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***Document* R1-00-512**
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CHANGE REQUEST

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25.223	**CR**	**008**	Current Version:	3.2.0

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

For submission to: RAN #8 *list expected approval meeting # here ↑*

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

Source: Siemens AG **Date:** 07.04.2000

Subject: Editorial Modifications for 25.223

Work item:

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

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

Reason for change: Some editorial modifications to 25.223 are required after approval of removal of synch-case 3 and change of signal point constellation. The scope of the spec was somehow changed in a former release of the document.

Clauses affected: 1, 7.1, 7.2

Other specs affected:

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

Other comments:

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1 Scope

The present document describes spreading and modulation for UTRA Physical Layer TDD mode.

~~The present document describes multiplexing, channel coding and interleaving for UTRA Physical Layer TDD mode.~~

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.

Define a = < x_1, x_2, x_3, …, x_{16} > = < 1, 1, 1, 1, 1, 1, -1, -1, 1, -1, 1, -1, 1, -1, -1, 1 >

The PSC code word is generated by repeating the sequence 'a' modulated by a Golay complementary sequence and creating a complex-valued sequence with identical real and imaginary components.

The PSC code word C_p is defined as C_p=< y(0),y(1),y(2),...,y(255) >

where $y = (1+\mathrm{j}) \times < a, a, a, -a, -a, a, -a, -a, a, a, a, -a, a, -a, a, a >$

and the left most index corresponds to the chip transmitted first in each time slot.

The ~~16~~ 12 secondary synchronization code words, {C_0,…,~~C_{15}~~ C_{11} } are complex valued with identical real and imaginary components, and are constructed from the position wise multiplication of a Hadamard sequence and a sequence z, defined as

z = $< b, b, b, -b, b, b, -b, -b, b, -b, b, -b, b, -b, -b, -b, -b >$, where

b = $< x_1, \ldots, x_8, -x_9, \ldots, -x_{16} >$ = <1, 1, 1, 1, 1, 1, -1, -1, -1, 1, -1, 1, -1, 1, 1, -1>.

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

$$H_0 = (1)$$

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

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

Denote the *n*:th Hadamard sequence h_n as a row of H_8 numbered from the top, n = 0, 1, 2, …, 255, in the sequel.

Furthermore, let $h_m(i)$ and $z(i)$ denote the *i:*th symbol of the sequence h_m and *z*, respectively where *i* = 0, 1, 2, …, 255 and *i* = 0 corresponds to the leftmost symbol.

The i:th SCH code word, $C_{SCH,i}$, i = 0, …, ~~15~~ 11 is then defined as

$C_{SCH,i} = (1 + j) \times <h_m(0) \times z(0), h_m(1) \times z(1), h_m(2) \times z(2), \ldots, h_m(255) \times z(255)>$,

where *m* = (16×i) and the leftmost chip in the sequence corresponds to the chip transmitted first in time.

~~This code word is chosen from every 16th row of the matrix H_8., which yields 16 possible codewords.~~

The Secondary SCH code words are defined in terms of $C_{SCH,i}$ and the definition of {C_0,…,~~C_{15}~~ C_{11} } now follows as:

$C_i = C_{SCH,\,i}$, i=0,…,11~~5~~

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)
- The position of the frame within an interleaving period of 20 msec (1 bit, Cases 1, 2)

- The position of the slot within the frame (1 bit, Case 2)

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 (Case 2) 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 (Case 2) 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 and four code sets for Case 2. The set is used to provide the following information:

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.

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}.

The following subsections 7.2.1 to 7.2.2 refer to the two cases of SCH/P-CCPCH usage as described in [7].

Note that in the Tables 4-~~6~~ 5 corresponding to Cases 1,2~~, and 3~~, respectively, Frame 1 implies the frame with an odd SFN and Frame 2 implies the frame with an even SFN.

7.2.1 Code allocation for Case 1:

~~NOTE: 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_{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~~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~~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~~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~~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~~jC_2	C_0	~~JC_1~~jC_1	jC_2	$-C_0$	t_{12}
13	1	jC_1	$-jC_2$	C_0	~~JC_1~~jC_1	$-jC_2$	$-C_0$	t_{13}
14	1	$-jC_1$	~~JC_2~~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~~jC_4	C_5	jC_3	jC_4	$-C_5$	t_{20}
…	…	…	…	…	…	…	…	…
24	2	jC_3	~~JC_5~~jC_5	C_4	jC_3	~~JC_5~~jC_5	$-C_4$	t_{24}
…	…	…	…	…	…	…	…	…
31	2	$-jC_4$	$-jC_5$	C_3	$-jC_4$	$-jC_5$	$-C_3$	t_{31}

NOTE: 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.