

# TS 25.223 V2.4.0 (1999-10)

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*Technical Specification*

**3<sup>rd</sup> Generation Partnership Project (3GPP);  
Technical Specification Group (TSG)  
Radio Access Network (RAN);  
Working Group 1 (WG1);  
Spreading and modulation (TDD)**

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Reference

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<Workitem>

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## Foreword

This Technical Specification has been produced by the 3GPP.

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where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

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## 1 Scope

This document establishes the characteristics of the spreading and modulation in the TDD mode.

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## 2 References

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

References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

For a specific reference, subsequent revisions do not apply.

For a non-specific reference, subsequent revisions do apply.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] TS 25.201: "Physical layer - general description"
- [2] TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)"
- [3] TS 25.212: "Multiplexing and channel coding (FDD)"
- [4] TS 25.213: "Spreading and modulation (FDD)"
- [5] TS 25.214: "Physical layer procedures (FDD)"
- [6] TS 25.215: "Physical layer – Measurements (FDD)"

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- [7] TS 25.221: "Physical channels and mapping of transport channels onto physical channels (TDD)"
- [8] TS 25.222: "Multiplexing and channel coding (TDD)"
- [9] TS 25.223: "Spreading and modulation (TDD)"
- [10] TS 25.224: "Physical layer procedures (TDD)"
- [11] TS 25.225: "Physical layer – Measurements (TDD)"

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following definitions apply:

<defined term>: <definition>.

### 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol>            <Explanation>

### 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CDMA Code Division Multiple Access  
 PN Pseudo Noise  
 QPSK Quadrature Phase Shift Keying  
 RACH Random Access Channel

## 4 General

In the following, a separation between the data modulation and the spreading modulation has been made. The data modulation is defined in section 5 and the spreading modulation in section 6.

**Table 1: Basic modulation parameters.**

Chip rate	same as FDD basic chiprate, 3.84 Mchip/s	Low chiprate: Value is FFS
Data modulation	QPSK	QPSK
Spreading characteristics	Orthogonal  Q chips/symbol, where $Q = 2^p$ , $0 \leq p \leq 4$	Orthogonal  Q chips/symbol, where $Q = 2^p$ , $0 \leq p \leq 4$

## 5 Data modulation

### 5.1 Symbol rate

The symbol duration  $T_s$  depends on the spreading factor  $Q$  and the chip duration  $T_c$ :  $T_s = Q \times T_c$ , where  $T_c = \frac{1}{\text{chiprate}}$ .

### 5.2 Mapping of bits onto signal point constellation

A certain number  $K$  of CDMA codes can be assigned to either a single user or to different users who are simultaneously transmitting bursts in the same time slot and the same frequency. The maximum possible number of CDMA codes, which is smaller or equal to 16, depends on the individual spreading factors, the actual interference situation and the service requirements. The applicable burst formats are shown in [7]. Each user burst has two data carrying parts, termed data blocks:

$$\underline{\mathbf{d}}^{(k,i)} = (d_1^{(k,i)}, d_2^{(k,i)}, \dots, d_{N_k}^{(k,i)})^T \quad i = 1, 2; k = 1, \dots, K. \quad (1)$$

$N_k$  is the number of symbols per data field for the user  $k$ . This number is linked to the spreading factor  $Q_k$  as described in table 1 of document TS 25.221.

Data block  $\underline{\mathbf{d}}^{(k,1)}$  is transmitted before the midamble and data block  $\underline{\mathbf{d}}^{(k,2)}$  after the midamble. Each of the  $N_k$  data symbols  $d_n^{(k,i)}$ ;  $i=1, 2$ ;  $k=1, \dots, K$ ;  $n=1, \dots, N_k$ ; of equation 1 has the symbol duration  $T_s^{(k)} = Q_k \cdot T_c$  as already given.

The data modulation is QPSK, thus the data symbols  $d_n^{(k,i)}$  are generated from two interleaved and encoded data bits

$$b_{l,n}^{(k,i)} \in \{0,1\} \quad l = 1,2; k = 1, \dots, K; n = 1, \dots, N_k; i = 1,2 \quad (2)$$

using the equation

$$\begin{aligned} \operatorname{Re}\{d_n^{(k,i)}\} &= \frac{1}{\sqrt{2}}(2b_{1,n}^{(k,i)} - 1) \\ \operatorname{Im}\{d_n^{(k,i)}\} &= \frac{1}{\sqrt{2}}(2b_{2,n}^{(k,i)} - 1) \quad k = 1, \dots, K; n = 1, \dots, N_k; i = 1, 2. \end{aligned} \quad (3)$$

Equation 3 corresponds to a QPSK modulation of the interleaved and encoded data bits  $b_{l,n}^{(k,i)}$  of equation 2.

## 6 Spreading modulation

### 6.1 Basic spreading parameters

Each data symbol  $d_n^{(k,i)}$  of equation 1 is spread with a spreading code  $\underline{\mathbf{c}}^{(k)}$  of length  $Q_k \in \{1, 2, 4, 8, 16\}$ . The resulting sequence is then scrambled by a sequence  $\mathbf{v}$  of length 16.

### 6.2 Spreading codes

The elements  $c_q^{(k)}$ ;  $k=1, \dots, K$ ;  $q=1, \dots, Q_k$ ; of the spreading codes  $\underline{\mathbf{c}}^{(k)} = (c_1^{(k)}, c_2^{(k)}, \dots, c_{Q_k}^{(k)})$ ;  $k=1, \dots, K$ ; shall be taken from the complex set

$$\underline{\mathbf{V}}_c = \{1, j, -1, -j\} \quad (4)$$

In equation 4 the letter  $j$  denotes the imaginary unit. A spreading code  $\underline{c}^{(k)}$  is generated from the binary codes  $\mathbf{a}_{Q_k}^{(k)} = (a_1^{(k)}, a_2^{(k)}, \dots, a_{Q_k}^{(k)})$  of length  $Q_k$  shown in Figure 2 allocated to the  $k^{\text{th}}$  user. The relation between the elements  $\underline{c}_q^{(k)}$  and  $\underline{a}_q^{(k)}$  is given by:

$$\underline{c}_q^{(k)} = (j)^q \cdot a_q^{(k)} \quad a_q^{(k)} \in \{1, -1\}; q = 1, \dots, Q_k. \quad (5)$$

Hence, the elements  $\underline{c}_q^{(k)}$  of the CDMA codes  $\underline{c}^{(k)}$  are alternating real and imaginary.

The  $\mathbf{a}_{Q_k}^{(k)}$  are Orthogonal Variable Spreading Factor (OVSF) codes, allowing to mix in the same timeslot channels with different spreading factors while preserving the orthogonality. The OVSF codes can be defined using the code tree of Figure 2.

