TSG-RAN Meeting #7
Madrid, Spain, 13 – 15 March 2000

RP-000067

Title: **Agreed CRs to TS 25.221**

Source: **TSG-RAN WG1**

Agenda item: **6.1.3**

No.	Doc #	Spec	CR	Rev	Subject	Cat	Versio	Versio
1	R1-000135	25.221	003	2	Cycling of cell parameters	C	3.1.1	3.2.0
2	R1-000076	25.221	011	-	Correction of Midamble Definition for TDD	F	3.1.1	3.2.0
3	R1-000096	25.221	012	-	Introduction of the timeslot formats for RACH to	D	3.1.1	3.2.0
4	R1-000097	25.221	013	-	Paging Indicator Channel reference power	D	3.1.1	3.2.0
5	R1-000376	25.221	014	1	Removal of Synchronisation Case 3 in TDD	F	3.1.1	3.2.0
6	R1-000228	25.221	015	1	Signal Point Constellation	F	3.1.1	3.2.0
7	R1-000415	25.221	016	-	Association between Midambles and	F	3.1.1	3.2.0
8	R1-000439	25.221	017	-	Removal of ODMA from the TDD specifications	D	3.1.1	3.2.0

3GPP TSG RAN Meeting #7
Madrid, Spain, 13-15 March 2000

Document R1-00-0135
e.g. for 3GPP use the format TP-99xxx
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25.221 CR 003r2 Current Version: V3.1.0

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

For submission to: RAN #7	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: TSG RAN WG1 **Date:** 13 Jan 2000

Subject: Cycling of cell parameters

Work item: TS25.221

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	X
D	Editorial modification	

Release:

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

Reason for change: Improvement in performance by increased diversity and reduction of false paths.

Clauses affected: 5.3.4

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.223-CR002r3, 25.224-CR003r2
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:

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 PCCPCH is known from the PSCH.

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

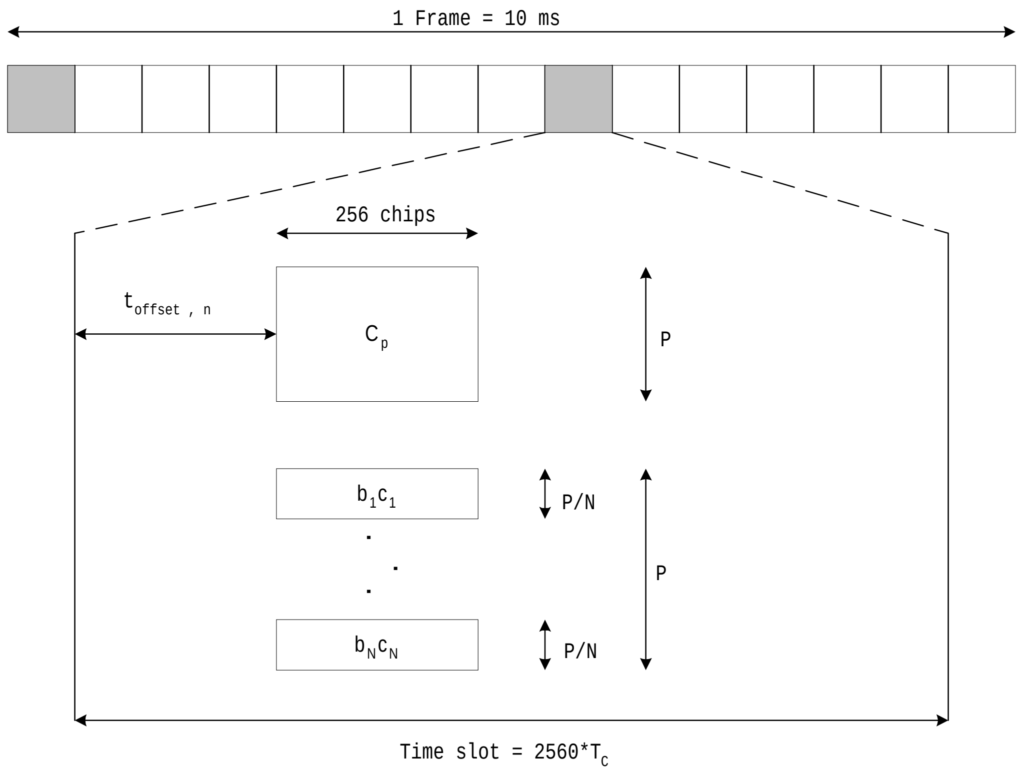

Figure 15: Scheme for Physical Synchronisation channel PSCH consisting of one primary sequence C_p and N=3 parallel secondary sequences in slot k and k+8

(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]. Note that the cell parameter will change from frame to frame, cf. 'Table 8 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}.The exact value for t_{offset}, regarding column 'Associated t_{offset}' in table 7 in [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.

3GPP TSG RAN Meeting #7
Madrid, Spain, 13-15 March 2000

Document R1-00-0076

e.g. for 3GPP use the format TP-99xxx
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25.221 CR 011 Current Version: V3.1.0

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

For submission to:	RAN #7	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: TSG RAN WG1 **Date:** 13 Jan 2000

Subject: Correction of Midamble Definition for TDD

Work item:

Category:				**Release:**		
	F	Correction	X		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			Release 99	X
					Release 00	

Reason for change: Removal of an error in mathematical representation and simplified mathematical representation.

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:

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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.~~

In this section, the training sequences for usage as midambles in burst type 1 and burst type 2 (see section 5.2.2) are defined. The training sequences, i.e. midambles, of different users active in the same cell and same time slot are ~~time~~ cyclically shifted versions of one single ~~periodic~~ basic midamble code. The applicable basic midamble codes are given in Annex A.1 and A.2. As different basic midamble codes are required for different burst formats, the Annex A.1 shows the basic midamble codes $\mathbf{m}_{PL}$ for burst type 1 and Annex and A.2 shows $\mathbf{m}_{PS}$ for burst type 2. It should be noted that the different burst types must not be mixed in the same timeslot of one cell.

The basic midamble codes in Annex A.1 and A.2 are listed in hexadecimal notation. The binary form of the basic midamble code shall be derived according to table 4 below.

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

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

For each particular basic midamble code, its binary representation can be written as a vector $\mathbf{m}_{\mathrm{P}}$:

$$\mathbf{m}_{\mathrm{P}} = (m_1, m_2, ..., m_P) \qquad (1)$$

According to Annex A.1, the size of this vector $\mathbf{m}_{\mathrm{P}}$ is P=456 for burst type 1. Annex A.2 is setting P=192 for burst type 2. As QPSK modulation is used, the training sequences are transformed into a complex form, denoted as the complex vector $\underline{\mathbf{m}}_{\mathrm{P}}$:

$$\underline{\mathbf{m}}_{\mathrm{P}} = (\underline{m}_1, \underline{m}_2, ..., \underline{m}_P) \qquad (2)$$

The elements $\underline{m}_i$ of $\underline{\mathbf{m}}_{\mathrm{P}}$ are derived from elements m_i of $\mathbf{m}_{\mathrm{P}}$ using equation (3):

$$\underline{m}_i = (\mathrm{j})^i \cdot m_i \text{ for all } i = 1,...,P \qquad (3)$$

Hence, the elements $\underline{m}_i$ of the complex basic midamble code are alternating real and imaginary.

To derive the required training sequences, this vector $\underline{\mathbf{m}}_{\mathrm{P}}$ is periodically extended to the size:

$$i_{\max} = L_m + (K'-1)W + \lfloor P/K \rfloor \qquad (4)$$

Notes on equation (4):

- K', W and P taken from Annex A.1 or A.2 according to burst type and thus to length of midamble L_m
- K=2K'
- $\lfloor x \rfloor$ denotes the largest integer smaller or equal to x

So we obtain a new vector $\underline{\mathbf{m}}$ containing the periodic basic midamble sequence:

$$\underline{\mathbf{m}} = \left(\underline{m}_1, \underline{m}_2, ..., \underline{m}_{i_{\max}}\right) = \left(\underline{m}_1, \underline{m}_2, ..., \underline{m}_{L_m+(K'-1)W+\lfloor P/K \rfloor}\right) \quad (5)$$

The first P elements of this vector $\underline{\mathbf{m}}$ are the same ones as in vector $\underline{\mathbf{m}}_P$, the following elements repeat the beginning:

$$\underline{m}_i = \underline{m}_{i-P} \text{ for the subset } i = (P+1), ..., i_{\max} \quad (6)$$

Using this periodic basic midamble sequence $\underline{\mathbf{m}}$ for each user k a midamble $\underline{\mathbf{m}}^{(k)}$ of length L_m is derived, which can be written as a user specific vector:

$$\underline{\mathbf{m}}^{(k)} = \left(\underline{m}_1^{(k)}, \underline{m}_2^{(k)}, ..., \underline{m}_{L_m}^{(k)}\right) \quad (7)$$

The L_m midamble elements $\underline{m}_i^{(k)}$ are generated for each midamble of the first K' users (k = 1,...,K') based on:

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K'-k)W} \text{ with } i = 1, ..., L_m \text{ and } k = 1, ..., K' \quad (8)$$

The elements of midambles for the second K' users (k = (K'+1),...,K = (K'+1),...,2K') are generated based on a slight modification of this formula introducing intermediate shifts:

$$\underline{m}_i^{(k)} = \underline{m}_{i+(K-k)W+\lfloor P/K \rfloor} \text{ with } i = 1, ..., L_m \text{ and } k = K'+1, ..., K \quad (9)$$

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

The midamble sequences derived according to equations (7) to (9) have complex values and are not subject to spreading or scrambling process, i.e. the elements $\underline{m}_i^{(k)}$ represent complex chips for usage in the pulse shaping process at modulation.

