3GPP TSG RAN Meeting #17 *RP-020572*
Biarritz, France, 3 – 6, September 2002

Title: **Agreed CRs (R99 and Rel-4/Rel-5 Category A) to TS 25.221 and TS 25.224 on "Corrections to transmit diversity mode for TDD beacon-function physical channels"**

Source: **TSG-RAN WG1**

Agenda item: **7.1.3**

No.	Spec	CR	Rev	R1 T-doc	Subject	Phase	Cat	Workitem	V_old	V_new
1	25.221	095	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	R99	F	TEI	3.10.0	3.11.0
2	25.221	096	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	Rel-4	A	TEI	4.5.0	4.6.0
3	25.221	097	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	Rel-5	A	TEI	5.1.0	5.2.0
4	25.224	092	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	R99	F	TEI	3.10.0	3.11.0
5	25.224	093	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	Rel-4	A	TEI	4.5.0	4.6.0
6	25.224	094	2	R1-02-1135	Corrections to transmit diversity mode for TDD beacon-function physical channels	Rel-5	A	TEI	5.1.0	5.2.0

R1-02-1135

CR-Form-v7

CHANGE REQUEST

⌘ **25.221** CR **095** ⌘ rev **2** ⌘ Current version: **3.10.0** ⌘

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

Title:	⌘	Corrections to Transmit Diversity Mode for TDD Beacon-Function Physical Channels
Source:	⌘	TSG RAN WG1
Work item code:	⌘	TEI
Date:	⌘	12/08/2002
Category:	⌘	**F**
Release:	⌘	R99

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

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

Reason for change:	⌘	A transmit diversity mode exists within the current specifications that is not correctly documented within 25.221, yet moreover results in severe performance degradations in Rician environments. This mode is appplied to physical channels other than P-CCPCH/PICH when mapped to beacon.
Summary of change:	⌘	The existing SCTD scheme for P-CCPCH/PICH when mapped to beacon is used for all beacon-function physical channels if transmit diversity is active. The applicability of SCTD to PICH when not beacon is removed.
Consequences if not approved:	⌘	TDD cannot function correctly in Rician environments if transmit diversity is used and non PCCPCH/PICH channels (eg: S-CCPCH) are mapped to beacon.

Clauses affected:	⌘	5.3.1.3, 5.4, 5.5.2, 5.7, annex B.4, annex B.5

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	25.224
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

5.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in ~~subclause~~ subclause 5.2.3 are used for the P-CCPCH. ~~For those timeslots in which the P-CCPCH is transmitted, the midambles $m^{(1)}$ and $m^{(2)}$ are reserved for P-CCPCH in order to support Space Code Transmit Diversity (SCTD) and the beacon function, see 5.4 and 5.5. The use of midambles depends on whether SCTD is applied to the P-CCPCH:~~

- ~~If no antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used and $m^{(2)}$ is left unused. The maximum number K_{Cell} of midambles in a cell may be 4, 8 or 16.~~

- ~~If SCTD antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna. The maximum number K_{Cell} of midambles in a cell may be 8 or 16. The case of 4 midambles is not allowed for SCTD.~~

5.4 Transmit Diversity for DL Physical Channels

Table 8 summarizes the different transmit diversity schemes for different downlink physical channel types that are described in [9].

Table 8: Application of Tx diversity schemes on downlink physical channel types "X" – can be applied, "–" – must not be applied

Physical channel type	Open loop TxDiversity		Closed loop TxDiversity
	TSTD	SCTD(*)	
P-CCPCH	–	X	–
S-CCPCH	--	X	--
SCH	X	–	–
DPCH	–	--	X
PDSCH	–	--X	X
PICH	–	X	–

(*) Note: SCTD may only be applied to physical channels when they are allocated to beacon locations.

5.5 Beacon characteristics of physical channels

For the purpose of measurements, common physical channels that are allocated to ~~at~~ particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The locations of the beacon channels are called beacon locations. The ensemble of beacon channels shall provide the beacon function, i.e. a reference power level at the beacon locations, regularly existing in each radio frame. Thus, beacon channels must be present in each radio frame.

5.5.2 Physical characteristics of beacon channels

The beacon channels shall have the following physical characteristics. They:

- 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.

Note that in the time slot where the P-CCPCH is transmitted only the midambles $m^{(1)}$ to $m^{(8)}$ shall be used, see 5.6.1. Thus, midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot.

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

- If ~~no~~ SCTD antenna diversity is not applied to ~~the P-CCPCH and PICH~~beacon channels all the reference power of any beacon channel is allocated to $m^{(1)}$.
- If SCTD antenna diversity is applied to ~~the P-CCPCH and PICH~~beacon channels, for any beacon channel 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. SCTD is applied to the P-CCPCH and PICH, see [9]; for all other beacon channels identical spread data sequences are transmitted on both antennas.~~

5.7 Midamble Transmit Power

There shall be no offset between the sum of the powers allocated to all midambles in a timeslot and the sum of the powers allocated to the data symbol fields. The transmit power within a timeslot is hence constant.

The midamble transmit power of beacon channels is equal to the reference power. If SCTD is used for beacon channels~~the P-CCPCH~~, the reference power is equally divided between the midambles $m^{(1)}$ and $m^{(2)}$.

The midamble transmit power of all other physical channels depends on the midamble allocation scheme used. The following rules apply

- In case of Default Midamble Allocation, every midamble is transmitted with the same power as the associated codes.
- In case of Common Midamble Allocation in the downlink, the transmit power of this common midamble is such that there is no power offset between the data parts and the midamble part of the overall transmit signal within one time slot.
- In case of UE Specific Midamble Allocation, the transmit power of the UE specific midamble is such that there is no power offset between the data parts and the midamble part of every user within one time slot.

The following figure depicts the midamble powers for the different channel types and midamble allocation schemes.

Note 1: In figure 18, the codes c(1) to c(16) represent the set of usable codes and not the set of used codes.

Note 2: The common midamble allocation and the midamble allocation by higher layers are not applicable in those beacon time slots, in which the P-CCPCH is located, see section 5.6.1.