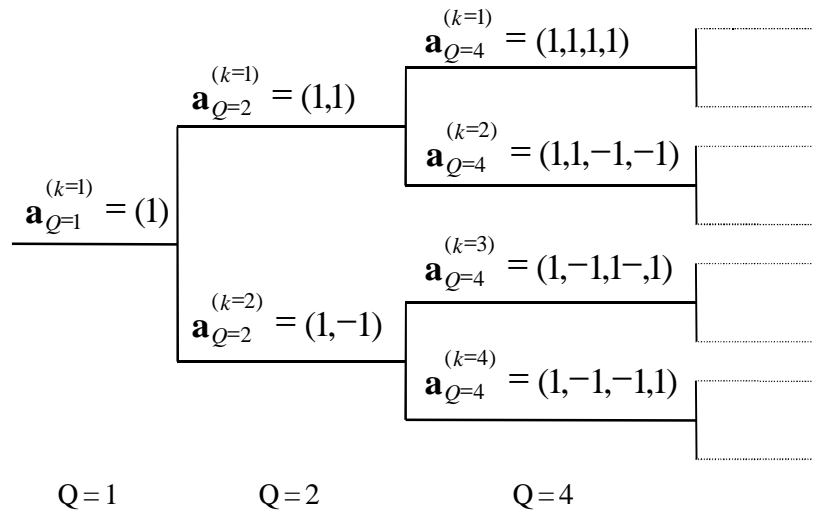


Figure 1: Code-tree for generation of Orthogonal Variable Spreading Factor (OVSF) codes.

Each level in the code tree defines a spreading factors indicated by the value of  $Q$  in the figure. All codes within the code tree cannot be used simultaneously in a given timeslot. A code can be used in a timeslot if and only if no other code on the path from the specific code to the root of the tree or in the sub-tree below the specific code is used in this timeslot. This means that the number of available codes in a slot is not fixed but depends on the rate and spreading factor of each physical channel.

The spreading factor goes up to  $Q_{\text{MAX}}=16$ .

### 6.3 Scrambling codes

The spreading of data by a code  $\underline{c}^{(k)}$  of length  $Q_k$  is followed by a cell specific scrambling sequence  $\mathbf{v}=(v_1, v_2, \dots, v_{Q_{\text{MAX}}})$ . The length matching is obtained by concatenating  $Q_{\text{MAX}}/Q_k$  spread words before the scrambling. The scheme is illustrated in Figure 3 below and is described in more detail in section 6.4. The applicable scrambling codes are shown in Annex A.

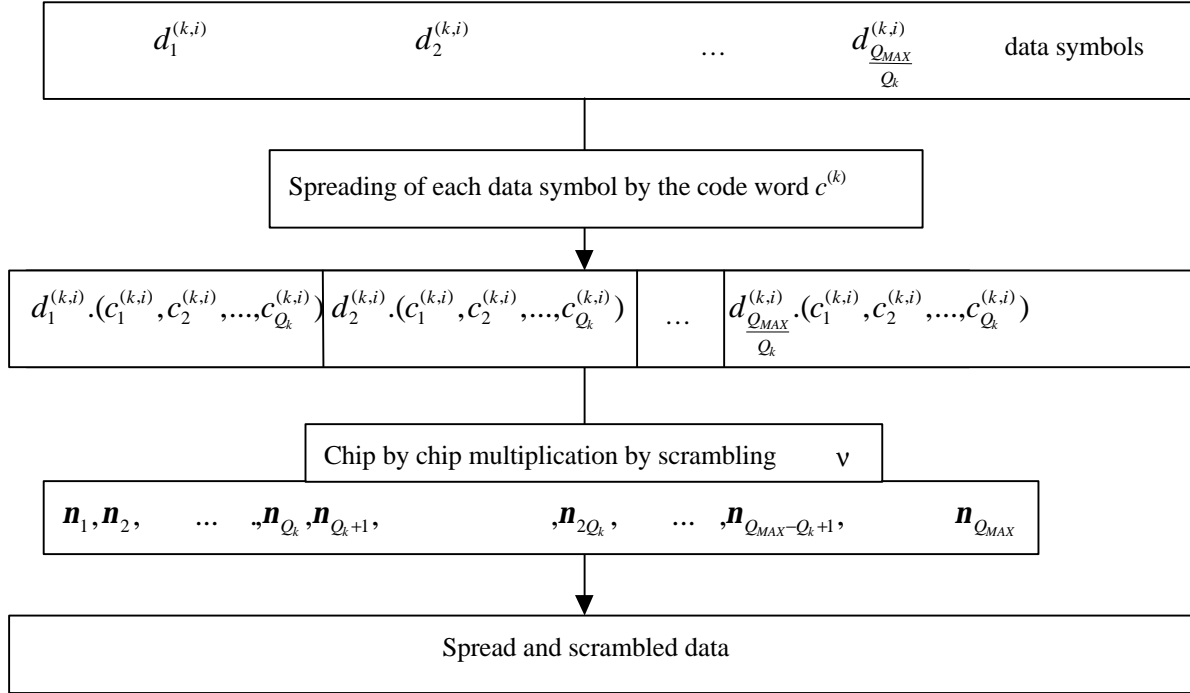


Figure 2: Spreading and subsequent scrambling of data symbols.

## 6.4 Spread and scrambled signal of data symbols and data blocks

The combination of the spreading and cell specific scrambling codes can be seen as a user and cell specific spreading code  $\mathbf{s}^{(k)} = (s_p^{(k)})$  with  $s_p^{(k)} = c^{(k)}_{1+[p-1] \bmod Q_k} \cdot \hat{I}_{1+[p-1] \bmod Q_{MAX}}$ ,  $k=1, \dots, K$ ,  $p=1, \dots, N_k Q_k$ .

With the root raised cosine chip impulse filter  $Cr_0(t)$  the transmitted signal belonging to the data block  $\underline{\mathbf{d}}^{(k,1)}$  of equation 1 transmitted before the midamble is

$$\underline{\mathbf{d}}^{(k,1)}(t) = \sum_{n=1}^{N_k} \underline{\mathbf{d}}_n^{(k,1)} \sum_{q=1}^{Q_k} s_{(n-1)Q_k+q}^{(k)} \cdot Cr_0(t - (q-1)T_c - (n-1)Q_k T_c) \quad (6)$$

and for the data block  $\underline{\mathbf{d}}^{(k,2)}$  of equation 1 transmitted after the midamble

$$\underline{\mathbf{d}}^{(k,2)}(t) = \sum_{n=1}^{N_k} \underline{\mathbf{d}}_n^{(k,2)} \sum_{q=1}^{Q_k} s_{(n-1)Q_k+q}^{(k)} \cdot Cr_0(t - (q-1)T_c - (n-1)Q_k T_c - N_k Q_k T_c - L_m T_c). \quad (7)$$

where  $L_m$  is the number of midamble chips.