The term 'a midamble code set' or 'a midamble code family' denotes K specific midamble codes $\underline{\mathbf{m}}^{(k)}$; k=1,...,K, based on a single basic midamble code $\underline{\mathbf{m}}_P$ according to (1).

~~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~~

$$\underline{V}_m = \{1, j, -1, -j\} \quad (1)$$

~~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~~

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

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

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

$\lfloor \mathrm{x} \rfloor$ 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

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

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

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

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

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

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

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

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 $\mathbf{m}_\mathrm{P}$ 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 $\mathbf{m}_\mathrm{P}$ according to (5).

In the Annex A the periods $\mathbf{m}_\mathrm{P}$ 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.~~

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25.221 CR 012 Current Version: V3.1.0

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

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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 :* 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 WG1 **Date:** 17.12.1999

Subject: Introduction of the timeslot formats for RACH to the TDD specifications

Work item: TS25.221

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

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

Reason for change: RACH timeslot formats are still missing from the TDD specifications

Clauses affected: 5.2.2.3

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:

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5.2.2.3 Timeslot formats

5.2.2.3.1 Downlink timeslot formats

The downlink timeslot format depends on the spreading factor, midamble length and on the number of the TFCI bits, as depicted in the table 4a.

Table 4a: Time slot formats for the Downlink

Slot Format #	Spreading Factor	Midamble length (chips)	N_{TFCI} (bits)	Bits/slot	$N_{Data/Slot}$ (bits)	$N_{data/data\ field}$ (bits)
0	16	512	0	244	244	122
1	16	512	4	244	240	120
2	16	512	8	244	236	118
3	16	512	16	244	228	114
4	16	512	32	244	212	106
5	16	256	0	276	276	138
6	16	256	4	276	272	136
7	16	256	8	276	268	134
8	16	256	16	276	260	130
9	16	256	32	276	244	122
10	1	512	0	3904	3904	1952
11	1	512	4	3904	3900	1950
12	1	512	8	3904	3896	1948
13	1	512	16	3904	3888	1944
14	1	512	32	3904	3872	1936
15	1	256	0	4416	4416	2208
16	1	256	4	4416	4412	2206
17	1	256	8	4416	4408	2204
18	1	256	16	4416	4400	2200
19	1	256	32	4416	4384	2192

5.2.2.3.2 Uplink timeslot formats

The uplink timeslot format depends on the spreading factor, midamble length, the TPC presence and on the number of the TFCI bits. In the case that TPC is used, different amount of bits are mapped to the two data fields. The timeslot formats are depicted in the table 4b.

Table 4b: Timeslot formats for the Uplink

Slot Format #	Spreading Factor	Midamble length (chips)	N_{TFCI} (bits)	N_{TPC} (bits)	Bits/slot	$N_{Data/Slot}$ (bits)	$N_{data/data\ field(1)}$ (bits)	$N_{data/data\ field(2)}$ (bits)
0	16	512	0	0	244	244	122	122
1	16	512	4	0	244	240	120	120
2	16	512	8	0	244	236	118	118
3	16	512	16	0	244	228	114	114
4	16	512	32	0	244	212	106	106
5	16	512	0	2	244	242	122	120
6	16	512	4	2	244	238	120	118
7	16	512	8	2	244	234	118	116
8	16	512	16	2	244	226	114	112
9	16	512	32	2	244	210	106	104
10	16	256	0	0	276	276	138	138
11	16	256	4	0	276	272	136	136
12	16	256	8	0	276	268	134	134
13	16	256	16	0	276	260	130	130
14	16	256	32	0	276	244	122	122
15	16	256	0	2	276	274	138	136
16	16	256	4	2	276	270	136	134
17	16	256	8	2	276	266	134	132
18	16	256	16	2	276	258	130	128
19	16	256	32	2	276	242	122	120
20	8	512	0	0	488	488	244	244
21	8	512	4	0	488	484	242	242
22	8	512	8	0	488	480	240	240
23	8	512	16	0	488	472	236	236
24	8	512	32	0	488	456	228	228
25	8	512	0	2	488	486	244	242
26	8	512	4	2	488	482	242	240
27	8	512	8	2	488	478	240	238
28	8	512	16	2	488	470	236	234
29	8	512	32	2	488	454	228	226

30	8	256	0	0	552	552	276	276
31	8	256	4	0	552	548	274	274
32	8	256	8	0	552	544	272	272
33	8	256	16	0	552	536	268	268
34	8	256	32	0	552	520	260	260
35	8	256	0	2	552	550	276	274
36	8	256	4	2	552	546	274	272
37	8	256	8	2	552	542	272	270
38	8	256	16	2	552	534	268	266
39	8	256	32	2	552	518	260	258
40	4	512	0	0	976	976	488	488
41	4	512	4	0	976	972	486	486
42	4	512	8	0	976	968	484	484
43	4	512	16	0	976	960	480	480
44	4	512	32	0	976	944	472	472
45	4	512	0	2	976	974	488	486
46	4	512	4	2	976	970	486	484
47	4	512	8	2	976	966	484	482
48	4	512	16	2	976	958	480	478
49	4	512	32	2	976	942	472	470
50	4	256	0	0	1104	1104	552	552
51	4	256	4	0	1104	1100	550	550
52	4	256	8	0	1104	1096	548	548
53	4	256	16	0	1104	1088	544	544
54	4	256	32	0	1104	1072	536	536
55	4	256	0	2	1104	1102	552	550
56	4	256	4	2	1104	1098	550	548
57	4	256	8	2	1104	1094	548	546
58	4	256	16	2	1104	1086	544	542
59	4	256	32	2	1104	1070	536	534
60	2	512	0	0	1952	1952	976	976
61	2	512	4	0	1952	1948	974	974
62	2	512	8	0	1952	1944	972	972
63	2	512	16	0	1952	1936	968	968
64	2	512	32	0	1952	1920	960	960
65	2	512	0	2	1952	1950	976	974
66	2	512	4	2	1952	1946	974	972
67	2	512	8	2	1952	1942	972	970

68	2	512	16	2	1952	1934	968	966
69	2	512	32	2	1952	1918	960	958
70	2	256	0	0	2208	2208	1104	1104
71	2	256	4	0	2208	2204	1102	1102
72	2	256	8	0	2208	2200	1100	1100
73	2	256	16	0	2208	2192	1096	1096
74	2	256	32	0	2208	2176	1088	1088
75	2	256	0	2	2208	2206	1104	1102
76	2	256	4	2	2208	2202	1102	1100
77	2	256	8	2	2208	2198	1100	1098
78	2	256	16	2	2208	2190	1096	1094
79	2	256	32	2	2208	2174	1088	1086
80	1	512	0	0	3904	3904	1952	1952
81	1	512	4	0	3904	3900	1950	1950
82	1	512	8	0	3904	3896	1948	1948
83	1	512	16	0	3904	3888	1944	1944
84	1	512	32	0	3904	3872	1936	1936
85	1	512	0	2	3904	3902	1952	1950
86	1	512	4	2	3904	3898	1950	1948
87	1	512	8	2	3904	3894	1948	1946
88	1	512	16	2	3904	3886	1944	1942
89	1	512	32	2	3904	3870	1936	1934
90	1	256	0	0	4416	4416	2208	2208
91	1	256	4	0	4416	4412	2206	2206
92	1	256	8	0	4416	4408	2204	2204
93	1	256	16	0	4416	4400	2200	2200
94	1	256	32	0	4416	4384	2192	2192
95	1	256	0	2	4416	4414	2208	2206
96	1	256	4	2	4416	4410	2206	2204
97	1	256	8	2	4416	4406	2204	2202
98	1	256	16	2	4416	4398	2200	2198
99	1	256	32	2	4416	4282	2192	2190

5.2.2.3.3 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	$N_{Data/Slot}$ (bits)	$N_{data/data\ field(1)}$ (bits)	$N_{data/data\ field(2)}$ (bits)
0	16	512	232	232	122	110
1	8	512	464	464	244	220

3GPP TSG RAN Meeting #7
Madrid, Spain, 13-15 March 2000

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25.221 CR 013 Current Version: V3.1.0

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

For submission to: TSG RAN #7	for approval	X	strategic		*(for SMG use only)*
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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:	TSG RAN WG1	**Date:**	
Subject:	Paging Indicator Channel reference power		
Work item:	TS25.221		

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

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

Reason for change: The current specification does not define the transmission power of the PICH.

