3GPP TSG-RAN Meeting #16 *RP-020314*
Marco Island, FL, U.S.A., 4 – 7, June, 2002

Title: **Agreed CRs (Rel-4 and Rel-5 Category A) to TS 25.222**

Source: **TSG-RAN WG1**

Agenda item: **7.1.4**

No.	Spec	CR	Rev	R1 T-doc	Subject	Phase	Cat	Work Item	V_old	V_new
1	25.222	072	-	R1-02-0396	Correction to addition of padding zeros to PICH in 1.28 Mcps TDD	Rel-4	F	LCRTDD-Phys	4.3.0	4.4.0
2	25.222	073	-	R1-02-0396	Correction to addition of padding zeros to PICH in 1.28 Mcps TDD	Rel-5	A	LCRTDD-Phys	5.0.0	5.1.0
3	25.222	085	-	R1-02-0734	Zero padding for TFCI (1.28Mcps TDD)	Rel-4	F	LCRTDD-Phys	4.3.0	4.4.0
4	25.222	086	-	R1-02-0734	Zero padding for TFCI (1.28Mcps TDD)	Rel-5	A	LCRTDD-Phys	5.0.0	5.1.0

 R1-02-0396

CR-Form-v5

CHANGE REQUEST

z	**25.222 CR 072**	z	rev **-**	z	Current version: **4.3.0**	z

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Proposed change affects: z (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

Title:	z Correction to addition of padding zeros to PICH in 1.28 Mcps TDD		
Source:	z TSG RAN WG1		
Work item code:	z LCRTDD-Phys	***Date:***	z April 2nd 2002
Category:	z **F**	***Release:***	z REL-4
	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)*

Reason for change: z	When the number of bits available to a PICH in a radio frame is greater than the number of actual PICH bits used for paging indicators, then padding zeros are added. However the function for the addition of the padding zeros is incorrectly specified for 1.28 Mcps TDD. This Error has been corrected alrady at WG1#24 for 3.84 Mcps TDD.
Summary of change: z	The function for the addition of padding zeros to form the function h_k is modified so that the last bit of the paging indicators is not over-written by a zero. **Isolated Impact Analysis:** This CR makes an isolated impact which corrects an erroneous function
Consequences if not approved: z	The last bit of the paging indicators will always be overwritten by a zero if padding is used. This clearly will reduce the performance for this paging indicator.

Clauses affected: z	4.4.3	
Other specs affected: z	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	z
Other comments: z		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

4.4.3 Coding and Bit Scrambling of the Paging Indicator

The paging indicator P_q, $q = 0, ..., N_{PI}-1$, $P_q \in \{0, 1\}$ is an identifier to instruct the UE whether there is a paging message for the groups of mobiles that are associated to the PI, calculated by higher layers, and the associated paging indicator P_q. The length L_{PI} of the paging indicator is $L_{PI}=2$, $L_{PI}=4$ or $L_{PI}=8$ symbols. $N_{PIB} = 2*N_{PI}*L_{PI}$ bits are used for the paging indicator transmission in one radio frame. The mapping of the paging indicators to the bits e_i, $i = 1, ..., N_{PIB}$ is shown in table 14.

Table 14: Mapping of the paging indicator

P_q	Bits $\{e_{2L_{PI}*q+1}, e_{2L_{PI}*q+2}, ... ,e_{2L_{PI}*(q+1)}\}$	Meaning
0	{0, 0, ..., 0}	There is no necessity to receive the PCH
1	{1, 1, ..., 1}	There is the necessity to receive the PCH

If the number S of bits in one radio frame available for the PICH is bigger than the number N_{PIB} of bits used for the transmission of paging indicators, the sequence $e = \{e_1, e_2, ..., e_{NPIB}\}$ is extended by S-N_{PIB} bits that are set to zero, resulting in a sequence $h = \{h_1, h_2, ..., h_S\}$:

$$h_k = e_k, \quad k = 1, ..., N_{PIB}$$
$$h_k = 0, \quad k = N_{PIB}, ..., S$$

$$h_k = e_k, \quad k = 1, ..., N_{PIB}$$
$$h_k = 0, \quad k = N_{PIB} + 1, ..., S$$

The bits h_k , $k = 1, ..., S$ on the PICH then undergo bit scrambling as defined in section 4.2.9.