## 7 Synchronisation codes

### 7.1 Code Generation

The Primary code sequence,  $C_p$  is constructed as a so-called generalised hierarchical Golay sequence. The Primary SCH is furthermore chosen to have good aperiodic auto correlation properties.

Letting  $\mathbf{a} = \langle x_1, x_2, x_3, \dots, x_{16} \rangle = \langle 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1, 0, 1, 1, 0 \rangle$  and

$\mathbf{b} = \langle x_1, \dots, x_8, \bar{x}_9, \dots, \bar{x}_{16} \rangle = \langle 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1 \rangle$



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The PSC code is generated by repeating sequence 'a' modulated by a Golay complementary sequence.

Letting  $y = \langle a, a, a, \bar{a}, \bar{a}, a, \bar{a}, \bar{a}, a, a, a, \bar{a}, \bar{a}, a, a, a \rangle$

The definition of the PSC code word  $C_p$  follows (the left most index corresponds to the chip transmitted first in each time slot):

$C_p = \langle y(0), y(1), y(2), \dots, y(255) \rangle$ .

Let the length 256 mask sequence  $z$  be given as,  $z = \langle b, b, b, \bar{b}, \bar{b}, b, \bar{b}, \bar{b}, b, \bar{b}, \bar{b}, b, \bar{b}, \bar{b}, b, \bar{b} \rangle$ .

Then the Secondary Synchronization code words,  $\{C_0, \dots, C_{15}\}$  are constructed as the position wise addition modulo 2 of a Hadamard sequence and the sequence  $z$ .

The Hadamard sequences are obtained as the rows in a matrix  $H_8$  constructed recursively by:

$$H_0 = (0)$$

$$H_k = \begin{pmatrix} H_{k-1} & H_{k-1} \\ H_{k-1} & H_{k-1} \end{pmatrix} \quad k \geq 1$$

The rows are numbered from the top starting with row 0 (the all zeros sequence),  $h_0$ .

The Hadamard sequence  $h$  depends on the chosen code number  $n$  and is denoted  $h_n$  in the sequel.

This code word is chosen from every 16<sup>th</sup> row of the matrix  $H_8$ , which yields 16 possible codewords  $n = 0, 1, \dots, 15$ .

Furthermore, let  $h_n(i)$  and  $z(i)$  denote the  $i$ :th symbol of the sequence  $h_n$  and  $z$ , respectively.

The definition of the  $n$ :th SCH code word follows (the left most index correspond to the chip transmitted first in each slot):

$$C_{SCH,n} = \langle h_n(0) + z(0), h_n(1) + z(1), h_n(2) + z(2), \dots, h_n(255) + z(255) \rangle,$$

All sums of symbols are taken modulo 2.

These PSC and SSC binary code words are converted to real valued sequences by the transformation '0' -> '+1', '1' -> '-1'.

The Secondary SCHcode words are defined in terms of  $C_{SCH,n}$  and the definition of  $\{C_0, \dots, C_{15}\}$  now follows as:

$$C_i = C_{SCH,i}, \quad i=0, \dots, 15$$

## 7.2 Code Allocation

Three SCH codes are QPSK modulated and transmitted in parallel with the primary synchronization code. The QPSK modulation carries the following information.

- The code group that the base station belongs to (5 bits; Cases 1,2,3)
- The position of the frame within an interleaving period of 20 msec (1 bit, Cases 1,2,3)
- The position of the slot within the frame (1 bit, Cases 2,3)
- SCH transport channel information, e.g. the location of the Primary CCPCH (3 bits, Case 3)

The modulated codes are also constructed such that their cyclic-shifts are unique, i.e. a non-zero cyclic shift less than 2 (Case 1) and 4 (Cases 2 and 3) of any of the sequences is not equivalent to some cyclic shift of any other of the sequences. Also, a non-zero cyclic shift less than 2 (Case 1) and 4 (Cases 2 and 3) of any of the sequences is not equivalent to itself with any other cyclic shift less than 8. The secondary synchronization codes are partitioned into two code sets for Case 1, four code sets for Case 2 and thirty two code sets (possibly overlapping) for Case 3. The set is used to provide the following information:

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Case 1:

Table 2 Code Set Allocation for Case 1

Code Set	Code Group
1	0-15
2	16-31

The code group and frame position information is provided by modulating the secondary codes in the code set.

Case 2:

Table 3 Code Set Allocation for Case 2

Code Set	Code Group
1	0-7
2	8-15
3	16-23
4	24-31

The slot timing and frame position information is provided by the comma free property of the code word and the Code group is provided by modulating some of the secondary codes in the code set.

Case 3:

Code set  $k$ ,  $k=1:32$  is associated with Code group  $k-1$ . The slot information, the frame position information is provided by the comma free property of the code and the SCH transport channel information is provided by modulating some of the codes in the code set.

The following SCH codes are allocated for each code set:

Case 1

Code set 1:  $C_0, C_1, C_2$ .Code set 2:  $C_3, C_4, C_5$ .

Case 2

Code set 1:  $C_0, C_1, C_2$ .Code set 2:  $C_3, C_4, C_5$ .Code set 3:  $C_6, C_7, C_8$ .Code set 4:  $C_9, C_{10}, C_{11}$ .

Case 3

Code set 1:  $C_0, C_1, C_2$ .Code set 2:  $C_3, C_4, C_5$ .Code set 3:  $C_6, C_7, C_8$ .Code set 4:  $C_9, C_{10}, C_{11}$ .Code set 5:  $C_{12}, C_{13}, C_{14}$ .Code set 6:  $C_0, C_3, C_6$ .Code set 7:  $C_0, C_4, C_7$ .Code set 8:  $C_0, C_5, C_8$ .Code set 9:  $C_0, C_9, C_{12}$ .Code set 10:  $C_0, C_{10}, C_{13}$ .Code set 11:  $C_0, C_{11}, C_{14}$ .Code set 12:  $C_1, C_3, C_7$ .Code set 13:  $C_1, C_4, C_6$ .Code set 14:  $C_1, C_5, C_9$ .Code set 15:  $C_1, C_8, C_{10}$ .Code set 16:  $C_1, C_{11}, C_{12}$ .

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Code set 17:  $C_1, C_{13}, C_{15}$ .  
 Code set 18:  $C_2, C_3, C_8$ .  
 Code set 19:  $C_2, C_4, C_9$ .  
 Code set 20:  $C_2, C_5, C_6$ .  
 Code set 21:  $C_2, C_7, C_{10}$ .  
 Code set 22:  $C_2, C_{11}, C_{13}$ .  
 Code set 23:  $C_2, C_{12}, C_{15}$ .  
 Code set 24:  $C_3, C_9, C_{13}$ .  
 Code set 25:  $C_3, C_{10}, C_{12}$ .  
 Code set 26:  $C_3, C_{11}, C_{15}$ .  
 Code set 27:  $C_4, C_8, C_{11}$ .  
 Code set 28:  $C_4, C_{10}, C_{14}$ .  
 Code set 29:  $C_5, C_7, C_{11}$ .  
 Code set 30:  $C_5, C_{10}, C_{15}$ .  
 Code set 31:  $C_6, C_9, C_{14}$ .  
 Code set 32:  $C_7, C_9, C_{15}$ .