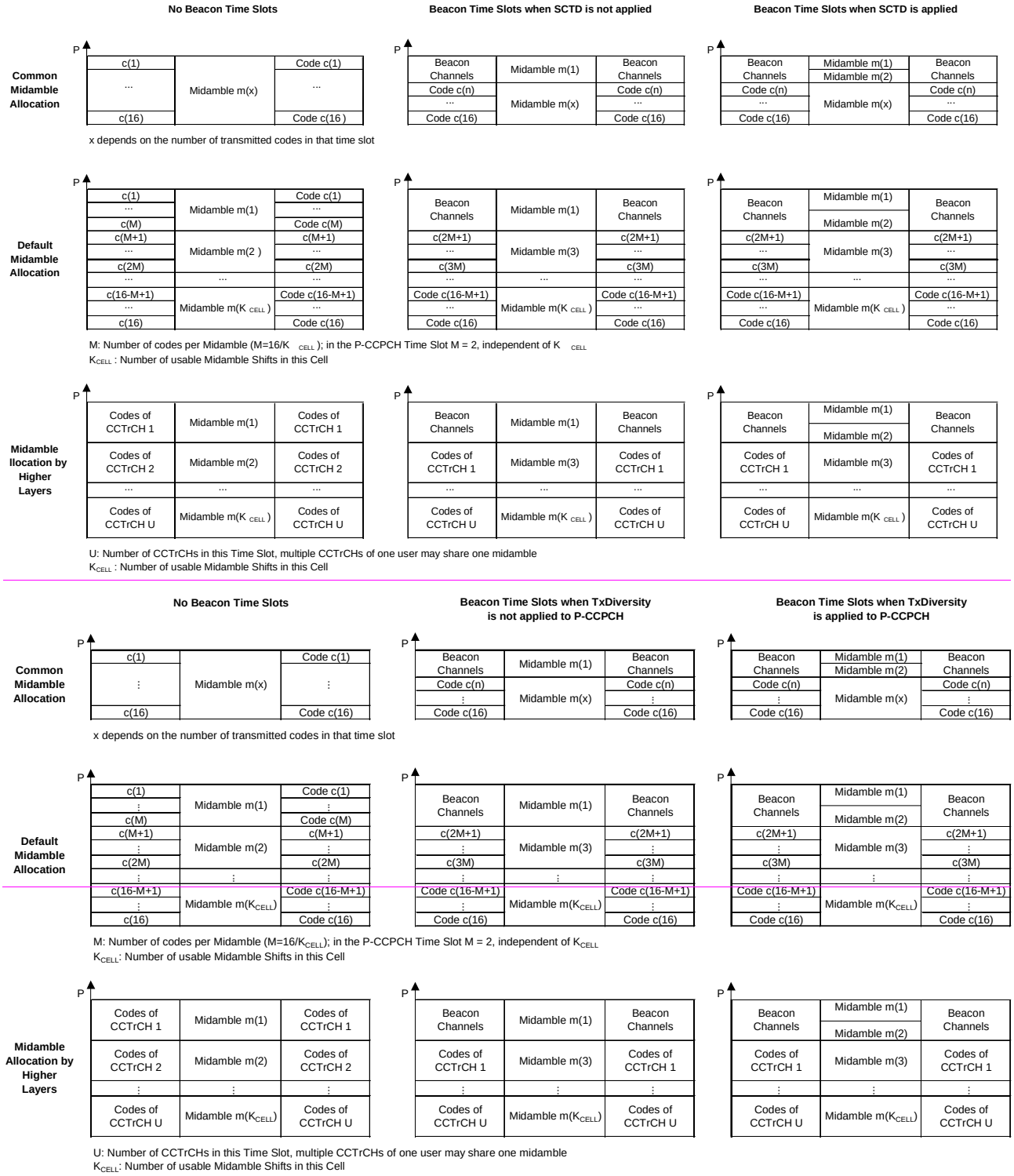

Figure 18: Midamble powers for the different midamble allocation schemes

B.4 Mapping scheme for beacon timeslots and K_{Cell} =16 Midambles.

m1	m2	m3	M4	m5	m6	m7	M8	m9	m10	m11	M12	M13	m14	m15	m16	
1	x[(*)]0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD applied to PICH beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	13 codes
1	x[(*)]0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD not applied to PICH beacon in this time slot) or 14 codes
1	x(*)	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	3 codes or 15 codes
1	x(*)	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	4 codes or 16 codes
1	x(*)	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	5 codes
1	x(*)	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	6 codes
1	x(*)	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	7 codes
1	x(*)	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	8 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	9 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	10 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	11 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	12 codes

(*) For the case of SCTD applied to P-CCPCH and PICHbeacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

Note 2: If SCTD is applied to beaconthe PICH and only two codes are present in a beacon time slot, the PICH is the beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midambles shall be used.

B.5 Mapping scheme for beacon timeslots and K_{Cell} =8 Midambles.

m1	m2	m3	m4	m5	m6	m7	M8	
1	x[(*)]0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	2 codes (SCTD applied to PICH beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	7 or 13 codes
1	x[(*)]0	0	**1**	0	0	0	0	2 (SCTD not applied to PICH beacon in this time slot) or 8 or 14 codes
1	x(*)	0	0	**1**	0	0	0	3 or 9 or 15 codes
1	x(*)	0	0	0	**1**	0	0	4 or 10 or 16 codes
1	x(*)	0	0	0	0	**1**	0	5 codes or 11 codes
1	x(*)	0	0	0	0	0	**1**	6 codes or 12 codes

(*) For the case of SCTD applied to P-CCPCH and PICHbeacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

Note 2: If SCTD is applied to beaconthe PICH and only two codes are present in a beacon time slot, the PICH is the beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midambles shall be used.