The bits s_k, $k = 1, ..., S$ output from the bit scrambler are then transmitted over the air as shown in [7].

3GPP TSG RAN Meeting #16
Marco Island, FL, U.S.A., 4 – 7, June 2002

R1-02-0396

CR-Form-v5

CHANGE REQUEST

z	**25.222**	**CR**	**073**	z rev	**-**	z Current version:	**5.0.0**	z

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Source:	z	TSG RAN WG1
Work item code:	z	LCRTDD-Phys
Date:	z	April 2nd 2002
Category:	z	**A**
Release:	z	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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The bits h_k , k = 1, ..., S on the PICH then undergo bit scrambling as defined in section 4.2.9.

The bits s_k, k = 1, ..., S output from the bit scrambler are then transmitted over the air as shown in [7].

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R1-02-0734

CR-Form-v5

CHANGE REQUEST

z	**25.222**	**CR**	**085**	z **rev**	**-**	z Current version:	**4.3.0** z

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Proposed change affects: z (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

Title:	z	Zero padding for TFCI (1.28Mcps TDD)		
Source:	z	TSG RAN WG1		
Work item code:	z	LCRTDD-Phys	***Date:*** z	May 9, 2002
Category:	z	**F** *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.	***Release:*** z	REL-4 *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)*

Reason for change:	z	The coding method for TFCI in case that TFCI bit number is less than 10bits or 5bits is not clearly written.
Summary of change:	z	In case of coding for long TFCI length, if the TFCI consist of less than 10 bits, it is padded with zeros to 10 bits, by setting the most significant bits to zero. In case of coding for short TFCI using bi-orthogonal codes, if the TFCI consist of less than 5 bits, it is padded with zeros to 5 bits, by setting the most significant bits to zero.
Consequences if not approved:	z	Ambiguous information in the specification.

Clauses affected:	z	4.4.2.1, 4.4.2.2.2	
Other specs affected:	z	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	z
Other comments:	z	Isolated impact analysis: the wording is added to avoid the misleading interpretation of the information.	

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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.

4.4 Coding for layer 1 control for the 1.28 Mcps option

4.4.1 Coding of transport format combination indicator (TFCI) for QPSK

The coding of TFCI for 1.28Mcps TDD is same as that of 3.84Mcps TDD.cf.[4.3.1 'Coding of transport format combination indicator'].

4.4.1.1 Mapping of TFCI code word

Denote the number of bits in the TFCI code word by $N_{TFCI\ code\ word}$, and denote the TFCI code word bits by b_k, where k = 0, …, $N_{TFCI\ code\ word}$ -1

When the number of bits in the TFCI code word is 8, 16, 32, the mapping of the TFCI code word to the TFCI bit positions shall be as follows:

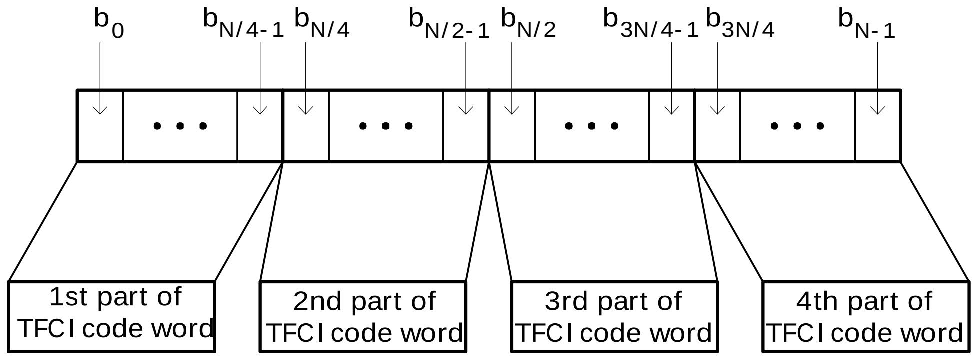

Figure 10: Mapping of TFCI code word bits to TFCI position in 1.28 Mcps TDD option, where N = $N_{TFCI\ code\ word}$.