The following subchapters 7.2.1 to 7.2.3 refer to the three cases of PSCH/PCCPCH usage as described in TS 25.221 section 7.4.

## 7.2.1 Code allocation for Case 1:

Note that modulation by "j" indicates that the code is transmitted on the Q channel.

Table 4 Code Allocation for Case 1

Code Group	Code Set	Frame 1			Frame 2			Associated $t_{\text{offset}}$
0	1	$C_0$	$C_1$	$C_2$	$C_0$	$C_1$	$-C_2$	$t_0$
1	1	$C_0$	$-C_1$	$C_2$	$C_0$	$-C_1$	$-C_2$	$t_1$
2	1	$-C_0$	$C_1$	$C_2$	$-C_0$	$C_1$	$-C_2$	$t_2$
3	1	$-C_0$	$-C_1$	$C_2$	$-C_0$	$-C_1$	$-C_2$	$t_3$
4	1	$jC_0$	$jC_1$	$C_2$	$jC_0$	$jC_1$	$-C_2$	$t_4$
5	1	$jC_0$	$-jC_1$	$C_2$	$jC_0$	$-jC_1$	$-C_2$	$t_5$
6	1	$-jC_0$	$jC_1$	$C_2$	$-jC_0$	$jC_1$	$-C_2$	$t_6$
7	1	$-jC_0$	$-jC_1$	$C_2$	$-jC_0$	$-jC_1$	$-C_2$	$t_7$
8	1	$jC_0$	$jC_2$	$C_1$	$jC_0$	$jC_2$	$-C_1$	$t_8$
9	1	$jC_0$	$-jC_2$	$C_1$	$jC_0$	$-jC_2$	$-C_1$	$t_9$
10	1	$-jC_0$	$jC_2$	$C_1$	$-jC_0$	$jC_2$	$-C_1$	$t_{10}$
11	1	$-jC_0$	$-jC_2$	$C_1$	$-jC_0$	$-jC_2$	$-C_1$	$t_{11}$
12	1	$jC_1$	$jC_2$	$C_0$	$jC_1$	$jC_2$	$-C_0$	$t_{12}$
13	1	$jC_1$	$-jC_2$	$C_0$	$jC_1$	$-jC_2$	$-C_0$	$t_{13}$
14	1	$-jC_1$	$jC_2$	$C_0$	$-jC_1$	$jC_2$	$-C_0$	$t_{14}$
15	1	$-jC_1$	$-jC_2$	$C_0$	$-jC_1$	$-jC_2$	$-C_0$	$t_{15}$
16	2	$C_3$	$C_4$	$C_5$	$C_3$	$C_4$	$-C_5$	$t_{16}$
17	2	$C_3$	$-C_4$	$C_5$	$C_3$	$-C_4$	$-C_5$	$t_{17}$
...	...	...	...	...	...	...	...	...
20	2	$jC_3$	$jC_4$	$C_5$	$jC_3$	$jC_4$	$-C_5$	$t_{20}$
...	...	...	...	...	...	...	...	...
24	2	$jC_3$	$jC_5$	$C_4$	$jC_3$	$jC_5$	$-C_4$	$t_{24}$
...	...	...	...	...	...	...	...	...
31	2	$-jC_4$	$-jC_5$	$C_3$	$-jC_4$	$-jC_5$	$-C_3$	$t_{31}$

Note that the code construction for code groups 0 to 15 using only the SCH codes from code set 1 is shown. The construction for code groups 16 to 31 using the SCH codes from code set 2 is done in the same way.

7.2.2 Code allocation for Case 2:

Table 5 Code Allocation for Case 2

Code Group	Code Set	Frame 1						Frame 2						Associated $t_{offset}$
		Slot k			Slot k+8			Slot k			Slot k+8			
0	1	$C_0$	$C_1$	$C_2$	$C_0$	$C_1$	$-C_2$	$-C_0$	$-C_1$	$C_2$	$-C_0$	$-C_1$	$-C_2$	$t_0$
1	1	$C_0$	$-C_1$	$C_2$	$C_0$	$-C_1$	$-C_2$	$-C_0$	$C_1$	$C_2$	$-C_0$	$C_1$	$-C_2$	$t_1$
2	1	$jC_0$	$jC_1$	$C_2$	$jC_0$	$jC_1$	$-C_2$	$-jC_0$	$-jC_1$	$C_2$	$-jC_0$	$-jC_1$	$-C_2$	$t_2$
3	1	$jC_0$	$-jC_1$	$C_2$	$jC_0$	$-jC_1$	$-C_2$	$-jC_0$	$jC_1$	$C_2$	$-jC_0$	$jC_1$	$-C_2$	$t_3$
4	1	$jC_0$	$jC_2$	$C_1$	$jC_0$	$jC_2$	$-C_1$	$-jC_0$	$-jC_2$	$C_1$	$-jC_0$	$-jC_2$	$-C_1$	$t_4$
5	1	$jC_0$	$-jC_2$	$C_1$	$jC_0$	$-jC_2$	$-C_1$	$-jC_0$	$jC_2$	$C_1$	$-jC_0$	$jC_2$	$-C_1$	$t_5$
6	1	$jC_1$	$jC_2$	$C_0$	$jC_1$	$jC_2$	$-C_0$	$-jC_1$	$-jC_2$	$C_0$	$-jC_1$	$-jC_2$	$-C_0$	$t_6$
7	1	$jC_1$	$-jC_2$	$C_0$	$jC_1$	$-jC_2$	$-C_0$	$-jC_1$	$jC_2$	$C_0$	$-jC_1$	$jC_2$	$-C_0$	$t_7$
8	2	$C_3$	$C_4$	$C_5$	$C_3$	$C_4$	$-C_5$	$-C_3$	$-C_4$	$C_5$	$-C_3$	$-C_4$	$-C_5$	$t_8$
9	2	$C_3$	$-C_4$	$C_5$	$C_3$	$-C_4$	$-C_5$	$-C_3$	$C_4$	$C_5$	$-C_3$	$C_4$	$-C_5$	$t_9$
10	2	$jC_3$	$jC_4$	$C_5$	$jC_3$	$jC_4$	$-C_5$	$-jC_3$	$-jC_4$	$C_5$	$-jC_3$	$-jC_4$	$-C_5$	$t_{10}$
11	2	$jC_3$	$-jC_4$	$C_5$	$jC_3$	$-jC_4$	$-C_5$	$-jC_3$	$jC_4$	$C_5$	$-jC_3$	$jC_4$	$-C_5$	$t_{11}$
12	2	$jC_3$	$jC_5$	$C_4$	$jC_3$	$jC_5$	$-C_4$	$-jC_3$	$-jC_5$	$C_4$	$-jC_3$	$-jC_5$	$-C_4$	$t_{12}$
13	2	$jC_3$	$-jC_5$	$C_4$	$jC_3$	$-jC_5$	$-C_4$	$-jC_3$	$jC_5$	$C_4$	$-jC_3$	$jC_5$	$-C_4$	$t_{13}$
14	2	$jC_4$	$jC_5$	$C_3$	$jC_4$	$jC_5$	$-C_3$	$-jC_4$	$-jC_5$	$C_3$	$-jC_4$	$-jC_5$	$-C_3$	$t_{14}$
15	2	$jC_4$	$-jC_5$	$C_3$	$jC_4$	$-jC_5$	$-C_3$	$-jC_4$	$jC_5$	$C_3$	$-jC_4$	$jC_5$	$-C_3$	$t_{15}$
16	3	$C_6$	$C_7$	$C_8$	$C_6$	$C_7$	$-C_8$	$-C_6$	$-C_7$	$C_8$	$-C_6$	$-C_7$	$-C_8$	$t_{16}$
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	3	$jC_7$	$-jC_8$	$C_6$	$jC_7$	$-jC_8$	$-C_6$	$-jC_7$	$jC_8$	$C_6$	$-jC_7$	$jC_8$	$-C_6$	$t_{20}$
24	4	$C_9$	$C_{10}$	$C_{11}$	$C_9$	$C_{10}$	$-C_{11}$	$-C_9$	$-C_{10}$	$C_{11}$	$-C_9$	$-C_{10}$	$-C_{11}$	$t_{24}$
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	4	$jC_{10}$	$-jC_{11}$	$C_9$	$jC_{10}$	$-jC_{11}$	$-C_9$	$-jC_{10}$	$jC_{11}$	$C_9$	$-jC_{10}$	$jC_{11}$	$-C_9$	$t_{31}$