R1-02-1135

CR-Form-v7

CHANGE REQUEST

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Work item code:	⌘	TEI
Date:	⌘	12/08/2002
Category:	⌘	**A**
Release:	⌘	Rel-4

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Other comments:	⌘	

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5.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in ~~subclause~~ subclause 5.2.3 are used for the P-CCPCH. ~~For those timeslots in which the P-CCPCH is transmitted, the midambles $m^{(1)}$ and $m^{(2)}$ are reserved for P-CCPCH in order to support Space Code Transmit Diversity (SCTD) and the beacon function, see 5.4 and 5.5. The use of midambles depends on whether SCTD is applied to the P-CCPCH:~~

- ~~If no antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used and $m^{(2)}$ is left unused. The maximum number K_{Cell} of midambles in a cell may be 4, 8 or 16.~~

- ~~If SCTD antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna. The maximum number K_{Cell} of midambles in a cell may be 8 or 16. The case of 4 midambles is not allowed for SCTD.~~

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S-CCPCH	--	X	--
SCH	X	–	–
DPCH	–	--	X
PDSCH	–	--X	X
PICH	–	X	–

(*) Note: SCTD may only be applied to physical channels when they are allocated to beacon locations.

5.5 Beacon characteristics of physical channels

For the purpose of measurements, common physical channels that are allocated to ~~at~~ particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The locations of the beacon channels are called beacon locations. The ensemble of beacon channels shall provide the beacon function, i.e. a reference power level at the beacon locations, regularly existing in each radio frame. Thus, beacon channels must be present in each radio frame.

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The beacon channels shall have the following physical characteristics. They:

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- 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.

Note that in the time slot where the P-CCPCH is transmitted only the midambles $m^{(1)}$ to $m^{(8)}$ shall be used, see 5.6.1. Thus, midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot.

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

- If ~~no~~ SCTD antenna diversity is not applied to ~~the P-CCPCH and PICH~~beacon channels all the reference power of any beacon channel is allocated to $m^{(1)}$.
- If SCTD antenna diversity is applied to ~~the P-CCPCH and PICH~~beacon channels, for any beacon channel 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. SCTD is applied to the P-CCPCH and PICH, see [9]; for all other beacon channels identical spread data sequences are transmitted on both antennas.~~

5.7 Midamble Transmit Power

There shall be no offset between the sum of the powers allocated to all midambles in a timeslot and the sum of the powers allocated to the data symbol fields. The transmit power within a timeslot is hence constant.

The midamble transmit power of beacon channels is equal to the reference power. If SCTD is used for beacon channels~~the P-CCPCH~~, the reference power is equally divided between the midambles $m^{(1)}$ and $m^{(2)}$.

The midamble transmit power of all other physical channels depends on the midamble allocation scheme used. The following rules apply

- In case of Default Midamble Allocation, every midamble is transmitted with the same power as the associated codes.
- In case of Common Midamble Allocation in the downlink, the transmit power of this common midamble is such that there is no power offset between the data parts and the midamble part of the overall transmit signal within one time slot.
- In case of UE Specific Midamble Allocation, the transmit power of the UE specific midamble is such that there is no power offset between the data parts and the midamble part of every user within one time slot.

The following figure 18 depicts the midamble powers for the different channel types and midamble allocation schemes.

Note 1: In figure 18, the codes c(1) to c(16) represent the set of usable codes and not the set of used codes.

Note 2: The common midamble allocation and the midamble allocation by higher layers are not applicable in those beacon time slots, in which the P-CCPCH is located, see section 5.6.1.