Clauses affected: 5.3.7

Other specs affected:

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

Other comments:

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

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 CCPCH, see 6.2.2. The page indicator indicates a paging message for one or more UEs that are associated with it. PICH is always transmitted at the same reference power level as the P-CCPCH.

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 number of page indicators N_{PI} per time slot is given by the number L_{PI} of symbols for the page indicators and the burst type. 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 examples for the transmission of page indicators in the different burst types for L_{PI}=4.

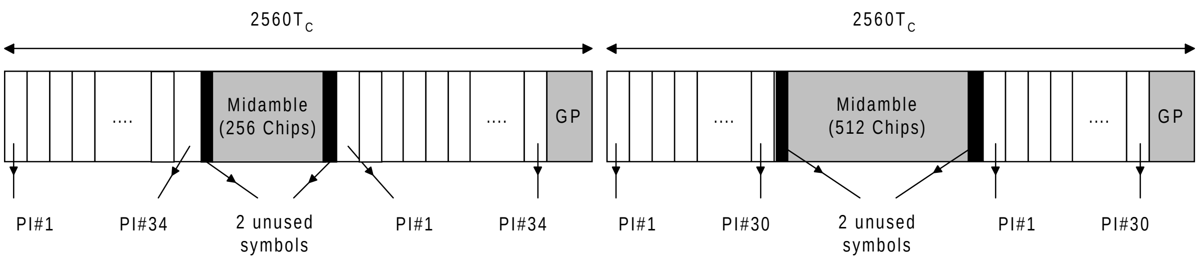

Figure 16: Example of PI Transmission in PICH bursts of different types for L_{PI}=4

3GPP TSG RAN Meeting #7
Madrid, Spain, 13-15 March 2000

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e.g. for 3GPP use the format TP-99xxx
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25.221	**CR**	**014r1**	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:	RAN#7	for approval	X	Strategic		*(for SMG use only)*
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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 WG1 **Date:** 2000-03-01

Subject: Removal of Synchronisation Case 3 in TDD

Work item:

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

F	Correction	X	**Release:**	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			Release 99	X
				Release 00	

Reason for change: Performance of SCH acquisition is too low with synchronisation case 3.

Clauses affected: 3, 4.1.2, 5.3.4, 5.4.1, 6, 6.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	CR005-223, CR011-224
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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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
PDU	Protocol Data Unit
PICH	Page Indicator Channel
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

4 Transport channels

4.1 Transport channels

Transport channels are the services offered by layer 1 to the higher layers. A transport channel is defined by how and with what characteristics data is transferred over the air interface. A general classification of transport channels is into two groups:

- common channels (where there is a need for in-band identification of the UEs when particular UEs are addressed) and

- dedicated channels (where the UEs are identified by the physical channel)

General concepts about transport channels are described in 3GPP RAN TS25.302 (L2 specification).

4.1.1 Dedicated transport channels

The Dedicated Channel (DCH) is an up- or downlink transport channel that is used to carry user or control information between the UTRAN and a UE.

Two types of dedicated transport channels have been identified:

1) Dedicated Channel (DCH)

2) ODMA Dedicated Transport Channel (ODCH)

4.1.2 Common transport channels

Common transport channels are:

1) Broadcast Channel (BCH)

   The Broadcast Channel (BCH) is a downlink transport channel that is used to broadcast system- and cell-specific information.

2) Paging Channel (PCH)

   The Paging Channel (PCH) is a downlink transport channel that is used to carry control information to a mobile station when the system does not know the location cell of the mobile station.

3) Forward Access Channel(s) (FACH)

   The Forward Access Channel (FACH) is a downlink transport channel that is used to carry control information to a mobile station when the system knows the location cell of the mobile station. The FACH may also carry short user packets.

4) Random Access Channel(s) (RACH)

   The Random Access Channel (RACH) is an up link transport channel that is used to carry control information from mobile station. The RACH may also carry short user packets.

5) ODMA Random Access Channel (ORACH)

~~6) Synchronisation Channel (SCH)~~

~~7~~6) Uplink Shared Channel (USCH)

   The uplink shared channel (USCH) is a uplink transport channel shared by several UEs carrying dedicated control or traffic data.

~~8~~7) Downlink Shared Channel (DSCH)

   The downlink shared channel (DSCH) is a downlink transport channel shared by several UEs carrying dedicated control or traffic data.

5.3.4 The ~~physical~~ synchronisation channel (~~P~~SCH)

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 ~~P~~SCH is mapped on one or two downlink slots per frame only.

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

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

Case 2) ~~P~~SCH 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 ~~P~~SCH (value of k) in frame can change on a long term basis in any case.

Due to this ~~P~~SCH scheme, the position of P-CCPCH is known from the ~~P~~SCH.

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

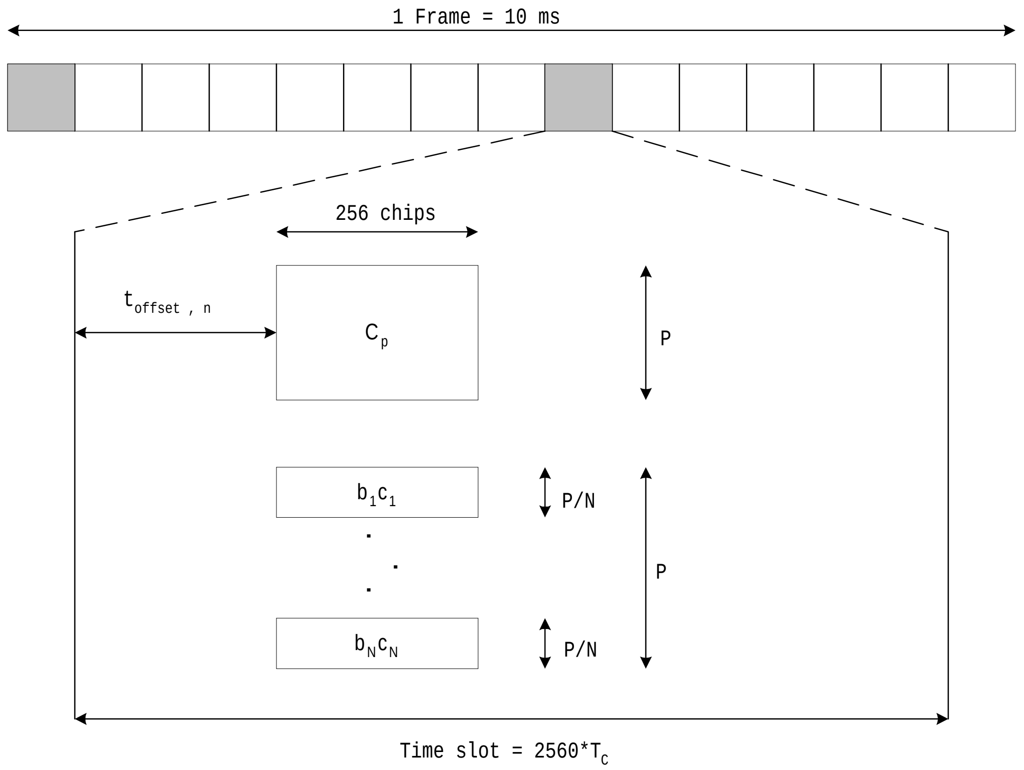

Figure 15: Scheme for ~~Physical~~ Synchronisation channel ~~P~~SCH consisting of one primary sequence C_p and N=3 parallel secondary sequences in slot k and k+8

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

As depicted in figure 15, the ~~P~~SCH 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 ~~P~~SCH 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 in [8] is given by:

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

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

5.4.1 Location of physical channels with beacon function

The location of the physical channels with beacon function is determined by the ~~P~~SCH and depends on the ~~P~~SCH 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.

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.