Note that the code construction for code groups 0 to 15 using the SCH codes from code sets 1 and 2 is shown. The construction for code groups 16 to 31 using the SCH codes from code sets 3 and 4 is done in the same way.

7.2.3 Code allocation for Case 3:

In addition to the information on code group three bits from SCH transport channel are transmitted to the UE with these codes.

Table 6 Code Allocation for Case 3

Code Group	Code Set	Frame 1						Frame 2						Associated $t_{offset}$	Addl bits from SCH transport channel
		Slot k			Slot k+8			Slot k			Slot k+8				
0	1	$C_0$	$C_1$	$C_2$	$C_0$	$C_1$	$-C_2$	$-C_0$	$-C_1$	$C_2$	$-C_0$	$-C_1$	$-C_2$	$t_0$	000
0	1	$C_0$	$-C_1$	$C_2$	$C_0$	$-C_1$	$-C_2$	$-C_0$	$C_1$	$C_2$	$-C_0$	$C_1$	$-C_2$		001
0	1	$jC_0$	$jC_1$	$C_2$	$jC_0$	$jC_1$	$-C_2$	$-jC_0$	$-jC_1$	$C_2$	$-jC_0$	$-jC_1$	$-C_2$		010
0	1	$jC_0$	$-jC_1$	$C_2$	$jC_0$	$-jC_1$	$-C_2$	$-jC_0$	$jC_1$	$C_2$	$-jC_0$	$jC_1$	$-C_2$		011
0	1	$jC_0$	$jC_2$	$C_1$	$jC_0$	$jC_2$	$-C_1$	$-jC_0$	$-jC_2$	$C_1$	$-jC_0$	$-jC_2$	$-C_1$		100
0	1	$jC_0$	$-jC_2$	$C_1$	$jC_0$	$-jC_2$	$-C_1$	$-jC_0$	$jC_2$	$C_1$	$-jC_0$	$jC_2$	$-C_1$		101
0	1	$jC_1$	$jC_2$	$C_0$	$jC_1$	$jC_2$	$-C_0$	$-jC_1$	$-jC_2$	$C_0$	$-jC_1$	$-jC_2$	$-C_0$		110
0	1	$jC_1$	$-jC_2$	$C_0$	$jC_1$	$-jC_2$	$-C_0$	$-jC_1$	$jC_2$	$C_0$	$-jC_1$	$jC_2$	$-C_0$		111
1	2	$C_3$	$C_4$	$C_5$	$C_3$	$C_4$	$-C_5$	$-C_3$	$-C_4$	$C_5$	$-C_3$	$-C_4$	$-C_5$		$t_2$
1	2	$C_3$	$-C_4$	$C_5$	$C_3$	$-C_4$	$-C_5$	$-C_3$	$C_4$	$C_5$	$-C_3$	$C_4$	$-C_5$	001	
1	2	$jC_3$	$jC_4$	$C_5$	$jC_3$	$jC_4$	$-C_5$	$-jC_3$	$-jC_4$	$C_5$	$-jC_3$	$-jC_4$	$-C_5$	010	
1	2	$jC_3$	$-jC_4$	$C_5$	$jC_3$	$-jC_4$	$-C_5$	$-jC_3$	$jC_4$	$C_5$	$-jC_3$	$jC_4$	$-C_5$	011	