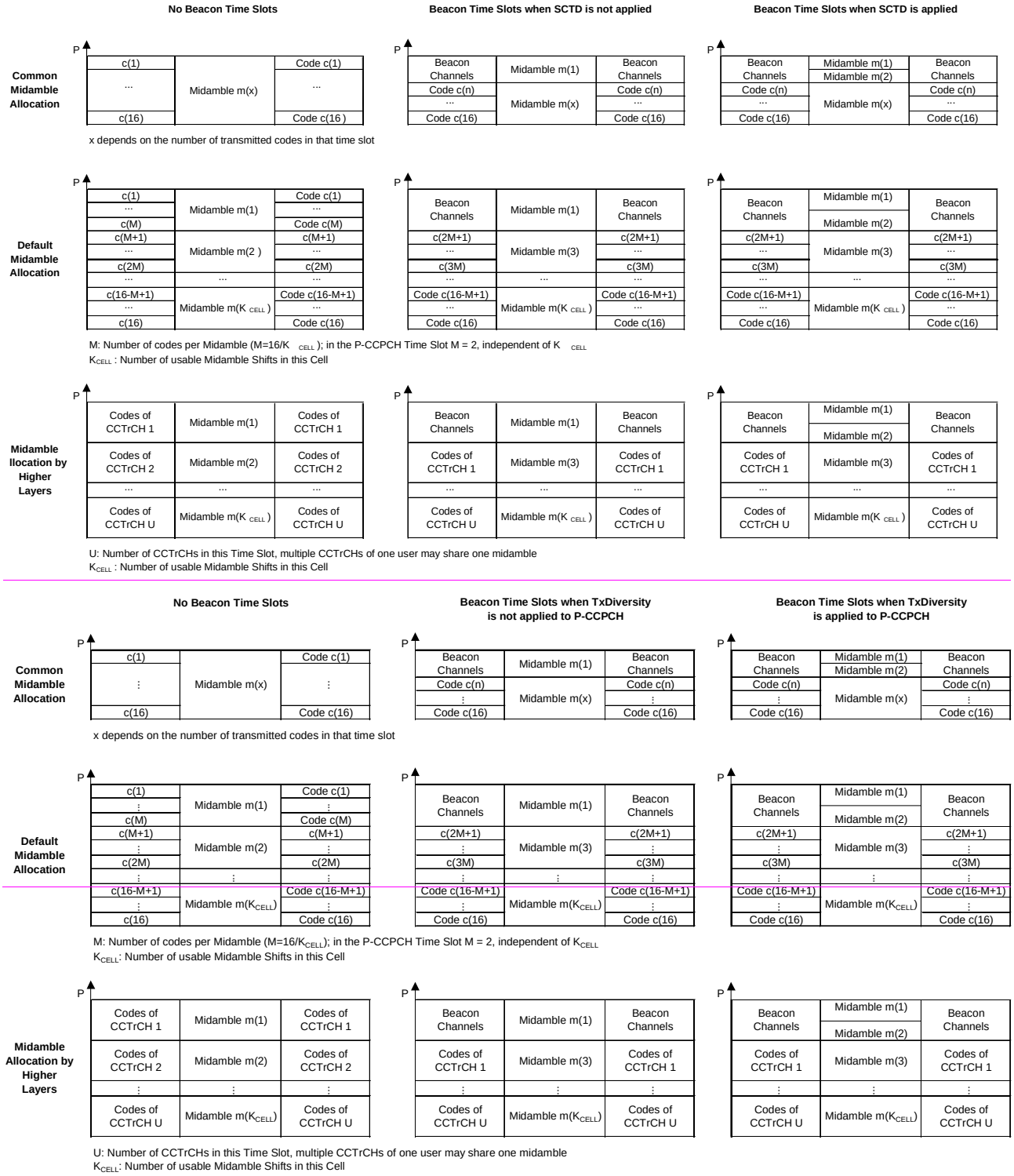

Figure 18: Midamble powers for the different midamble allocation schemes

C.4Mapping scheme for beacon timeslots and K_{Cell} =16 Midambles

m1	m2	m3	M4	m5	m6	m7	M8	m9	m10	m11	M12	M13	m14	m15	m16	
1	x(*)0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD applied to ~~PICH~~ beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	13 codes
1	x(*)0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD not applied to ~~PICH~~ beacon in this time slot) or 14 codes
1	x(*)	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	3 codes or 15 codes
1	x(*)	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	4 codes or 16 codes
1	x(*)	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	5 codes
1	x(*)	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	6 codes
1	x(*)	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	7 codes
1	x(*)	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	8 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	9 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	10 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	11 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	12 codes

(*) For the case of SCTD applied to ~~P-CCPCH and PICH~~beacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

Note 2: If SCTD is applied to ~~the PICH~~beacon and only two codes are present in a beacon time slot, ~~the PICH is the beacon channel and~~ the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midambles shall be used.

C.5Mapping scheme for beacon timeslots and K_{Cell} =8 Midambles

m1	m2	m3	m4	m5	m6	m7	M8	
1	x(*)0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	2 codes (SCTD applied to ~~PICH~~ beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	7 or 13 codes
1	x(*)0	0	**1**	0	0	0	0	2 (SCTD not applied to ~~PICH~~ beacon in this time slot) or 8 or 14 codes
1	x(*)	0	0	**1**	0	0	0	3 or 9 or 15 codes
1	x(*)	0	0	0	**1**	0	0	4 or 10 or 16 codes
1	x(*)	0	0	0	0	**1**	0	5 codes or 11 codes
1	x(*)	0	0	0	0	0	**1**	6 codes or 12 codes

(*) For the case of SCTD applied to ~~P-CCPCH and PICH~~beacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

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R1-02-1135

CR-Form-v7

CHANGE REQUEST

⌘ **25.221** CR **097** ⌘ rev **2** ⌘ Current version: **5.1.0** ⌘

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R97	*(Release 1997)*
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R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	A transmit diversity mode exists within the current specifications that is not correctly documented within 25.221, yet moreover results in severe performance degradations in Rician environments. This mode is appplied to physical channels other than P-CCPCH/PICH when mapped to beacon.
Summary of change:	⌘	The existing SCTD scheme for P-CCPCH/PICH when mapped to beacon is used for all beacon-function physical channels if transmit diversity is active. Applicability of SCTD to PICH when not beacon is removed.
Consequences if not approved:	⌘	TDD cannot function correctly in Rician environments if transmit diversity is used and non PCCPCH/PICH channels (eg: S-CCPCH) are mapped to beacon.

Clauses affected:	⌘	5.3.1.3, 5.4, 5.5.2, 5.7, annex C.4, annex C.5

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	25.224
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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

5.3.1.3 P-CCPCH Training sequences

The training sequences, i.e. midambles, as described in ~~subclause~~ subclause 5.2.3 are used for the P-CCPCH. ~~For those timeslots in which the P-CCPCH is transmitted, the midambles $m^{(1)}$ and $m^{(2)}$ are reserved for P-CCPCH in order to support Space Code Transmit Diversity (SCTD) and the beacon function, see 5.4 and 5.5. The use of midambles depends on whether SCTD is applied to the P-CCPCH:~~

- ~~If no antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used and $m^{(2)}$ is left unused. The maximum number K_{Cell} of midambles in a cell may be 4, 8 or 16.~~

- ~~If SCTD antenna diversity is applied to P-CCPCH, $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna. The maximum number K_{Cell} of midambles in a cell may be 8 or 16. The case of 4 midambles is not allowed for SCTD.~~

5.4 Transmit Diversity for DL Physical Channels

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

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

Physical channel type	Open loop TxDiversity		Closed loop TxDiversity
	TSTD	SCTD(*)	
P-CCPCH	–	X	–
S-CCPCH	--	X	--
SCH	X	–	–
DPCH	–	–	X
PDSCH	–	–X	X
PICH	–	X	–
HS-SCCH	-	-X	X
HS-PDSCH	-	-X	X

(*) Note: SCTD may only be applied to physical channels when they are allocated to beacon locations.

5.5 Beacon characteristics of physical channels

For the purpose of measurements, common physical channels that are allocated to ~~at~~ particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The locations of the beacon channels are called beacon locations. The ensemble of beacon channels shall provide the beacon function, i.e. a reference power level at the beacon locations, regularly existing in each radio frame. Thus, beacon channels must be present in each radio frame.

5.5.2 Physical characteristics of beacon channels

The beacon channels shall have the following physical characteristics. They:

- 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.

Note that in the time slot where the P-CCPCH is transmitted only the midambles $m^{(1)}$ to $m^{(8)}$ shall be used, see 5.6.1. Thus, midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot.