When the number of bits of the TFCI code word is 4 , then the TFCI code word is equally divided into two parts for the consecutive two subframe and mapped onto the end of the first data field in each of the consecutive subframes.The mapping for $N_{TFCI\ code\ word}$ =4 is shown in figure 11:

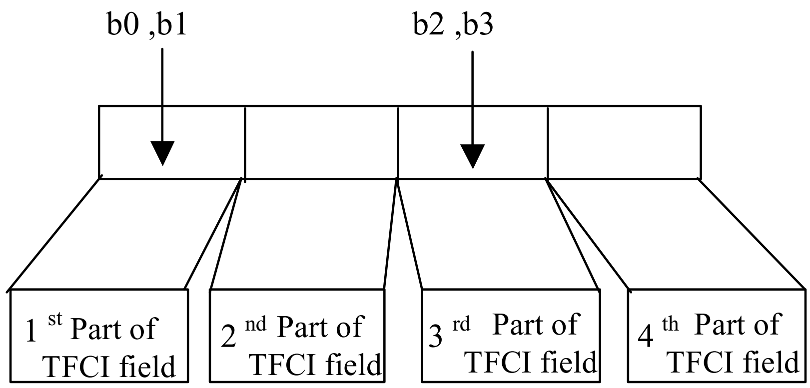

Figure 11: Mapping of TFCI code word bits to TFCI position in 1.28 Mcps TDD option, when $N_{TFCI\ code\ word.}$=4

The location of the 1st to 4th parts of the TFCI code word in the timeslot is defined in [7].

If the shortest transmission time interval of any constituent TrCH is at least 20 ms, then successive TFCI code words in the frames within the TTI shall be identical. If a TFCI is transmitted on multiple timeslots in a frame each timeslot shall have the same TFCI code word.

4.4.2 Coding of transport format combination indicator (TFCI) for 8PSK

Encoding of TFCI bits depends on the number of them and the modulation in use. When 2 Mcps service is transmitted, 8PSK modulation is applied in 1.28 Mcps TDD option. The encoding scheme for TFCI when the number of bits are 6 – 10, and less than 6 bits is described in section 4.4.2.1 and 4.4.2.2, respectively.

4.4.2.1 Coding of long TFCI lengths

When the number of TFCI bits is 6 – 10, the TFCI bits are encoded by using a (64,10) sub-code of the second order Reed-Muller code, then 16 bits out of 64 bits are punctured (Puncturing positions are 0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61st bits). The coding procedure is shown in Figure 12.

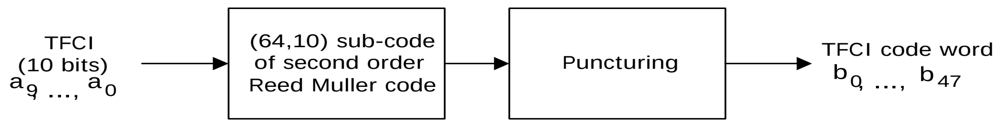

Figure 12: Channel coding of long TFCI bits for 8PSK

If the TFCI consists of less than 10 bits, it is padded with zeros to 10 bits, by setting the most significant bits to zero.
The code words of the punctured (48,10) sub-code of the second order Reed-Muller codes are linear combination of 10 basis sequences. The basis sequences are shown in Table 12.