Transport Channels	Physical Channels
DCH ODCH*	Dedicated Physical Channel (DPCH)
BCH	Primary Common Control Physical Channel (P-CCPCH)
FACH PCH	Secondary Common Control Physical Channel (S-CCPCH)
RACH ORACH*	Physical Random Access Channel (PRACH)
~~SCH~~	~~Physical Synchronisation Channel (PSCH)~~
USCH	Physical Uplink Shared Channel (PUSCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
	Page Indicator Channel (PICH)
	Synchronisation Channel (SCH)

* in case of ODMA networks

Figure 17: Transport channel to physical channel mapping

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 allocated multiframe structure. 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 S-CCPCH. 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.

6.2.4 The Random Access Channel (RACH)

The RACH has intraslot interleaving only and is mapped onto PRACH. The same slot may be used for PRACH by more than one cell. Multiple transmissions using different spreading codes may be received in parallel. More than one slot per frame may be administered for the PRACH. The location of slots allocated to PRACH is broadcast on the BCH. The PRACH uses open loop power control. The details of the employed open loop power control algorithm may be different from the corresponding algorithm on other channels.

~~6.2.5 The Synchronisation Channel (SCH)~~

~~The SCH is mapped onto the PSCH as described in section 5.4.~~

6.2.6 Common Transport Channels for ODMA networks

The ORACH is used to transfer short probes or short protocol data units (PDU) between one or more nodes for routing and resource allocation control.

To limit the transmission time of short probe PDUs on the ORACH then this data should be transmitted as one burst on one code. That is, one probe burst should be transmitted on one $2560*T_c$ timeslot (which as described in section 5.1 would be configured as an ORACH slot).

Since the ORACH is a common control channel used to transfer probes between one or more nodes a common fixed spreading factor should be adopted.

6.2.7 The Uplink Shared Channel (USCH)

The uplink shared channel is mapped on one or several PUSCH, see section 5.5.

6.2.8 The Downlink Shared Channel (DSCH)

The downlink shared channel is mapped on one or several PDSCH, see section 5.6.

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25.221 **CR** **015r1** Current Version: 3.1.0

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

For submission to: TSG RAN#7	for approval	X	strategic		(for SMG 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: TSG RAN WG1 **Date:** 2000-02-25

Subject: Signal Point Constellation

Work item:

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

Reason for change: Corresponds to modification in TS25.223 CR 006 regarding Signal Point Constellation

Clauses affected: 5.3.1, 5.3.3.4, 5.3.4, 5.4.1, A.3.1-A.3.5

Other specs affected:			
Other 3G core specifications	X	→ List of CRs:	25.223 CR006r1, 25.224 CR013
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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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 ~~$a_{Q=16}^{(k=1)}$~~ $c_{Q=16}^{(k=1)}$.

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.

5.3.3.4 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 ~~**a**~~$\mathbf{c}_Q^{(k)}$ 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.

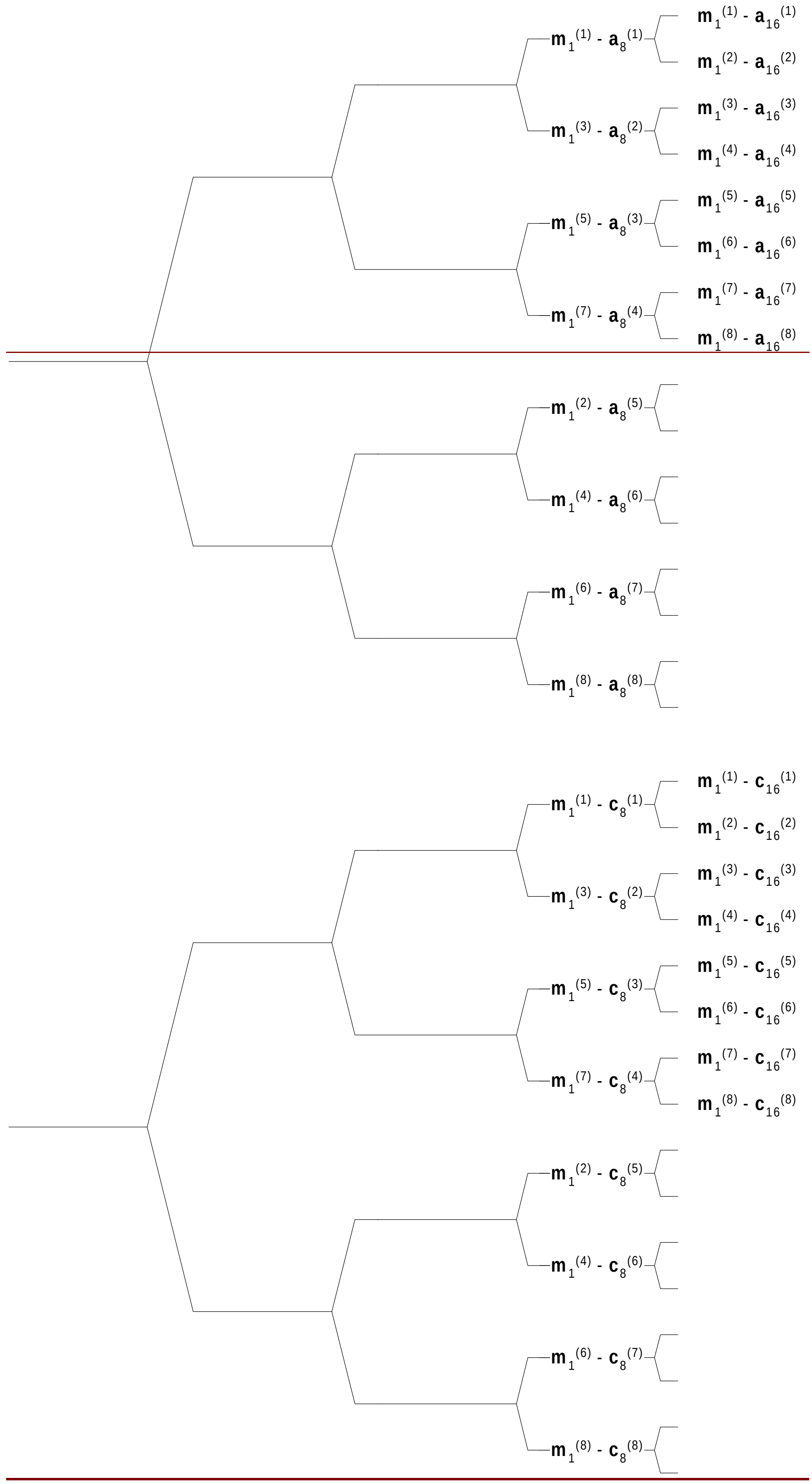
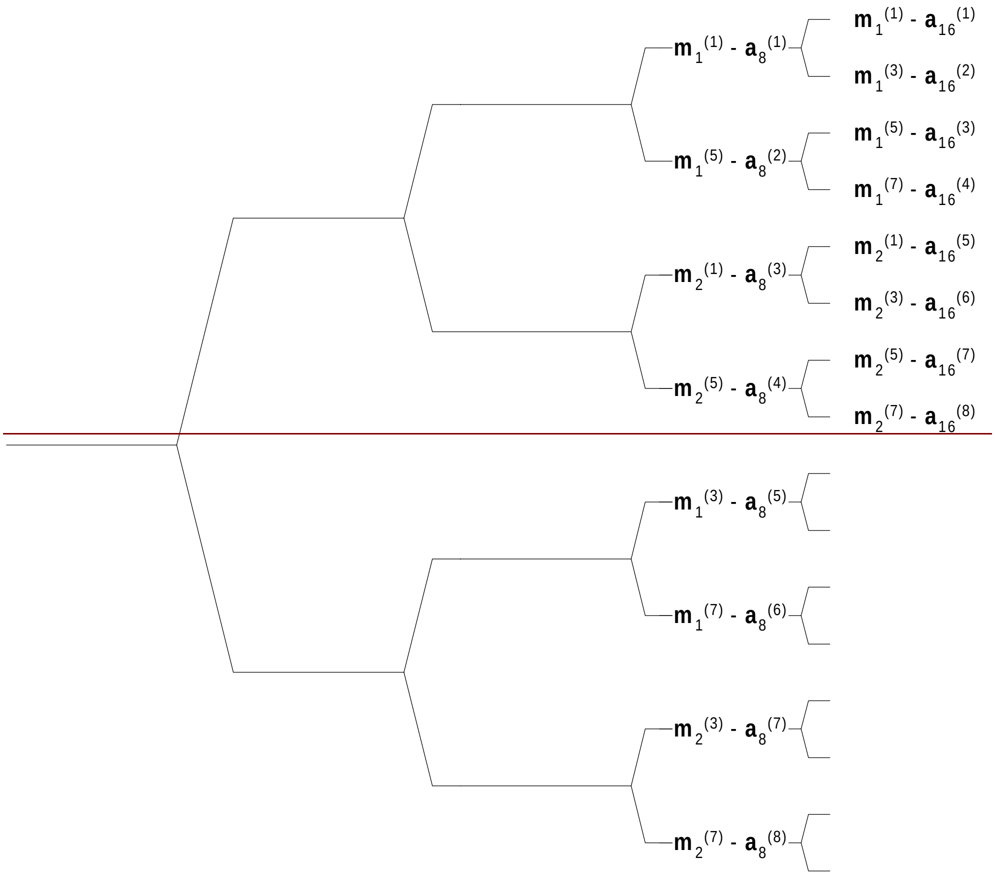