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

- If ~~no~~ SCTD antenna diversity is not applied to ~~the P-CCPCH and PICH~~beacon channels all the reference power of any beacon channel is allocated to $m^{(1)}$.
- If SCTD antenna diversity is applied to ~~the P-CCPCH and PICH~~beacon channels, for any beacon channel 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. SCTD is applied to the P-CCPCH and PICH, see [9]; for all other beacon channels identical spread data sequences are transmitted on both antennas.~~

5.7 Midamble Transmit Power

There shall be no offset between the sum of the powers allocated to all midambles in a timeslot and the sum of the powers allocated to the data symbol fields. The transmit power within a timeslot is hence constant.

The midamble transmit power of beacon channels is equal to the reference power. If SCTD is used for beacon channels~~the P-CCPCH~~, the reference power is equally divided between the midambles $m^{(1)}$ and $m^{(2)}$.

The midamble transmit power of all other physical channels depends on the midamble allocation scheme used. The following rules apply

- In case of Default Midamble Allocation, every midamble is transmitted with the same power as the associated codes.
- In case of Common Midamble Allocation in the downlink, the transmit power of this common midamble is such that there is no power offset between the data parts and the midamble part of the overall transmit signal within one time slot.
- In case of UE Specific Midamble Allocation, the transmit power of the UE specific midamble is such that there is no power offset between the data parts and the midamble part of every user within one time slot.

The following figure 18 depicts the midamble powers for the different channel types and midamble allocation schemes.

Note 1: In figure 18, the codes c(1) to c(16) represent the set of usable codes and not the set of used codes.

Note 2: The common midamble allocation and the midamble allocation by higher layers are not applicable in those beacon time slots, in which the P-CCPCH is located, see section 5.6.1.

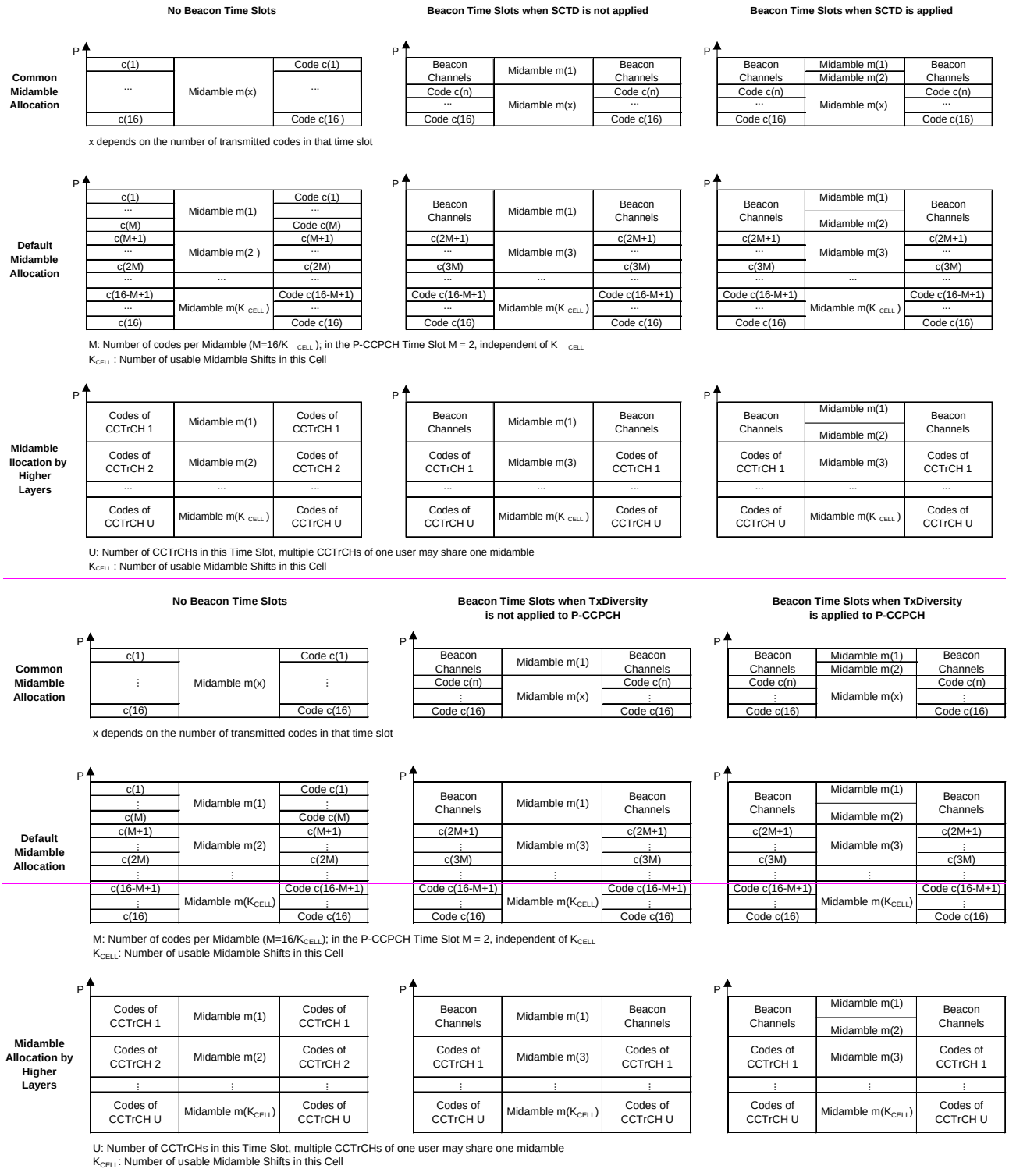

Figure 18: Midamble powers for the different midamble allocation schemes

C.4 Mapping scheme for beacon timeslots and K_{Cell} =16 Midambles

m1	m2	m3	M4	m5	m6	m7	M8	m9	m10	m11	M12	M13	m14	m15	m16	
1	x(*)0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD applied to PICH beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	13 codes
1	x(*)0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	2 codes (SCTD not applied to PICH beacon in this time slot) or 14 codes
1	x(*)	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	3 codes or 15 codes
1	x(*)	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	4 codes or 16 codes
1	x(*)	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	5 codes
1	x(*)	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	6 codes
1	x(*)	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	7 codes
1	x(*)	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	8 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	9 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	10 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	11 codes
1	x(*)	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	12 codes

(*) For the case of SCTD applied to P-CCPCH and PICHbeacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

Note 2: If SCTD is applied to the PICH beacon and only two codes are present in a beacon time slot, the PICH is the beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midambles shall be used.