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1	2	$jC_3$	$jC_5$	$C_4$	$jC_3$	$jC_5$	$-C_4$	$-jC_3$	$-jC_5$	$C_4$	$-jC_3$	$-jC_5$	$-C_4$		100
1	2	$jC_3$	$-jC_5$	$C_4$	$jC_3$	$-jC_5$	$-C_4$	$-jC_3$	$jC_5$	$C_4$	$-jC_3$	$jC_5$	$-C_4$		101
1	2	$jC_4$	$jC_5$	$C_3$	$jC_4$	$jC_5$	$-C_3$	$-jC_4$	$-jC_5$	$C_3$	$-jC_4$	$-jC_5$	$-C_3$		110
1	2	$jC_4$	$-jC_5$	$C_3$	$jC_4$	$-jC_5$	$-C_3$	$-jC_4$	$jC_5$	$C_3$	$-jC_4$	$jC_5$	$-C_3$		111
2	3	$C_6$	$C_7$	$C_8$	$C_6$	$C_7$	$-C_8$	$-C_6$	$-C_7$	$C_8$	$-C_6$	$-C_7$	$-C_8$	$t_3$	000
...	...	...	...	...	...	...	...	...	...	...	...	...	...		...
2	3	$jC_7$	$-jC_8$	$C_6$	$jC_7$	$-jC_8$	$-C_6$	$-jC_7$	$jC_8$	$C_6$	$-jC_7$	$jC_8$	$-C_6$		111
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	32	$C_7$	$C_9$	$C_{15}$	$C_7$	$C_9$	$-C_{15}$	$-C_7$	$-C_9$	$C_{15}$	$-C_7$	$-C_9$	$-C_{15}$	$t_{31}$	000
31	32	$C_7$	$-C_9$	$C_{15}$	$C_7$	$-C_9$	$-C_{15}$	$-C_7$	$C_9$	$C_{15}$	$-C_7$	$C_9$	$-C_{15}$		001
31	32	$jC_7$	$jC_9$	$C_{15}$	$jC_7$	$jC_9$	$-C_{15}$	$-jC_7$	$-jC_9$	$C_{15}$	$-jC_7$	$-jC_9$	$-C_{15}$		010
31	32	$jC_7$	$-jC_9$	$C_{15}$	$jC_7$	$-jC_9$	$-C_{15}$	$-jC_7$	$jC_9$	$C_{15}$	$-jC_7$	$jC_9$	$-C_{15}$		011
31	32	$jC_7$	$jC_{15}$	$C_9$	$jC_7$	$jC_6$	$-C_9$	$-jC_7$	$-jC_{15}$	$C_9$	$-jC_7$	$-jC_{15}$	$-C_9$		100
31	32	$jC_7$	$-jC_{15}$	$C_9$	$jC_7$	$-jC_6$	$-C_9$	$-jC_7$	$jC_{15}$	$C_9$	$-jC_7$	$jC_{15}$	$-C_9$		101
31	32	$jC_9$	$jC_{15}$	$C_7$	$jC_9$	$jC_{15}$	$-C_7$	$-jC_9$	$-jC_{15}$	$C_7$	$-jC_9$	$-jC_{15}$	$-C_7$		110
31	32	$jC_9$	$-jC_{15}$	$C_7$	$jC_9$	$-jC_{15}$	$-C_7$	$-jC_9$	$jC_{15}$	$C_7$	$-jC_9$	$jC_{15}$	$-C_7$		111

Note that the code construction for code groups 0 and 1 using the SCH codes from code sets 1 and 2 is shown. The construction for code groups 2 to 31 using the SCH codes from code sets 3 to 32 is done in the same way.

### 7.3 Evaluation of synchronisation codes

The evaluation of information transmitted in SCH on code group and frame timing is shown in table 7, where the 32 code groups are listed. Each code group is containing 4 specific scrambling codes (cf. section 6.3), each scrambling code associated with a specific short and long basic midamble code.

Each code group is additionally linked to a specific  $t_{\text{Offset}}$ , thus to a specific frame timing. By using this scheme, the UE can derive the position of the frame border due to the position of the SCH sequence and the knowledge of  $t_{\text{Offset}}$ . The complete mapping of Code Group to Scrambling Code, Midamble Codes and  $t_{\text{Offset}}$  is depicted in table 7.

**Table 7 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and  $t_{\text{Offset}}$ .**

CELL PARAMETER	Code Group	Associated Codes			Associated $t_{\text{Offset}}$
		Scrambling Code	Long Basic Midamble Code	Short Basic Midamble Code	
0	Group 1	Code 0	$m_{\text{PL}0}$	$m_{\text{SL}0}$	$t_0$
1		Code 1	$m_{\text{PL}1}$	$m_{\text{SL}1}$	
2		Code 2	$m_{\text{PL}2}$	$m_{\text{SL}2}$	
3		Code 3	$m_{\text{PL}3}$	$m_{\text{SL}3}$	
4	Group 2	Code 4	$m_{\text{PL}4}$	$m_{\text{SL}4}$	$t_1$
5		Code 5	$m_{\text{PL}5}$	$m_{\text{SL}5}$	
6		Code 6	$m_{\text{PL}6}$	$m_{\text{SL}6}$	
7		Code 7	$m_{\text{PL}7}$	$m_{\text{SL}7}$	
124	Group 32	Code 124	$m_{\text{PL}124}$	$m_{\text{SL}124}$	$t_{31}$
125		Code 125	$m_{\text{PL}125}$	$m_{\text{SL}125}$	
126		Code 126	$m_{\text{PL}126}$	$m_{\text{SL}126}$	
127		Code 127	$m_{\text{PL}127}$	$m_{\text{SL}127}$	

For basic midamble codes  $m_p$  cf. TS 25.221, annex A 'Basic Midamble Codes'.

## Annex A: Scrambling Codes

The applicable scrambling codes are listed in below. Code numbers are referring to Table 7 'Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and  $t_{\text{offset}}$ ' in chapter 7.2 'Code Allocation'.