Figure 13: Association of Midambles to Channelisation Codes in the OVSF tree for all *k*



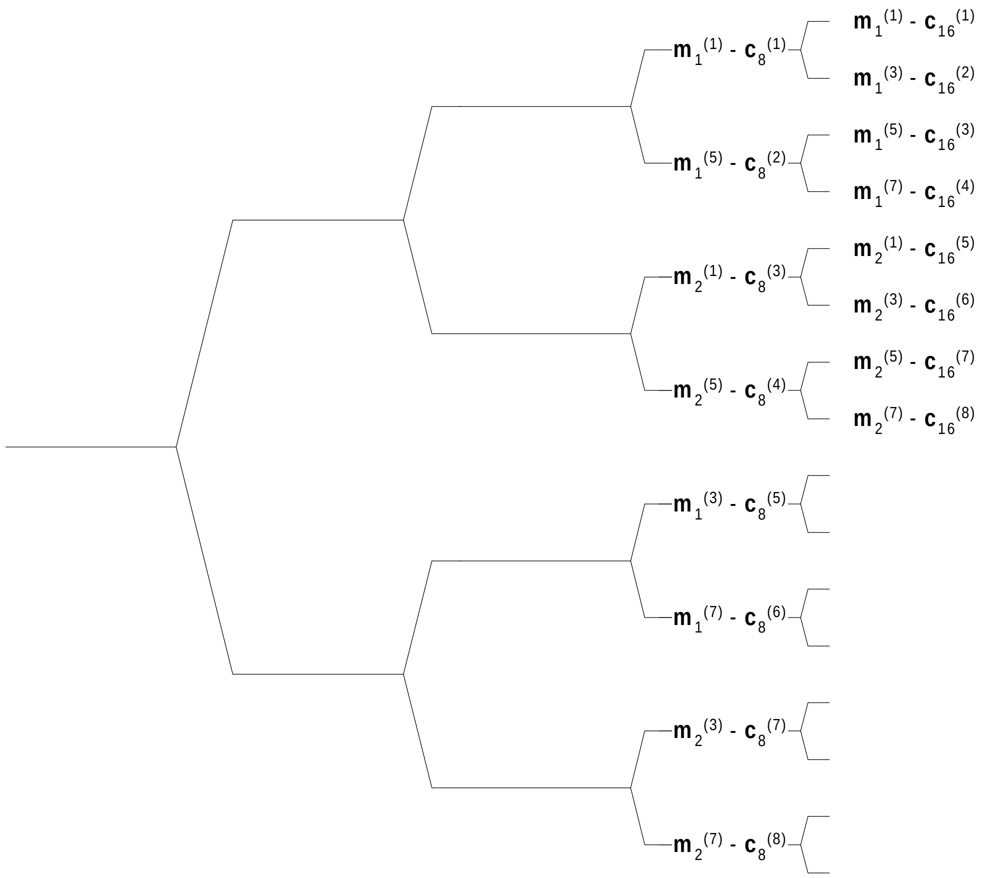


Figure 14: Association of Midambles to Channelisation Codes in the OVSF tree for odd *k*

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 PCCPCH is known from the PSCH.

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

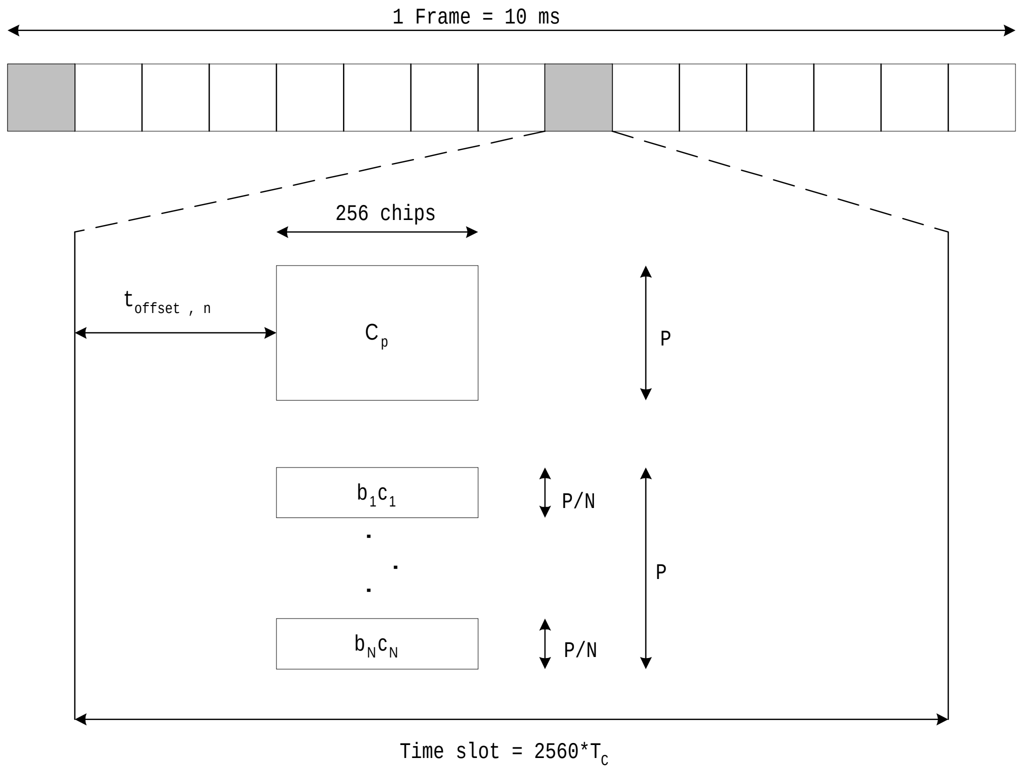


Figure 15: Scheme for Physical Synchronisation channel PSCH consisting of one primary sequence C_p and N=3 parallel secondary sequences in slot k and k+8

(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 in [8] is given by:

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

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

5.4.1 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 ~~$a_{Q=16}^{(k=1)}$~~ $c_{Q=16}^{(k=1)}$ and in TS#k, k=0….14 shall provide the beacon function.

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

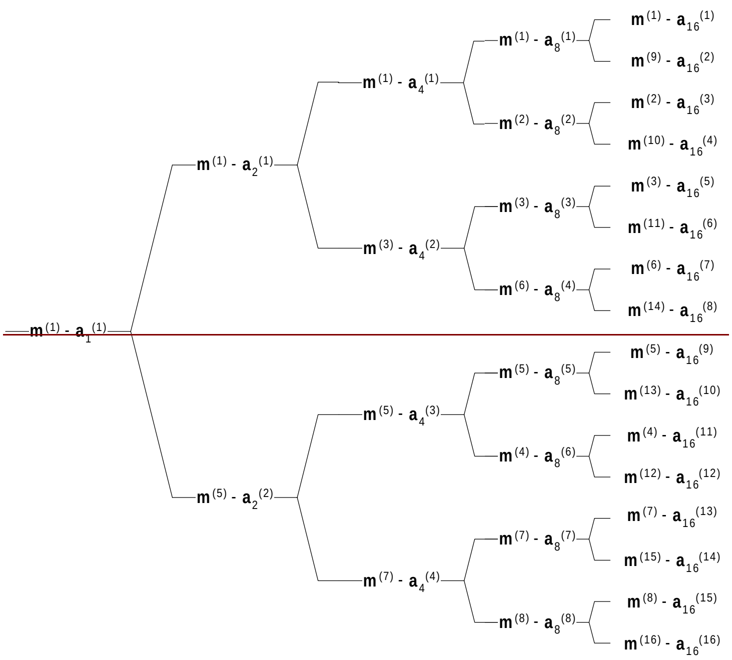
Case 3) All physical channels that are allocated to channelisation code ~~$a_{Q=16}^{(k=1)}$~~ $c_{Q=16}^{(k=1)}$ and in TS#i and TS#i+8, i=0…6, pointed by PSCH, shall provide the beacon function.