C.5 Mapping scheme for beacon timeslots and K_{Cell} =8 Midambles

m1	m2	m3	m4	m5	m6	m7	M8	
1	x(*)0	0	0	0	0	0	0	1 code (see note 1)
1	**1**	0	0	0	0	0	0	2 codes (SCTD applied to PICH beacon in this time slot, see note 2)
1	x(*)	**1**	0	0	0	0	0	7 or 13 codes
1	x(*)0	0	**1**	0	0	0	0	2 (SCTD not applied to PICH beacon in this time slot) or 8 or 14 codes
1	x(*)	0	0	**1**	0	0	0	3 or 9 or 15 codes
1	x(*)	0	0	0	**1**	0	0	4 or 10 or 16 codes
1	x(*)	0	0	0	0	**1**	0	5 codes or 11 codes
1	x(*)	0	0	0	0	0	**1**	6 codes or 12 codes

(*) For the case of SCTD applied to P-CCPCH and PICHbeacon, midamble shift 2 is used by the diversity antenna.

Note 1: If only one code is present in a beacon time slot, this code is a beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midamble(s) shall be used.

Note 2: If SCTD is applied to the PICHbeacon and only two codes are present in a beacon time slot, the PICH is the beacon channel and the beacon channel is the only channel in this slot, by default. Therefore, only the beacon midambles shall be used.

R1-02-1135

CR-Form-v7

CHANGE REQUEST

⌘ **25.224** CR **092** ⌘ rev **2** ⌘ Current version: **3.10.0** ⌘

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

Title:	⌘	Corrections to Transmit Diversity Mode for TDD Beacon-Function Physical Channels
Source:	⌘	TSG RAN WG1
Work item code:	⌘	TEI
Date:	⌘	12/08/2002
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
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B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	A transmit diversity mode exists within the current specifications that is not correctly documented within 25.221, yet moreover results in severe performance degradations in Rician environments. This mode is appplied to physical channels other than P-CCPCH/PICH when mapped to beacon.
Summary of change:	⌘	The existing SCTD scheme for P-CCPCH/PICH when mapped to beacon is used for all beacon-function physical channels if transmit diversity is active. Applicability of SCTD to PICH when not beacon is removed.
Consequences if not approved:	⌘	TDD cannot function correctly in Rician environments if transmit diversity is used and non PCCPCH/PICH channels (eg: S-CCPCH) are mapped to beacon.

Clauses affected:	⌘	4.6, 4.6.3, 4.6.3.1, 4.6.3.2

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	25.221
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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

4.6 Downlink Transmit Diversity

Downlink transmit diversity for PDSCH, DPCH, P-CCPCH, S-CCPCH, PICH, and SCH is optional in UTRAN. Its support is mandatory at the UE.

4.6.3 Transmit Diversity for ~~P-CCPCH~~Beacon Channels ~~and PICH~~

Space Code Transmit Diversity (SCTD) for ~~the P-CCPCH and PICH~~beacon channels may be employed optionally in the UTRAN. The support is mandatory in the UE. The use of SCTD ~~for the P-CCPCH and PICH~~ will be indicated by higher layers. If SCTD is active within a cell :-

- SCTD shall be applied to any beacon channel, and
- the maximum number K_{Cell} of midambles for burst type 1 that are supported in this cell may be 8 or 16, see [8]. The case of K_{Cell} = 4 midambles is not allowed for this burst type.

~~If SCTD is applied to the P-CCPCH then it is also applied to the PICH. Otherwise it is not applied to either.~~

4.6.3.1 ~~P-CCPCH~~SCTD Transmission Scheme

The open loop downlink transmit diversity scheme for ~~the P-CCPCH~~beacon channels is shown in figure 4. Channel coding, rate matching, interleaving and bit-to-symbol mapping are performed as in the non-diversity mode. In Space Code Transmit Diversity mode the data sequence is spread with the channelisation codes $c_{16}^{(k=1)}$ and $c_{16}^{(k=2)}$ and scrambled with the cell specific scrambling code. The spread sequence on code $c_{16}^{(k=2)}$ is then transmitted on the diversity antenna. The power applied to each antenna shall be equal.

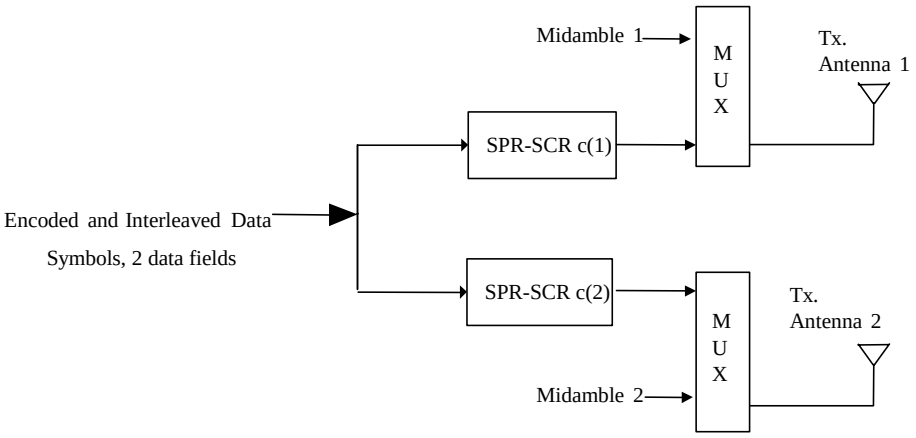

Figure 4: Block Diagram of the transmitter SCTD

~~4.6.3.2 PICH Transmission Scheme~~

~~The transmission scheme for the PICH shall be identical to that of the P-CCPCH, but the channelisation code and midamble assignment depends on whether the PICH is a beacon channel:~~