Table 12: Basis sequences for (48,10) TFCI code

I	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{I,4}$	$M_{i,5}$	$M_{i,6}$	$M_{I,7}$	$M_{I,8}$	$M_{i,9}$
0	1	0	0	0	0	0	1	0	1	0
1	0	1	0	0	0	0	1	1	0	0
2	1	1	0	0	0	0	1	1	0	1
3	1	0	1	0	0	0	1	1	1	0
4	0	1	1	0	0	0	1	0	1	0
5	1	1	1	0	0	0	1	1	1	0
6	1	0	0	1	0	0	1	1	1	1
7	0	1	0	1	0	0	1	1	0	1
8	1	1	0	1	0	0	1	0	1	0
9	0	0	1	1	0	0	1	1	0	0
10	0	1	1	1	0	0	1	1	0	1
11	1	1	1	1	0	0	1	1	1	1
12	1	0	0	0	1	0	1	0	1	1
13	0	1	0	0	1	0	1	1	1	0
14	1	1	0	0	1	0	1	0	0	1
15	1	0	1	0	1	0	1	0	1	1
16	0	1	1	0	1	0	1	1	0	0
17	1	1	1	0	1	0	1	1	1	0
18	0	0	0	1	1	0	1	0	0	1
19	1	0	0	1	1	0	1	0	1	1
20	0	1	0	1	1	0	1	0	1	0
21	0	0	1	1	1	0	1	0	1	0
22	1	0	1	1	1	0	1	1	0	1
23	0	1	1	1	1	0	1	1	1	0
24	0	0	0	0	0	1	1	1	0	1
25	1	0	0	0	0	1	1	1	1	0
26	1	1	0	0	0	1	1	1	1	1
27	0	0	1	0	0	1	1	0	1	1
28	1	0	1	0	0	1	1	1	0	1
29	1	1	1	0	0	1	1	0	1	1
30	0	0	0	1	0	1	1	0	0	1
31	0	1	0	1	0	1	1	0	0	1
32	1	1	0	1	0	1	1	1	1	1
33	1	0	1	1	0	1	1	0	0	1
34	0	1	1	1	0	1	1	1	1	0
35	1	1	1	1	0	1	1	1	0	1
36	0	0	0	0	1	1	1	1	1	0
37	1	0	0	0	1	1	1	0	1	1
38	1	1	0	0	1	1	1	1	1	1
39	0	0	1	0	1	1	1	1	0	0
40	1	0	1	0	1	1	1	1	0	0
41	1	1	1	0	1	1	1	1	1	1
42	0	0	0	1	1	1	1	1	1	1
43	0	1	0	1	1	1	1	0	1	0
44	1	1	0	1	1	1	1	0	1	0
45	0	0	1	1	1	1	1	0	1	1
46	0	1	1	1	1	1	1	0	0	1
47	1	1	1	1	1	1	1	1	0	0

Let's define the TFCI bits as a_0 , a_1 , a_2 , a_3 , a_4 , a_5 , a_6 , a_7 , a_8 , a_9, where a_0 is the LSB and a_9 is the MSB. The TFCI bits shall correspond to the TFC index (expressed in unsigned binary form) defined by the RRC layer to reference the TFC of the CCTrCH in the associated DPCH radio frame.

The output TFCI code word bits b_i are given by:

$$b_i = \sum_{n=0}^{9} (a_n \times M_{i,n}) \bmod 2$$

where i=0…47. $N_{TFCI\ code\ word}$ =48.

4.4.2.2 Coding of short TFCI lengths

4.4.2.2.1 Coding very short TFCIs by repetition

When the number of TFCI bits is 1 or 2, then repetition will be used for the coding. In this case, each bit is repeated to a total of 6 times giving 6-bit transmission ($N_{TFCI\ code\ word}$ = 6) for a single TFCI bit and 12-bit transmission ($N_{TFCI\ code\ word}$ = 12) for 2 TFCI bits. For a single TFCI bit b_0, the TFCI code word shall be $\{b_0, b_0, b_0, b_0, b_0, b_0\}$. For two TFCI bits b_0 and b_1, the TFCI code word shall be $\{b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1\}$.