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

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



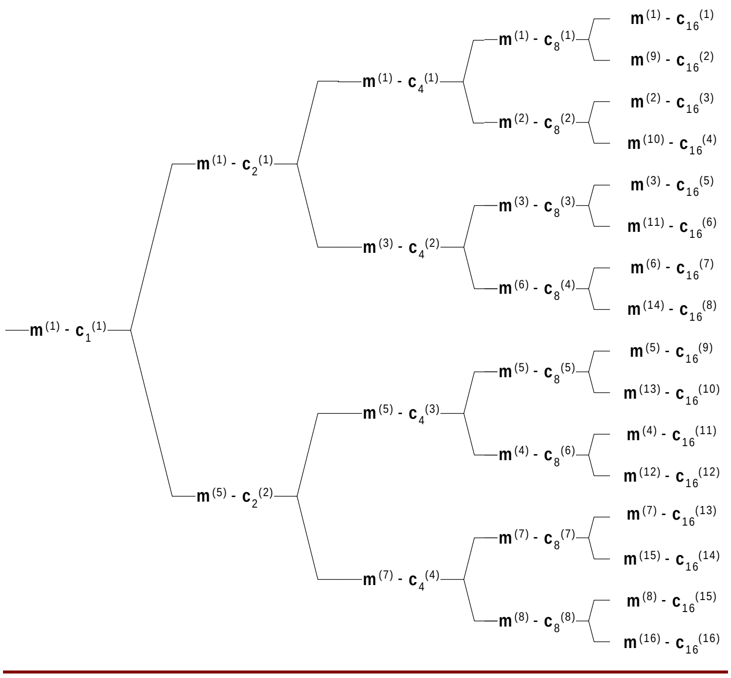


Figure A-1 Association of Midambles to Spreading Codes for Burst Type 1 and K=16

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

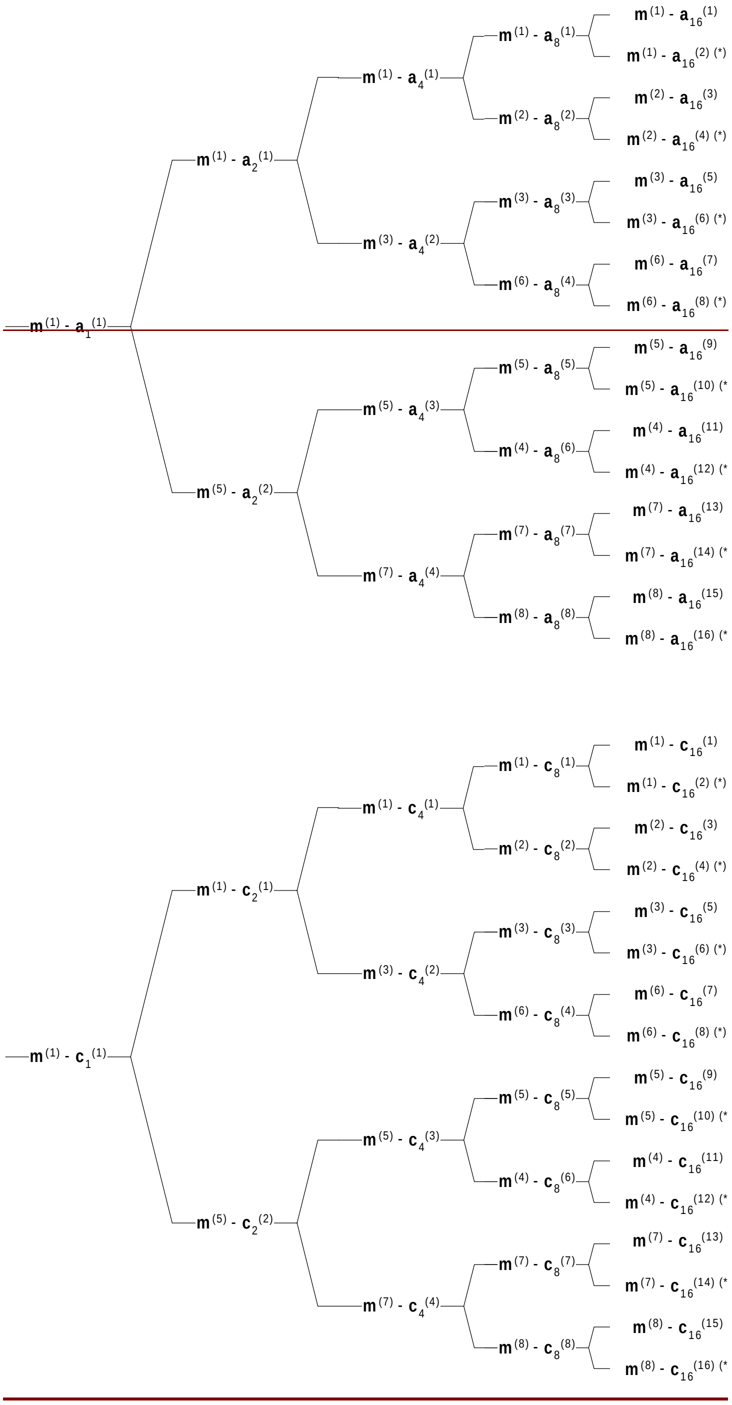
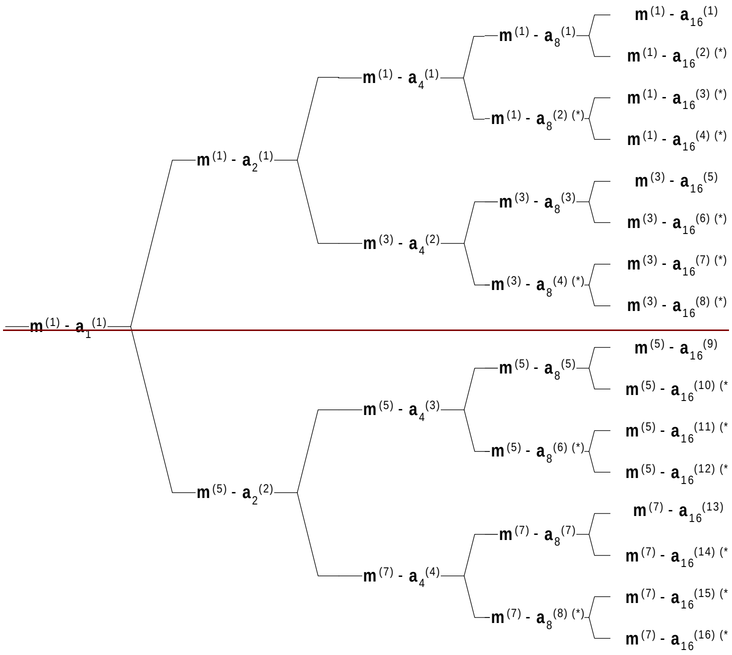


