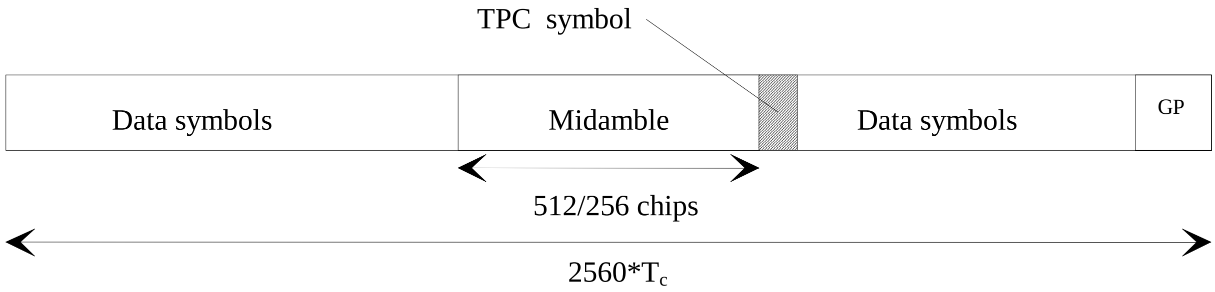


Figure 11: Position of TPC information in the traffic burst

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, 30 Nov – 3 Dec 1999

***Document* R1-99K60**
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.

25.221	**CR**	**009**	Current Version:	3.0.0

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

For submission to:	RAN #6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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

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

Source: Siemens AG, Nokia **Date:** 1st December 99

Subject: Midamble Allocation in UTRA TDD

Work item:

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

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	X	Release 98	
D	Editorial modification		Release 99	X
			Release 00	

Release: (see right-hand columns above)

Reason for change: Default mappings between midambles and channelisation codes reduce signalling overhead and enhance UE code detection performance.

Clauses affected: 5.8, annex A.3

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.

5.8 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 annex 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.

5.8.1 Midamble Allocation for DL Physical Channels

For DL physical channels the midamble allocation depends on whether the midambles are signalled by higher layers or by default and whether TxDiversity/Beamforming is used.

5.8.1.1 Midamble Allocation by signalling

5.8.1.1.1 DL Physical Channels without TxDiversity/Beamforming

If the midamble is part of the physical channel configuration, a common midamble shall be assigned to all physical channels in one time slot, except for physical channels providing the beacon function, see 5.4. When PDSCH physical layer signalling based on the midamble is used, each UE that may share the PDSCH shall get an individual midamble, see 5.3.6.

5.8.1.1.2 DL Physical Channels with TxDiversity/Beamforming

When DL beamforming or TX Diversity is used, each user to which TxDiversity/Beamforming is applied and which has a dedicated channel shall get one individual midamble, see 5.2.4.

5.8.1.2 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, except for physical channels providing the beacon function, see 5.4. 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.

5.8.2 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.

A.3 Association between Midambles and Channelisation Codes

The following mapping schemes apply for the association between midambles and channelisation codes if no midamble is allocated by higher layers. Secondary channelisation codes are marked with a (*). These associations apply both for UL and DL.