- ~~If the PICH is a beacon channel, then the channelisation codes and midambles are identical to that of the P-CCPCH.~~
- ~~If the PICH is not a beacon channel, then higher layers shall only assign the channelisation code $c_{16}^{(k=m_1)}$ for the first antenna. The midamble $\mathbf{m}^{(k_1)}$ for this antenna shall be the default midamble for this channelisation code, see [8]. The second antenna shall use midamble $\mathbf{m}^{(k_2)}$, where $k_2=k_1+1$ when $k<K_{cell}$, and $k_2=k_1-1$ when $k=K_{cell}$. The channelisation code for the second antenna shall be the code $c_{16}^{(k=m_2)}$, where m_2 is the smallest channelisation code index that is associated with the midamble $\mathbf{m}^{(k_2)}$, according to the default midamble allocation scheme.~~

R1-02-1135

CR-Form-v7

CHANGE REQUEST

⌘ **25.224** CR **093** ⌘ rev **2** ⌘ Current version: **4.5.0** ⌘

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

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

Title:	⌘	Corrections to Transmit Diversity Mode for TDD Beacon-Function Physical Channels
Source:	⌘	TSG RAN WG1
Work item code:	⌘	TEI
Date:	⌘	12/08/2002
Category:	⌘	**A**
Release:	⌘	Rel-4

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B *(addition of feature),*
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2	*(GSM Phase 2)*
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R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	A transmit diversity mode exists within the current specifications that is not correctly documented within 25.221, yet moreover results in severe performance degradations in Rician environments. This mode is appplied to physical channels other than P-CCPCH/PICH when mapped to beacon.
Summary of change:	⌘	The existing SCTD scheme for P-CCPCH/PICH when mapped to beacon is used for all beacon-function physical channels if transmit diversity is active. Applicability of SCTD to PICH when not beacon is removed.
Consequences if not approved:	⌘	TDD cannot function correctly in Rician environments if transmit diversity is used and non PCCPCH/PICH channels (eg: S-CCPCH) are mapped to beacon.

Clauses affected:	⌘	4.6, 4.6.3, 4.6.3.1, 4.6.3.2

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	25.221
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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4.6 Downlink Transmit Diversity

Downlink transmit diversity for PDSCH, DPCH, P-CCPCH, S-CCPCH, PICH and SCH is optional in UTRAN. Its support is mandatory at the UE.

4.6.3 Transmit Diversity for ~~P-CCPCH~~Beacon Channels ~~and PICH~~

Space Code Transmit Diversity (SCTD) for ~~the P-CCPCH and PICH~~beacon channels may be employed optionally in the UTRAN. The support is mandatory in the UE. The use of SCTD ~~for the P-CCPCH and PICH~~ will be indicated by higher layers. If SCTD is active within a cell :-

- SCTD shall be applied to any beacon channel, and
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~~If SCTD is applied to the P-CCPCH then it is also applied to the PICH. Otherwise it is not applied to either.~~

4.6.3.1 ~~P-CCPCH~~SCTD Transmission Scheme

The open loop downlink transmit diversity scheme for ~~the P-CCPCH~~beacon channels is shown in figure 4. Channel coding, rate matching, interleaving and bit-to-symbol mapping are performed as in the non-diversity mode. In Space Code Transmit Diversity mode the data sequence is spread with the channelisation codes $c_{16}^{(k=1)}$ and $c_{16}^{(k=2)}$ and scrambled with the cell specific scrambling code. The spread sequence on code $c_{16}^{(k=2)}$ is then transmitted on the diversity antenna. The power applied to each antenna shall be equal.

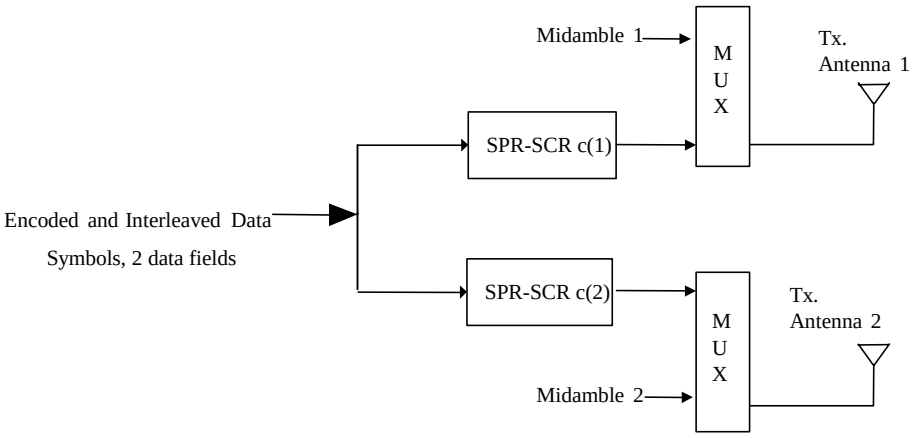

Figure 4: Block Diagram of the transmitter SCTD

~~4.6.3.2 PICH Transmission Scheme~~

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CHANGE REQUEST

⌘ 25.224 CR 094 ⌘rev 2 ⌘ Current version: 5.1.0 ⌘

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

Title:	⌘	Corrections to Transmit Diversity Mode for TDD Beacon-Function Physical Channels
Source:	⌘	TSG RAN WG1
Work item code:	⌘	TEI
Date:	⌘	12/08/2002
Category:	⌘	A
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Clauses affected:	⌘	4.6, 4.6.1, 4.6.3, 4.6.3.1, 4.6.3.2

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	25.221
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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4.6 Downlink Transmit Diversity

Downlink transmit diversity for PDSCH, DPCH, P-CCPCH, S-CCPCH, PICH, HS-SCCH, HS-PDSCH, and SCH is optional in UTRAN. Its support is mandatory at the UE.