Figure A-2 Association of Midambles to Spreading Codes for Burst Type 1 and K=8

A.3.3 Association for Burst Type 1 and K=4 Midambles



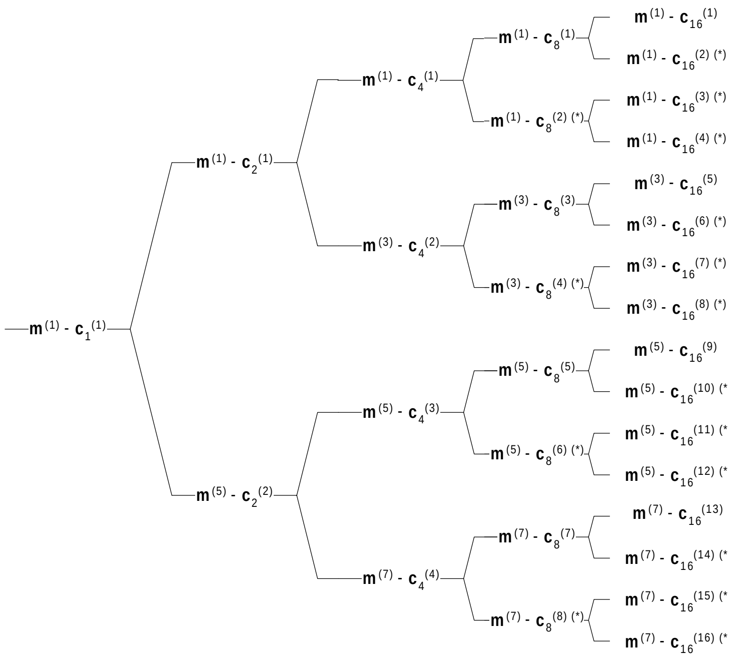


Figure A-3 Association of Midambles to Spreading Codes for Burst Type 1 and K=4

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

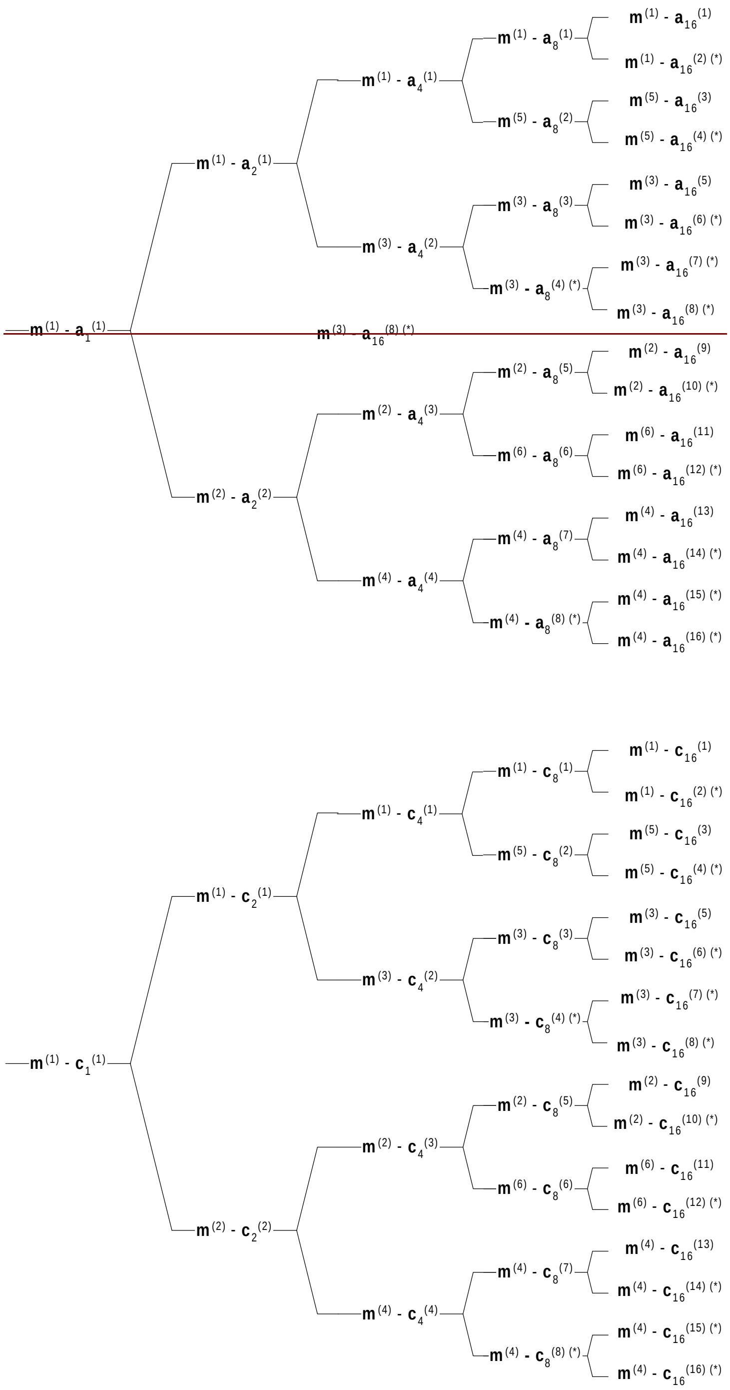


Figure A-4 Association of Midambles to Spreading Codes for Burst Type 2 and K=6

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

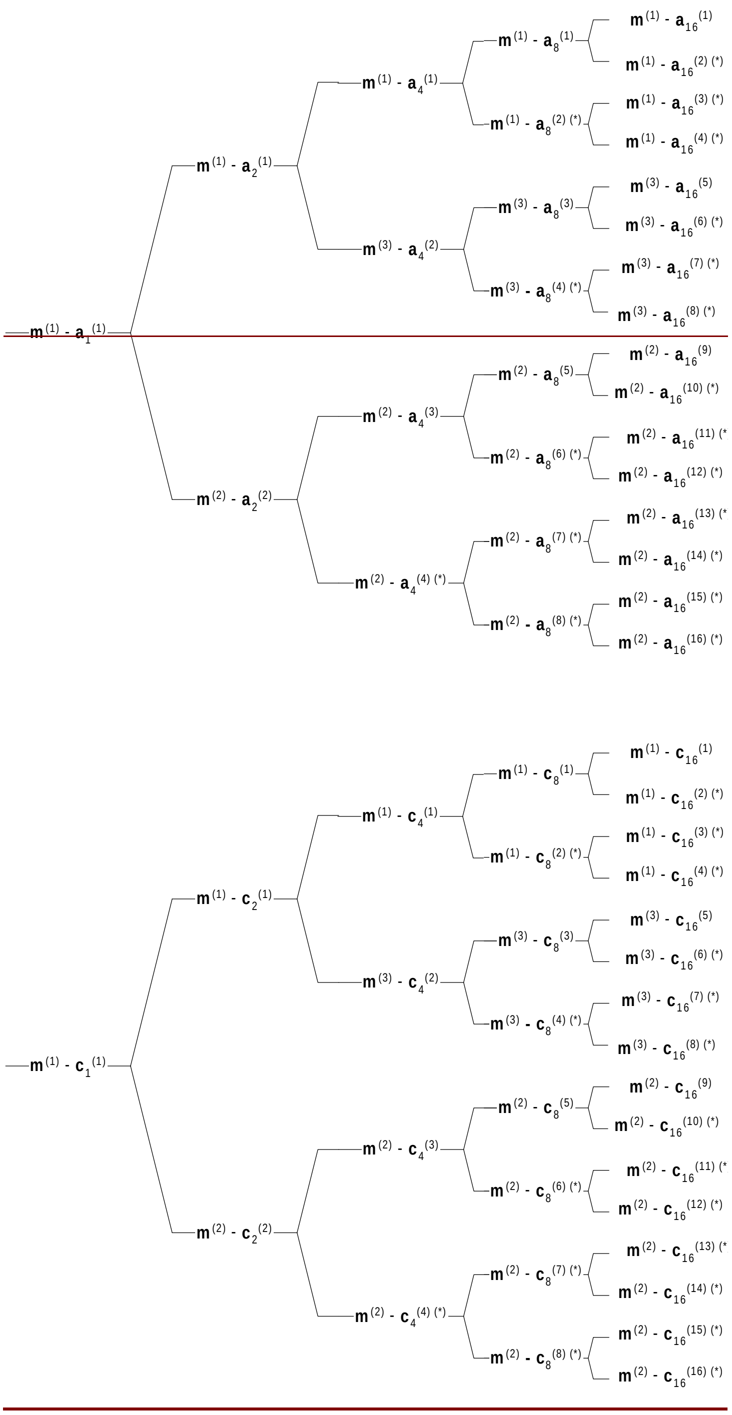


Figure A-5 Association of Midambles to Spreading Codes for Burst Type 2 and K=3

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)	-	-

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25.221	**CR**	**16**	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:	RAN #7	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:	TSG RAN WG1	**Date:**	2, March 2000

Subject: Association between Midambles and Channelisation Codes

Work item: TS 25.221

Category:	F	Correction	X	**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			Release 99	X
					Release 00	

Reason for change: A mandatory mapping between midambles and channelisation codes is required in some cases, e.g. Tx diversity is used and multiple UEs share the same time slot. The present specification does not mandate the mapping in these cases.

Clauses affected: 5.3.6, 5.5.1, 5.5.1.1, 5.5.1.1.1, 5.5.1.1.2, 5.5.1.2

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:

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

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 assigned indicated tofor 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.

5.5 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.

5.5.1 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. 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.

5.5.1.1 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 Sections 5.5.1.1.1 and Section 5.5.1.1.2 hold respectively. If the midamble is not signalled as a part of the physical channel configuration, midamble allocation by default shall be used.

5.5.1.1.1 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/TxDiversity is applied to any of these DL physical channels and
- midambles are not used for PDSCH physical layer signalling.

5.5.1.1.2 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 TxDiversity is applied to any of these DL physical channels

or

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

5.5.1.1.1 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.~~

~~5.5.1.1.2 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.~~

5.5.1.2 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.

5.5.2 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.

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25.221	**CR**	**017**	Current Version: V3.1.0

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

For submission to:	TSG RAN #7	for approval	X	strategic		*(for SMG 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 : 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: TSG RAN WG1 **Date:** 23.02.2000

Subject: Removal of ODMA from the TDD specifications

Work item: TS25.221

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

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

Reason for change: Removal of ODMA from the TDD specifications since it is not supported for 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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<--------- 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
PDU	Protocol Data Unit
PICH	Page Indicator Channel
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

4 Transport channels

4.1 Transport channels

Transport channels are the services offered by layer 1 to the higher layers. A transport channel is defined by how and with what characteristics data is transferred over the air interface. A general classification of transport channels is into two groups:

- common channels (where there is a need for in-band identification of the UEs when particular UEs are addressed) and
- dedicated channels (where the UEs are identified by the physical channel)

General concepts about transport channels are described in 3GPP RAN TS25.302 (L2 specification).