A.3.1 Association for Burst Type 1 and K=16 Midambles

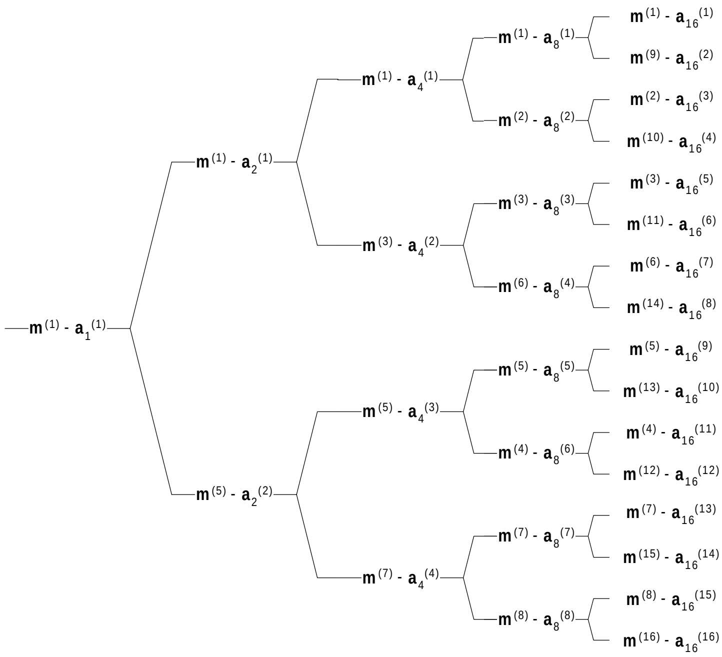


Figure A-1 Association of Midambles to Spreading Codes for Burst Type 1 and K=16

A.3.2 Association for Burst Type 1 and K=8 Midambles

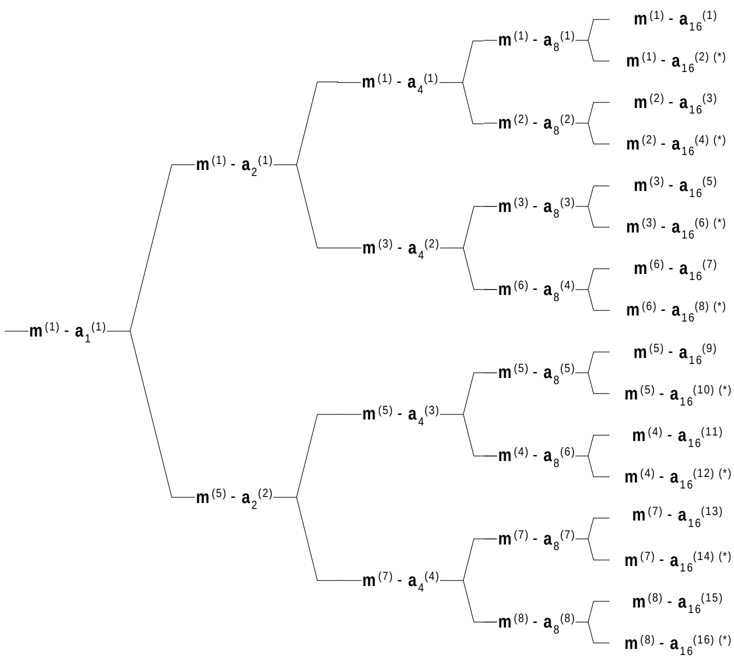


Figure A-2 Association of Midambles to Spreading Codes for Burst Type 1 and K=8

A.3.2 Association for Burst Type 1 and K=4 Midambles

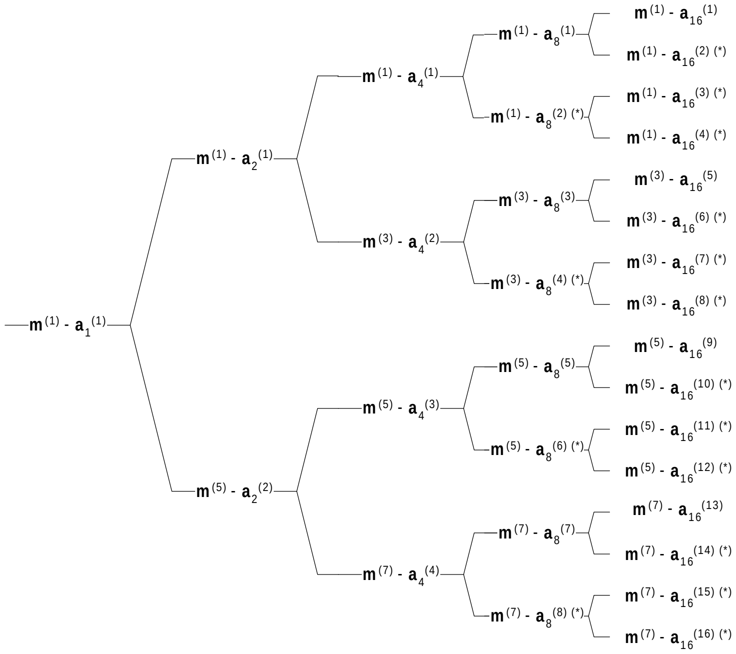


Figure A-3 Association of Midambles to Spreading Codes for Burst Type 1 and K=4