Scrambling Code	$v_1$	$v_2$	$v_3$	$v_4$	$v_5$	$v_6$	$v_7$	$v_8$	$v_9$	$v_{10}$	$v_{11}$	$v_{12}$	$v_{13}$	$v_{14}$	$v_{15}$	$v_{16}$
Code 0	-1	1	-1	-1	-1	1	-1	-1	1	-1	1	1	-1	1	-1	-1
Code 1	1	1	1	1	1	-1	1	-1	1	-1	-1	1	1	1	-1	-1
Code 2	1	-1	1	1	1	-1	1	1	-1	1	1	1	1	-1	-1	-1
Code 3	1	1	1	-1	-1	-1	-1	1	-1	-1	1	-1	-1	-1	1	-1
Code 4	1	1	1	-1	-1	-1	-1	1	1	1	1	-1	1	1	1	-1
Code 5	-1	1	1	-1	-1	-1	1	1	1	1	1	1	1	-1	1	-1
Code 6	-1	1	-1	-1	-1	1	-1	-1	-1	1	1	1	1	-1	-1	-1
Code 7	1	-1	1	-1	-1	-1	-1	-1	1	1	-1	-1	-1	1	1	-1
Code 8	1	1	1	-1	-1	-1	1	-1	1	1	-1	1	1	1	1	-1
Code 9	1	1	-1	1	1	1	1	-1	1	1	1	-1	-1	-1	1	-1
Code 10	1	-1	1	-1	1	1	1	1	-1	-1	1	1	-1	1	1	-1
Code 11	-1	1	1	1	1	-1	-1	-1	-1	1	-1	-1	-1	1	-1	-1
Code 12	-1	-1	1	-1	-1	-1	1	-1	-1	-1	-1	1	1	1	1	-1
Code 13	1	-1	1	1	1	-1	-1	-1	1	-1	-1	-1	-1	1	-1	-1
Code 14	1	-1	-1	-1	-1	1	-1	-1	1	-1	1	1	1	-1	-1	-1
Code 15	1	1	-1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1
Code 16	1	-1	-1	1	-1	1	-1	1	-1	-1	-1	-1	1	1	-1	-1
Code 17	1	1	1	-1	1	1	1	-1	1	1	-1	1	-1	-1	1	-1
Code 18	-1	1	1	1	-1	1	-1	-1	-1	1	-1	-1	1	-1	-1	-1
Code 19	-1	1	-1	-1	1	-1	-1	-1	-1	1	1	1	-1	1	-1	-1
Code 20	-1	-1	-1	-1	1	-1	1	-1	-1	1	1	-1	1	1	-1	-1
Code 21	1	1	1	1	-1	-1	1	1	-1	1	1	-1	1	-1	1	-1
Code 22	1	-1	-1	-1	-1	1	1	1	-1	1	-1	-1	-1	1	-1	-1
Code 23	-1	1	1	1	-1	1	1	1	1	-1	1	1	-1	1	-1	-1
Code 24	-1	-1	1	-1	1	1	1	-1	-1	-1	-1	1	-1	-1	1	-1
Code 25	1	-1	1	1	1	-1	1	1	1	-1	1	1	-1	1	-1	-1
Code 26	1	-1	-1	-1	1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1
Code 27	-1	1	-1	-1	-1	1	1	1	1	-1	-1	-1	-1	1	-1	-1
Code 28	-1	-1	-1	1	-1	-1	-1	1	-1	-1	-1	1	1	1	1	-1
Code 29	1	-1	1	1	-1	1	-1	-1	-1	1	-1	-1	-1	1	-1	-1
Code 30	-1	-1	-1	-1	-1	-1	1	1	1	-1	-1	1	1	-1	1	-1
Code 31	1	1	-1	-1	1	1	1	1	-1	1	-1	1	-1	1	1	-1
Code 32	1	-1	-1	-1	1	-1	1	1	-1	1	-1	-1	1	-1	-1	-1
Code 33	-1	-1	-1	1	1	1	1	-1	1	1	1	-1	1	1	1	-1
Code 34	1	-1	-1	-1	1	-1	-1	-1	1	-1	1	1	-1	1	-1	-1
Code 35	1	-1	1	1	-1	1	-1	-1	1	-1	-1	-1	1	-1	-1	-1
Code 36	1	1	-1	1	1	1	-1	1	-1	-1	-1	1	1	1	1	-1
Code 37	-1	-1	-1	1	-1	-1	1	-1	-1	-1	1	-1	1	1	1	-1
Code 38	-1	1	-1	-1	1	-1	1	1	1	-1	-1	-1	1	-1	-1	-1
Code 39	-1	1	1	1	1	-1	-1	-1	1	-1	-1	-1	1	-1	-1	-1
Code 40	-1	1	-1	1	-1	-1	-1	-1	-1	-1	1	1	-1	1	1	-1
Code 41	1	1	-1	1	-1	-1	1	-1	-1	-1	1	-1	-1	-1	1	-1
Code 42	1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1	1	-1	-1	-1

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Code 43	-1	-1	1	1	-1	-1	-1	-1	-1	1	-1	1	-1	1	1	-1
Code 44	-1	-1	1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1	1	-1
Code 45	-1	-1	1	-1	1	1	-1	1	1	1	1	-1	1	1	1	-1
Code 46	-1	1	1	-1	1	1	-1	-1	-1	-1	-1	-1	1	-1	1	-1
Code 47	1	-1	-1	1	1	1	-1	-1	1	1	1	1	1	-1	1	-1
Code 48	1	1	-1	1	1	1	-1	1	1	1	-1	1	-1	-1	1	-1
Code 49	-1	-1	1	1	-1	1	1	-1	-1	1	-1	1	-1	-1	-1	-1
Code 50	1	1	-1	1	-1	-1	1	-1	1	1	1	-1	1	1	1	-1
Code 51	1	-1	-1	1	1	1	-1	-1	1	-1	1	-1	-1	-1	-1	-1
Code 52	1	1	1	-1	1	1	1	-1	-1	-1	-1	1	1	1	1	-1
Code 53	-1	1	1	1	-1	-1	-1	1	-1	1	1	1	1	1	1	-1
Code 54	-1	-1	1	-1	-1	-1	1	-1	1	1	-1	1	-1	-1	1	-1
Code 55	-1	1	1	-1	-1	-1	-1	-1	1	-1	1	-1	1	1	-1	-1
Code 56	-1	1	1	1	-1	1	1	1	-1	1	1	1	1	-1	-1	-1
Code 57	-1	1	1	-1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1
Code 58	-1	1	-1	1	-1	-1	-1	-1	-1	1	1	-1	1	1	-1	-1
Code 59	1	1	-1	-1	-1	-1	-1	-1	1	-1	1	-1	-1	1	1	-1
Code 60	-1	1	1	-1	1	1	1	1	-1	1	-1	1	1	1	-1	-1
Code 61	-1	-1	1	1	1	-1	-1	1	1	-1	1	-1	-1	-1	-1	-1
Code 62	-1	1	-1	-1	1	1	1	-1	1	-1	-1	-1	-1	-1	1	-1
Code 63	-1	1	-1	1	-1	-1	1	1	1	-1	-1	1	-1	-1	-1	-1
Code 64	1	-1	-1	1	-1	-1	1	1	-1	-1	-1	-1	1	-1	1	-1
Code 65	-1	-1	-1	1	1	1	1	-1	-1	-1	1	-1	-1	-1	1	-1
Code 66	-1	-1	-1	-1	1	-1	-1	1	1	1	-1	-1	1	-1	1	-1
Code 67	-1	-1	-1	1	1	1	-1	1	1	1	-1	1	1	1	1	-1
Code 68	1	-1	1	1	-1	-1	-1	1	1	-1	-1	-1	-1	-1	1	-1
Code 69	-1	-1	1	-1	1	-1	-1	-1	1	1	1	-1	-1	1	-1	-1
Code 70	1	1	-1	1	-1	-1	-1	1	-1	-1	-1	1	-1	-1	1	-1
Code 71	1	-1	-1	1	-1	-1	-1	-1	-1	1	-1	1	1	1	-1	-1
Code 72	1	1	1	1	-1	1	1	-1	1	1	-1	-1	1	-1	1	-1
Code 73	-1	1	1	1	-1	-1	-1	1	-1	1	-1	-1	-1	-1	1	-1
Code 74	1	1	-1	1	-1	1	-1	-1	-1	-1	-1	1	1	-1	-1	-1
Code 75	1	1	-1	-1	1	-1	-1	1	-1	1	-1	1	-1	-1	-1	-1
Code 76	-1	1	-1	-1	-1	-1	-1	1	-1	1	1	1	-1	-1	1	-1
Code 77	-1	1	-1	1	1	1	1	1	-1	1	1	-1	1	1	-1	-1
Code 78	-1	1	-1	1	-1	1	1	-1	-1	-1	1	1	-1	-1	-1	-1
Code 79	-1	1	-1	1	1	1	-1	-1	-1	1	1	-1	-1	-1	-1	-1
Code 80	1	1	-1	1	-1	1	-1	-1	-1	-1	1	-1	-1	1	-1	-1
Code 81	1	1	1	1	1	-1	1	-1	-1	-1	1	1	-1	1	1	-1
Code 82	-1	1	-1	1	1	1	1	1	1	1	-1	-1	-1	1	1	-1
Code 83	1	1	-1	-1	1	-1	1	-1	-1	-1	-1	-1	-1	1	1	-1
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Code 85	-1	1	1	-1	-1	1	-1	1	1	1	1	1	1	1	-1	-1
Code 86	-1	-1	-1	1	-1	-1	-1	1	1	1	-1	1	-1	-1	1	-1
Code 87	1	1	-1	-1	-1	1	-1	1	1	1	1	1	-1	1	1	-1
Code 88	-1	1	1	-1	1	1	-1	-1	1	-1	1	-1	-1	-1	-1	-1
Code 89	-1	1	-1	-1	1	-1	1	1	-1	1	-1	-1	-1	1	-1	-1
Code 90	1	-1	-1	-1	-1	-1	-1	1	1	-1	1	1	-1	-1	1	-1
Code 91	-1	1	-1	-1	-1	-1	1	-1	1	-1	1	1	-1	-1	1	-1
Code 92	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1	1	1	-1	-1
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Code 94	1	-1	1	-1	-1	1	1	-1	1	1	-1	-1	-1	-1	-1	-1
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Code 97	1	1	-1	-1	1	-1	-1	1	1	1	1	1	1	-1	1	-1