4.4.2.2.2 Coding short TFCIs using bi-orthogonal codes

If the number of TFCI bits is in the range of 3 to 5, the TFCI bits are encoded using a (32,5) first order Reed-Muller code, then 8 bits out of 32 bits are punctured (Puncturing positions are 0, 1, 2, 3, 4, 5, 6, 7th bits). The coding procedure is shown in Figure 13.

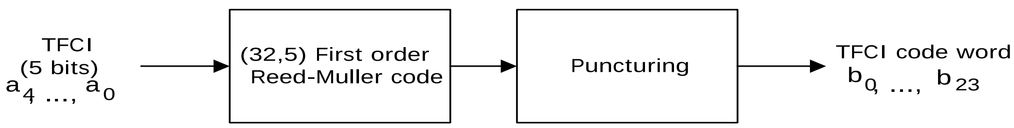

Figure 13: Channel coding of short TFCI bits for 8PSK

If the TFCI consists of less than 5 bits, it is padded with zeros to 5 bits, by setting the most significant bits to zero. The code words of the punctured (32,5) first order Reed-Muller codes are linear combination of 5 basis sequences shown in Table 13.

Table 13: Basis sequences for (24,5) TFCI code

I	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{i,4}$
0	0	0	0	1	0
1	1	0	0	1	0
2	0	1	0	1	0
3	1	1	0	1	0
4	0	0	1	1	0
5	1	0	1	1	0
6	0	1	1	1	0
7	1	1	1	1	0
8	0	0	0	0	1
9	1	0	0	0	1
10	0	1	0	0	1
11	1	1	0	0	1
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23	1	1	1	1	1

Let's define the TFCI bits as a_0 , a_1 , a_2 , a_3 , a_4, where a_0 is the LSB and a_4 is the MSB. The TFCI bits shall correspond to the TFC index (expressed in unsigned binary form) defined by the RRC layer to reference the TFC of the CCTrCH in the associated DPCH radio frame.

The output code word bits b_i are given by:

$$b_i = \sum_{n=0}^{4} (a_n \times M_{i,n}) \bmod 2$$

where i=0…23. $N_{\text{TFCI code word}}$ =24.

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R1-02-0734

CR-Form-v5

CHANGE REQUEST

z	**25.222**	**CR**	**086**	z **rev**	**-**	z	Current version:	**5.0.0** z

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Proposed change affects: z (U)SIM [ ] ME/UE [X] Radio Access Network [X] Core Network [ ]

Title:	z	Zero padding for TFCI (1.28Mcps TDD)		
Source:	z	TSG RAN WG1		
Work item code:	z	LCRTDD-Phys	***Date:*** z	May 9, 2002
Category:	z	**A**	***Release:*** z	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)* 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)*

Reason for change:	z	The coding method for TFCI in case that TFCI bit number is less than 10bits or 5bits is not clearly written.
Summary of change:	z	In case of coding for long TFCI length, if the TFCI consist of less than 10 bits, it is padded with zeros to 10 bits, by setting the most significant bits to zero. In case of coding for short TFCI using bi-orthogonal codes, if the TFCI consist of less than 5 bits, it is padded with zeros to 5 bits, by setting the most significant bits to zero.
Consequences if not approved:	z	Ambiguous information in the specification.

Clauses affected:	z	4.4.2.1, 4.4.2.2.2	
Other specs affected:	z	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	z
Other comments:	z	Isolated impact analysis: the wording is added to avoid the misleading interpretation of the information.	

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4.4 Coding for layer 1 control for the 1.28 Mcps option

4.4.1 Coding of transport format combination indicator (TFCI) for QPSK

The coding of TFCI for 1.28Mcps TDD is same as that of 3.84Mcps TDD.cf.[4.3.1 'Coding of transport format combination indicator'].