4.1.1 Dedicated transport channels

The Dedicated Channel (DCH) is an up- or downlink transport channel that is used to carry user or control information between the UTRAN and a UE.

~~Two types of dedicated transport channels have been identified:~~

~~1) Dedicated Channel (DCH)~~

~~2) ODMA Dedicated Transport Channel (ODCH)~~

4.1.2 Common transport channels

Common transport channels are:

1) Broadcast Channel (BCH)

   The Broadcast Channel (BCH) is a downlink transport channel that is used to broadcast system- and cell-specific information.

2) Paging Channel (PCH)

   The Paging Channel (PCH) is a downlink transport channel that is used to carry control information to a mobile station when the system does not know the location cell of the mobile station.

3) Forward Access Channel(s) (FACH)

   The Forward Access Channel (FACH) is a downlink transport channel that is used to carry control information to a mobile station when the system knows the location cell of the mobile station. The FACH may also carry short user packets.

4) Random Access Channel(s) (RACH)

   The Random Access Channel (RACH) is an up link transport channel that is used to carry control information from mobile station. The RACH may also carry short user packets.

~~5) ODMA Random Access Channel (ORACH)~~

5~~6~~) Synchronisation Channel (SCH)

6~~7~~) Uplink Shared Channel (USCH)

   The uplink shared channel (USCH) is a uplink transport channel shared by several UEs carrying dedicated control or traffic data.

7~~8~~) Downlink Shared Channel (DSCH)

   The downlink shared channel (DSCH) is a downlink transport channel shared by several UEs carrying dedicated control or traffic data.

5 Physical channels

All physical channels take three-layer structure with respect to timeslots, radio frames and system frame numbering (SFN), see [14]. 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.

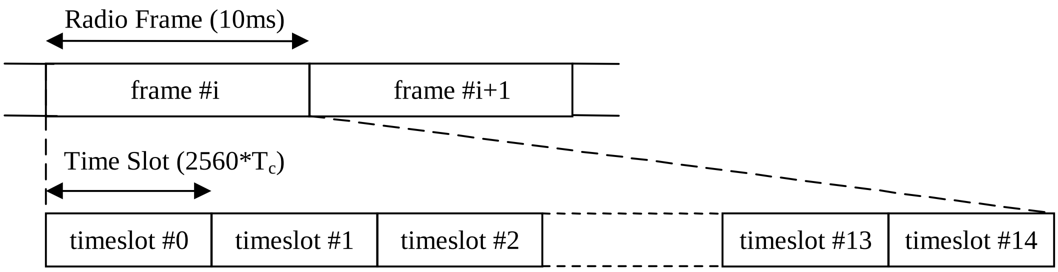


Figure 1: Physical channel signal format

The data part of the burst is spread with a combination of channelisation code and scrambling code. 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.

So a physical channel is defined by frequency, timeslot, channelisation code, burst type and Radio Frame allocation The scrambling code and the basic midamble code are broadcast 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.

5.1 Frame structure

The TDMA frame has a duration of 10 ms and is subdivided into 15 time slots (TS) of 2560*T_c duration each. A time slot corresponds to 2560 chips. The physical content of the time slots are the bursts of corresponding length as described in section 5.2.2.

Each 10 ms frame consists of 15 time slots, each allocated to either the uplink or the downlink (figure 2). With such a flexibility , the TDD mode can be adapted to different environments and deployment scenarios. In any configuration at least one time slot has to be allocated for the downlink and at least one time slot has to be allocated for the uplink.

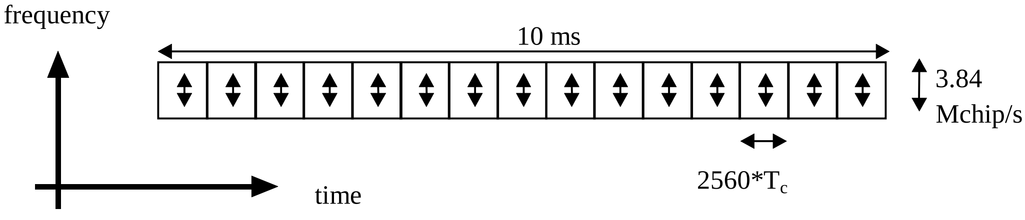


Figure 2: The TDD frame structure

Examples for multiple and single switching point configurations as well as for symmetric and asymmetric UL/DL allocations are given in figure 3.

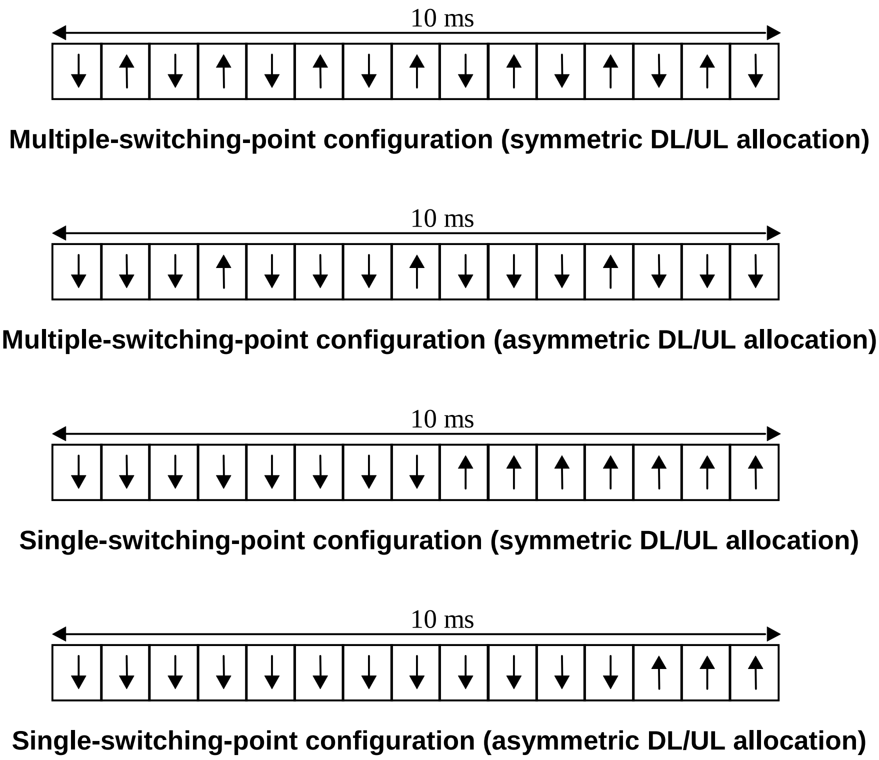
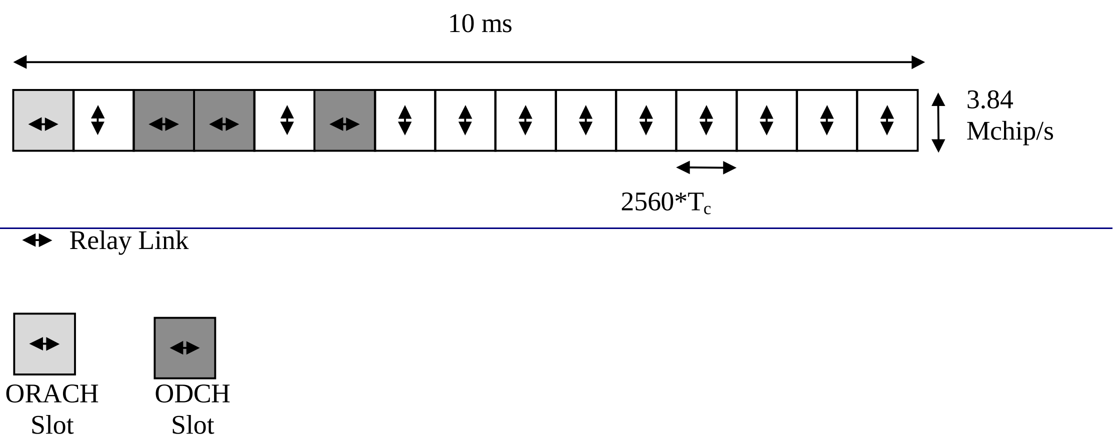


Figure 3: TDD frame structure examples

~~When operating ODMA at least one common timeslot has to be allocated for the ORACH. If large quantities of information have to be transferred between ODMA nodes then it is normal to use at least one timeslot for the ODCH (figure 4). As figure 4 shows, any timeslot in the TDD frame may potentially be used by the ODCH.~~

~~A common timeslot indicates a carrier-timeslot combination which can be used for transmission and reception by a group of mobiles operating ODMA.~~



~~**Figure 4: TDD frame structure example for ODMA operation**~~