## Spreading and modulation (TDD)

## TS 25.223 V2.4.0 (1999-10)

Code 98	1	1	-1	1	1	-1	1	1	1	1	1	-1	1	-1	-1	-1
Code 99	1	-1	1	-1	1	-1	-1	1	-1	-1	1	1	-1	-1	-1	-1
Code 100	1	-1	1	1	-1	-1	1	-1	-1	1	-1	-1	-1	-1	1	-1
Code 101	1	1	1	1	-1	1	-1	1	1	1	-1	-1	-1	1	1	-1
Code 102	1	-1	1	-1	1	1	1	1	-1	1	1	-1	1	1	-1	-1
Code 103	-1	-1	1	-1	-1	1	-1	-1	1	1	1	-1	1	-1	-1	-1
Code 104	1	-1	1	1	-1	1	1	1	-1	1	1	1	-1	1	-1	-1
Code 105	1	1	1	1	1	1	-1	-1	1	-1	-1	1	1	-1	1	-1
Code 106	1	1	-1	-1	-1	1	-1	1	-1	-1	-1	-1	-1	1	1	-1
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Code 108	-1	-1	-1	1	-1	1	-1	-1	1	1	-1	1	1	-1	-1	-1
Code 109	-1	1	-1	1	1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1
Code 110	-1	-1	1	1	-1	1	-1	1	1	1	1	1	-1	1	1	-1
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Code 113	1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	1	1	-1
Code 114	-1	-1	-1	1	1	-1	-1	-1	1	1	-1	1	-1	1	-1	-1
Code 115	1	-1	-1	1	1	1	1	1	1	-1	1	-1	1	1	-1	-1
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Code 119	-1	-1	-1	1	-1	1	1	1	-1	-1	1	-1	-1	1	-1	-1
Code 120	-1	-1	1	-1	1	-1	1	1	-1	-1	1	-1	-1	1	-1	-1
Code 121	-1	1	1	1	1	1	1	-1	1	-1	1	1	-1	-1	1	-1
Code 122	-1	-1	-1	1	1	-1	1	1	-1	-1	1	-1	1	-1	-1	-1
Code 123	1	-1	1	-1	1	1	-1	-1	1	-1	-1	1	-1	-1	-1	-1
Code 124	-1	-1	1	1	1	1	1	1	1	-1	1	-1	-1	1	1	-1
Code 125	1	-1	-1	1	1	-1	1	-1	1	1	1	1	1	1	-1	-1
Code 126	1	1	1	1	-1	1	-1	1	-1	1	1	-1	1	1	-1	-1
Code 127	1	-1	1	-1	-1	-1	-1	-1	1	-1	-1	1	1	1	-1	-1



## History

Document history		
Date	Version	Comment
February 1999	0.0.1	Document created. Based on ETSI XX.11, v1.0.0 and ARIB Vol.3, v1.0-1.0.
23 <sup>rd</sup> Feb. 1999	0.0.2	Document updated according to TSGR1#2(99)076 which was agreed in TSG RAN WG1 meeting#2, Yokohama, February 23, 1999
25 <sup>th</sup> Feb. 1999	0.1.0	Numbering increased due to approval by TSG RAN WG1 meeting #2 in Yokohama
1 <sup>st</sup> to 5 <sup>th</sup> Mar. 1999	1.0.0	Numbering increased due to presentation at TSG RAN #2 meeting
23 <sup>rd</sup> Mar. 1999	1.0.1	Document updated according to TSGR1#3(99)161 which was approved in TSG RAN WG1 meeting#3, Nynaeshamn, March 23, 1999
26 <sup>th</sup> Mar. 1999	1.1.0	Version approved by WG#3 meeting (Nynaeshamn).
21 <sup>st</sup> Apr. 1999	2.0.0	Numbering increased due to presentation at TSG RAN #3 meeting
22 <sup>nd</sup> Apr. 1999	2.0.0	Endorsed by TSG-RAN as TS 25.223 V2.0.0
1 <sup>st</sup> June 1999	2.0.1	Section 5.3 Pulse shape filtering was removed to WG4 specifications.
4 <sup>th</sup> June 1999	2.0.2	Changed the PSC and SSC which was approved in TSG RAN WG1 #5 meeting.
4 <sup>th</sup> June 1999	2.1.0	Numbering increased due to presentation at TSG RAN #4 meeting
22 June, 1999	2.1.0	Endorsed by TSG-RAN
13 July, 1999	2.1.1	Updated according to OHG Harmonization agreement
20 Aug, 1999	2.1.2	Updated Table-1 and Annex was approved in TSG RAN WG1 #6 meeting.
30 Aug, 1999	2.2.0	Version approved by WG#7 meeting (Hannover).
3 <sup>rd</sup> Sep, 1999	2.2.1	Changed the SSC which was approved in TSG RAN WG1 #7 meeting.
3 <sup>rd</sup> Sep, 1999	2.3.0	Numbering increased due to presentation at TSG RAN #5 meeting
4 <sup>th</sup> Oct, 1999	2.4.0	Update of TS25.223 according to text proposal:R1-99e91
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