4.6.1 Transmit Diversity for PDSCH ~~and~~, DPCH, HS-SCCH and HS-PDSCH

The transmitter structure to support transmit diversity for PDSCH, DPCH, HS-SCCH, and HS-PDSCH transmission is shown in figure 1. Channel coding, interleaving and spreading are done as in non-diversity mode. The spread complex valued signal is fed to both TX antenna branches, and weighted with antenna specific weight factors w_1 and w_2. The weight factors are complex valued signals (i.e., $w_i = a_i + jb_i$), in general. These weight factors are calculated on a per slot and per user basis.

The weight factors are determined by the UTRAN. Examples of transmit diversity schemes are given in annex B.

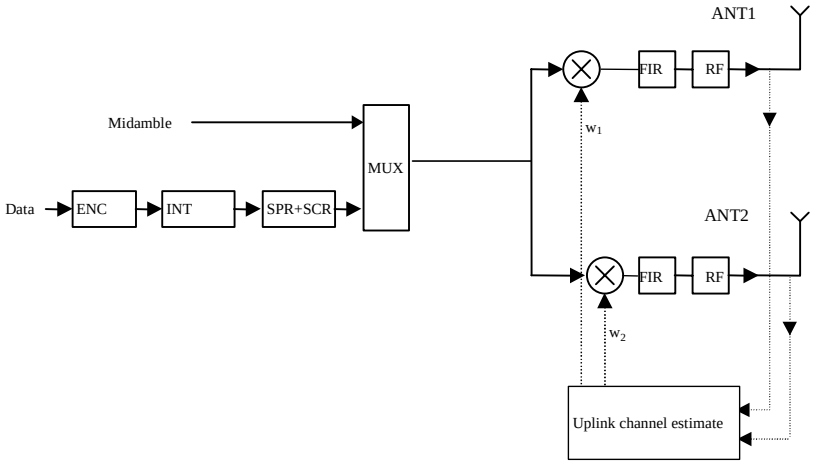

Figure 1: Downlink transmitter structure to support Transmit Diversity for PDSCH, DPCH, HS-SCCH, and HS-PDSCH transmission (UTRAN Access Point)

4.6.3 Transmit Diversity for ~~P-CCPCH~~Beacon Channels ~~and PICH~~

Space Code Transmit Diversity (SCTD) for ~~the P-CCPCH and PICH~~beacon channels may be employed optionally in the UTRAN. The support is mandatory in the UE. The use of SCTD ~~for the P-CCPCH and PICH~~ will be indicated by higher layers. If SCTD is active within a cell :-

- SCTD shall be applied to any beacon channel, and
- the maximum number K_{Cell} of midambles for burst type 1 that are supported in this cell may be 8 or 16, see [8]. The case of K_{Cell} = 4 midambles is not allowed for this burst type.

~~If SCTD is applied to the P-CCPCH then it is also applied to the PICH. Otherwise it is not applied to either.~~

4.6.3.1 ~~P-CCPCH~~SCTD Transmission Scheme

The open loop downlink transmit diversity scheme for ~~the P-CCPCH~~beacon channels is shown in figure 4. Channel coding, rate matching, interleaving and bit-to-symbol mapping are performed as in the non-diversity mode. In Space Code Transmit Diversity mode the data sequence is spread with the channelisation codes $c_{16}^{(k=1)}$ and $c_{16}^{(k=2)}$ and scrambled with the cell specific scrambling code. The spread sequence on code $c_{16}^{(k=2)}$ is then transmitted on the diversity antenna. The power applied to each antenna shall be equal.

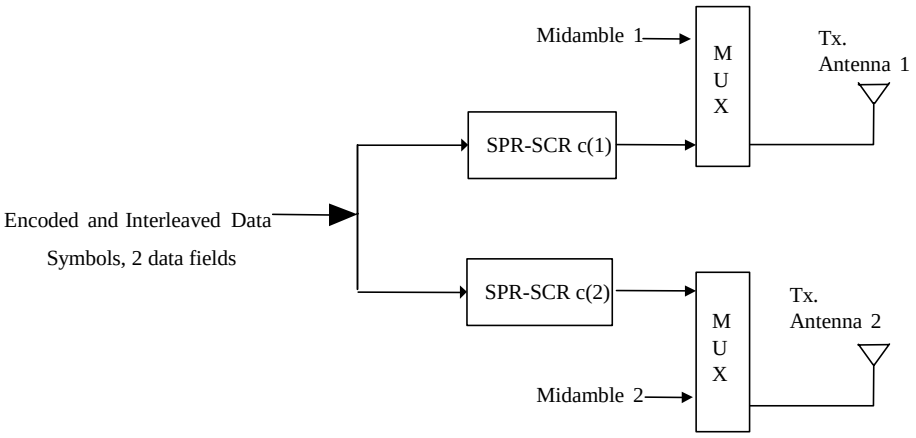

Figure 4: Block Diagram of the transmitter SCTD

~~4.6.3.2 PICH Transmission Scheme~~

~~The transmission scheme for the PICH shall be identical to that of the P-CCPCH, but the channelisation code and midamble assignment depends on whether the PICH is a beacon channel:~~

- ~~If the PICH is a beacon channel, then the channelisation codes and midambles are identical to that of the P-CCPCH.~~
- ~~If the PICH is not a beacon channel, then higher layers shall only assign the channelisation code $c_{16}^{(k=m_1)}$ for the first antenna. The midamble $\mathbf{m}^{(k_1)}$ for this antenna shall be the default midamble for this channelisation code, see [8]. The second antenna shall use midamble $\mathbf{m}^{(k_2)}$, where $k_2=k_1+1$ when $k<K_{cell}$, and $k_2=k_1-1$ when $k=K_{cell}$. The channelisation code for the second antenna shall be the code $c_{16}^{(k=m_2)}$, where m_2 is the smallest channelisation code index that is associated with the midamble $\mathbf{m}^{(k_2)}$, according to the default midamble allocation scheme.~~