A.3.4 Association for Burst Type 2 and K=6 Midambles

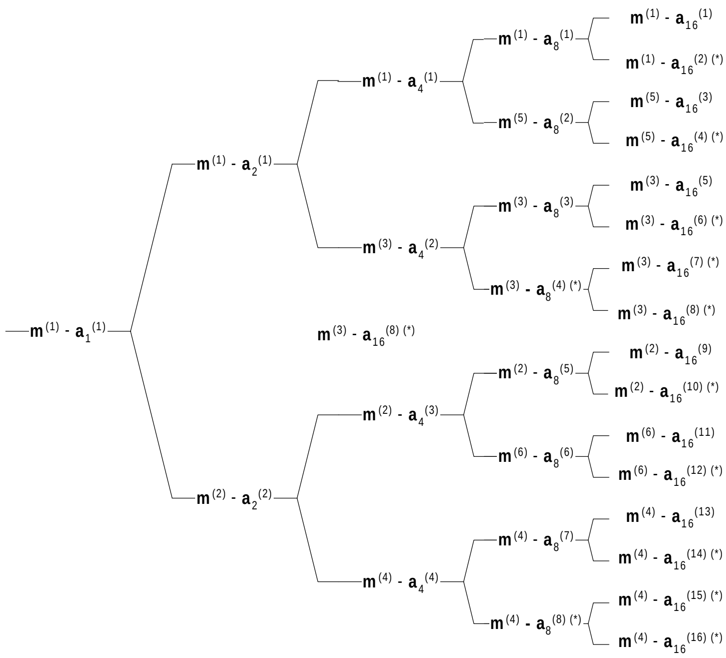


Figure A-4 Association of Midambles to Spreading Codes for Burst Type 2 and K=6

A.3.5 Association for Burst Type 2 and K=3 Midambles

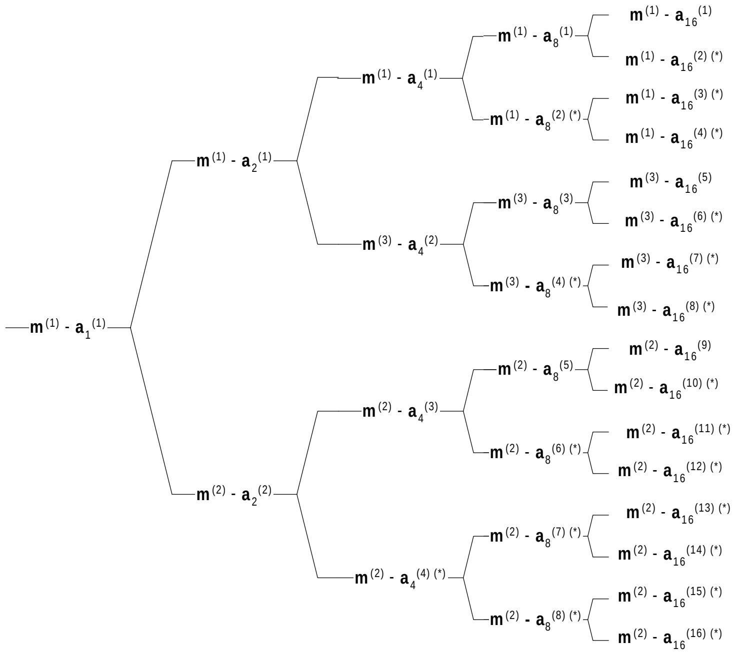


Figure A-5 Association of Midambles to Spreading Codes for Burst Type 2 and K=3

Note that the association for burst type 2 can be derived from the association for burst type 1, using the following table:

Burst Type 1	m(1)	m(2)	m(3)	m(4)	m(5)	m(6)	m(7)	m(8)
Burst Type 2	m(1)	m(5)	m(3)	m(6)	m(2)	m(4)	-	-