4.4.1.1 Mapping of TFCI code word

Denote the number of bits in the TFCI code word by $N_{TFCI\ code\ word}$, and denote the TFCI code word bits by b_k, where k = 0, …, $N_{TFCI\ code\ word}$ -1

When the number of bits in the TFCI code word is 8, 16, 32, the mapping of the TFCI code word to the TFCI bit positions shall be as follows:

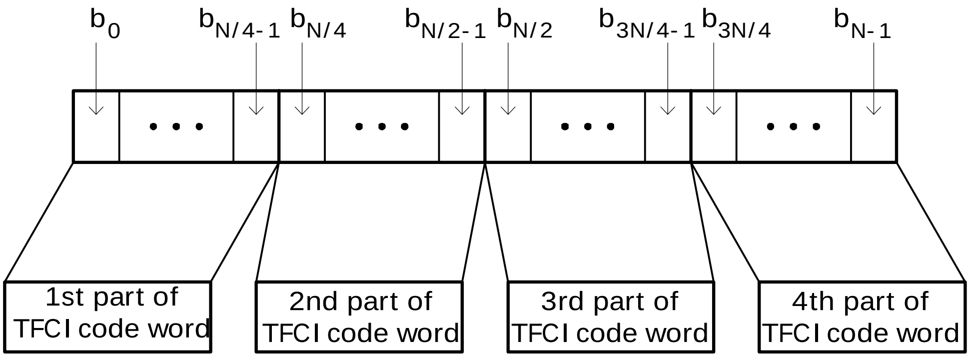

Figure 10: Mapping of TFCI code word bits to TFCI position in 1.28 Mcps TDD option, where N = $N_{TFCI\ code\ word}$.

When the number of bits of the TFCI code word is 4 , then the TFCI code word is equally divided into two parts for the consecutive two subframe and mapped onto the end of the first data field in each of the consecutive subframes.The mapping for $N_{TFCI\ code\ word}$ =4 is shown in figure 11:

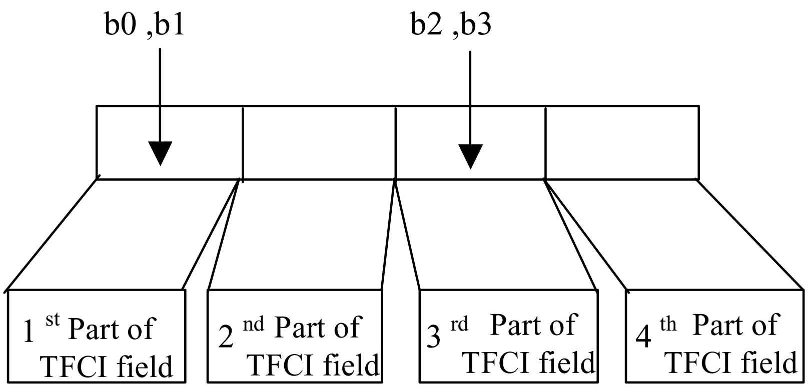

Figure 11: Mapping of TFCI code word bits to TFCI position in 1.28 Mcps TDD option, when $N_{TFCI\ code\ word.}$=4

The location of the 1st to 4th parts of the TFCI code word in the timeslot is defined in [7].

If the shortest transmission time interval of any constituent TrCH is at least 20 ms, then successive TFCI code words in the frames within the TTI shall be identical. If a TFCI is transmitted on multiple timeslots in a frame each timeslot shall have the same TFCI code word.

4.4.2 Coding of transport format combination indicator (TFCI) for 8PSK

Encoding of TFCI bits depends on the number of them and the modulation in use. When 2 Mcps service is transmitted, 8PSK modulation is applied in 1.28 Mcps TDD option. The encoding scheme for TFCI when the number of bits are 6 – 10, and less than 6 bits is described in section 4.4.2.1 and 4.4.2.2, respectively.

4.4.2.1 Coding of long TFCI lengths

When the number of TFCI bits is 6 – 10, the TFCI bits are encoded by using a (64,10) sub-code of the second order Reed-Muller code, then 16 bits out of 64 bits are punctured (Puncturing positions are 0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61st bits). The coding procedure is shown in Figure 12.

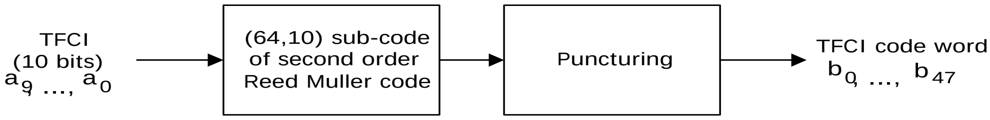

Figure 12: Channel coding of long TFCI bits for 8PSK

If the TFCI consists of less than 10 bits, it is padded with zeros to 10 bits, by setting the most significant bits to zero. The code words of the punctured (48,10) sub-code of the second order Reed-Muller codes are linear combination of 10 basis sequences. The basis sequences are shown in Table 12.

Table 12: Basis sequences for (48,10) TFCI code

I	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{i,4}$	$M_{i,5}$	$M_{i,6}$	$M_{i,7}$	$M_{i,8}$	$M_{i,9}$
0	1	0	0	0	0	0	1	0	1	0
1	0	1	0	0	0	0	1	1	0	0
2	1	1	0	0	0	0	1	1	0	1
3	1	0	1	0	0	0	1	1	1	0
4	0	1	1	0	0	0	1	0	1	0
5	1	1	1	0	0	0	1	1	1	0
6	1	0	0	1	0	0	1	1	1	1
7	0	1	0	1	0	0	1	1	0	1
8	1	1	0	1	0	0	1	0	1	0
9	0	0	1	1	0	0	1	1	0	0
10	0	1	1	1	0	0	1	1	0	1
11	1	1	1	1	0	0	1	1	1	1
12	1	0	0	0	1	0	1	0	1	1
13	0	1	0	0	1	0	1	1	1	0
14	1	1	0	0	1	0	1	0	0	1
15	1	0	1	0	1	0	1	0	1	1
16	0	1	1	0	1	0	1	1	0	0
17	1	1	1	0	1	0	1	1	1	0
18	0	0	0	1	1	0	1	0	0	1
19	1	0	0	1	1	0	1	0	1	1
20	0	1	0	1	1	0	1	0	1	0
21	0	0	1	1	1	0	1	0	1	0
22	1	0	1	1	1	0	1	1	0	1
23	0	1	1	1	1	0	1	1	1	0
24	0	0	0	0	0	1	1	1	0	1
25	1	0	0	0	0	1	1	1	1	0
26	1	1	0	0	0	1	1	1	1	1
27	0	0	1	0	0	1	1	0	1	1
28	1	0	1	0	0	1	1	1	0	1
29	1	1	1	0	0	1	1	0	1	1
30	0	0	0	1	0	1	1	0	0	1
31	0	1	0	1	0	1	1	0	0	1
32	1	1	0	1	0	1	1	1	1	1
33	1	0	1	1	0	1	1	0	0	1
34	0	1	1	1	0	1	1	1	1	0
35	1	1	1	1	0	1	1	1	0	1
36	0	0	0	0	1	1	1	1	1	0
37	1	0	0	0	1	1	1	0	1	1
38	1	1	0	0	1	1	1	1	1	1
39	0	0	1	0	1	1	1	1	0	0
40	1	0	1	0	1	1	1	1	0	0
41	1	1	1	0	1	1	1	1	1	1
42	0	0	0	1	1	1	1	1	1	1
43	0	1	0	1	1	1	1	0	1	0
44	1	1	0	1	1	1	1	0	1	0
45	0	0	1	1	1	1	1	0	1	1
46	0	1	1	1	1	1	1	0	0	1
47	1	1	1	1	1	1	1	1	0	0

Let's define the TFCI bits as a_0 , a_1 , a_2 , a_3 , a_4 , a_5 , a_6 , a_7 , a_8 , a_9, where a_0 is the LSB and a_9 is the MSB. The TFCI bits shall correspond to the TFC index (expressed in unsigned binary form) defined by the RRC layer to reference the TFC of the CCTrCH in the associated DPCH radio frame.

The output TFCI code word bits b_i are given by:

$$b_i = \sum_{n=0}^{9} (a_n \times M_{i,n}) \bmod 2$$

where i=0…47. $N_{TFCI\ code\ word}$ =48.

4.4.2.2 Coding of short TFCI lengths

4.4.2.2.1 Coding very short TFCIs by repetition

When the number of TFCI bits is 1 or 2, then repetition will be used for the coding. In this case, each bit is repeated to a total of 6 times giving 6-bit transmission ($N_{TFCI\ code\ word}$ = 6) for a single TFCI bit and 12-bit transmission ($N_{TFCI\ code\ word}$ = 12) for 2 TFCI bits. For a single TFCI bit b_0, the TFCI code word shall be {b_0, b_0, b_0, b_0, b_0, b_0}. For two TFCI bits b_0 and b_1, the TFCI code word shall be {b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1, b_0, b_1}.

4.4.2.2.2 Coding short TFCIs using bi-orthogonal codes

If the number of TFCI bits is in the range of 3 to 5, the TFCI bits are encoded using a (32,5) first order Reed-Muller code, then 8 bits out of 32 bits are punctured (Puncturing positions are 0, 1, 2, 3, 4, 5, 6, 7th bits). The coding procedure is shown in Figure 13.

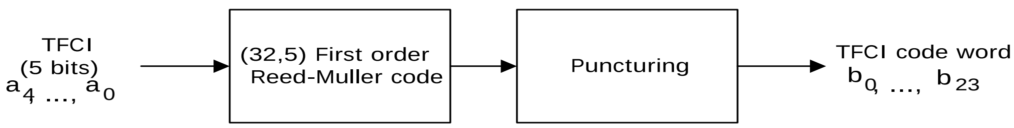

Figure 13: Channel coding of short TFCI bits for 8PSK

If the TFCI consists of less than 5 bits, it is padded with zeros to 5 bits, by setting the most significant bits to zero. The code words of the punctured (32,5) first order Reed-Muller codes are linear combination of 5 basis sequences shown in Table 13.

Table 13: Basis sequences for (24,5) TFCI code

I	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{i,4}$
0	0	0	0	1	0
1	1	0	0	1	0
2	0	1	0	1	0
3	1	1	0	1	0
4	0	0	1	1	0
5	1	0	1	1	0
6	0	1	1	1	0
7	1	1	1	1	0
8	0	0	0	0	1
9	1	0	0	0	1
10	0	1	0	0	1
11	1	1	0	0	1
12	0	0	1	0	1
13	1	0	1	0	1
14	0	1	1	0	1
15	1	1	1	0	1
16	0	0	0	1	1
17	1	0	0	1	1
18	0	1	0	1	1
19	1	1	0	1	1
20	0	0	1	1	1
21	1	0	1	1	1
22	0	1	1	1	1
23	1	1	1	1	1

Let's define the TFCI bits as a_0 , a_1 , a_2 , a_3 , a_4, where a_0 is the LSB and a_4 is the MSB. The TFCI bits shall correspond to the TFC index (expressed in unsigned binary form) defined by the RRC layer to reference the TFC of the CCTrCH in the associated DPCH radio frame.

The output code word bits b_i are given by:

$$b_i = \sum_{n=0}^{4} (a_n \times M_{i,n}) \bmod 2$$

where i=0…23. $N_{\text{TFCI code word}}$ =24.