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# Text Proposal for 25.221

## 5.4 The physical synchronisation channel (PSCH)

~~The PSCH is similar to the FDD SCH, where the code group of a cell can be derived when decoding the FDD synchronisation channel~~. In TDD mode code group of a cell can be derived from the synchronization channel. A~~a~~dditional information, received from higher layers on SCH transport channel, is also transmitted to the UE in PSCH in case 3 from below. In order not to limit the uplink/downlink asymmetry the PSCH is mapped on one or two downlink slots per frame only.

There are three cases of PSCH and CCPCH allocation as follows:

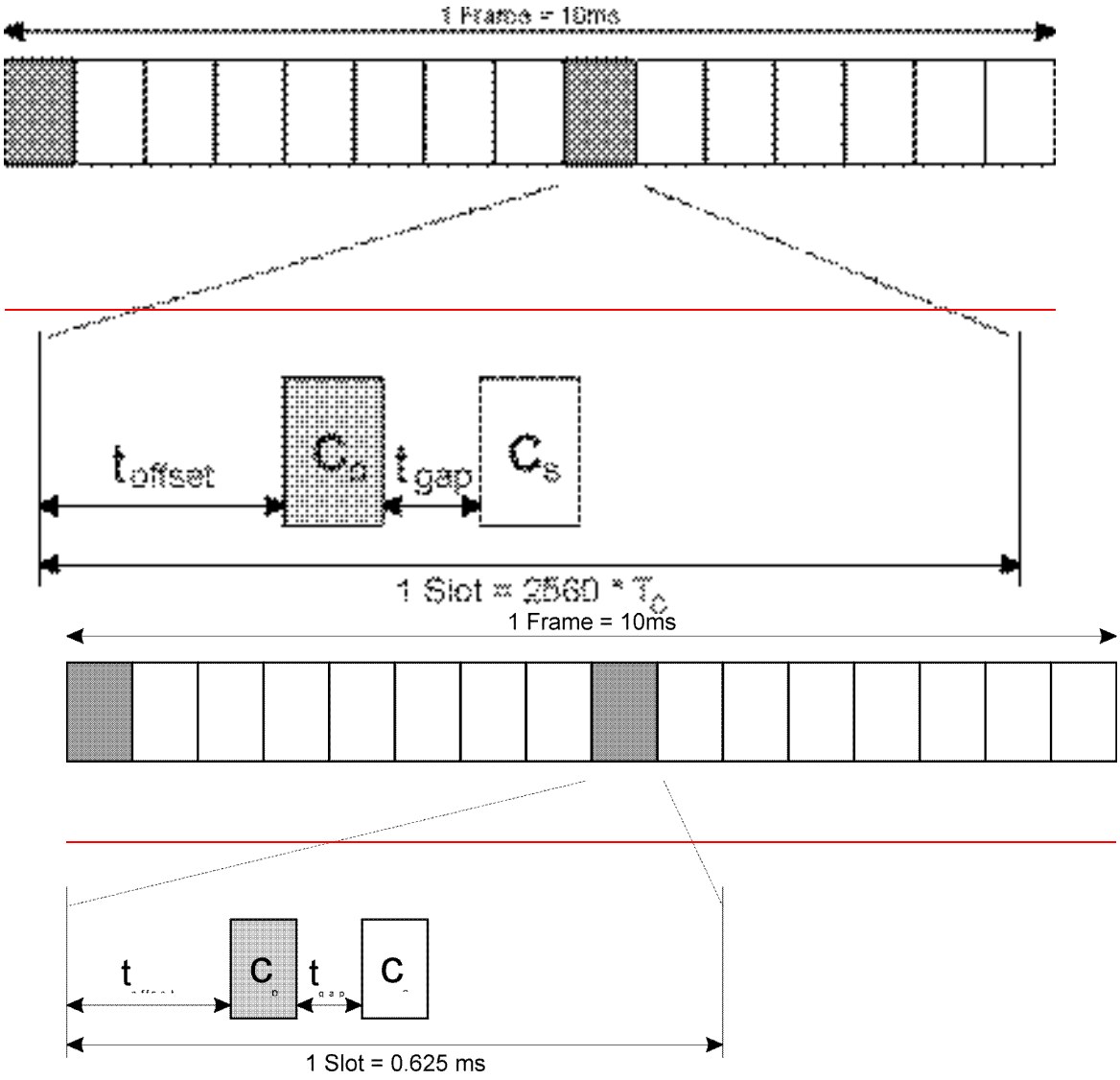
Case 1) PSCH and CCPCH allocated in TS#k, k=0….14

Case 2) PSCH in two TS and CCPCH in the same two TS: TS#k and TS#k+8, k=0…6

Case 3) PSCH in two TS, TS#k and TS#k+8, k=0…6, and the primary CCPCH TS#i, i=0…14, pointed by PSCH. Pointing is determined via the SCH from the higher layers.

These three cases are addressed by higher layers using the SCCH in TDD Mode. The position of PSCH (value of k) in frame can change on a long term basis in any case.

Figure 1~~Figure 1~~~~Figure 1~~Figure 1~~Figure 11~~ is an example for transmission of PSCH, k=0, of Case 2 or Case 3.


1 Frame = 10ms
t offset
C s
t gap
C s
1 Slot = 2560 * T c
1 Frame = 10ms
t
C
t
C
1 Slot = 0.625 ms

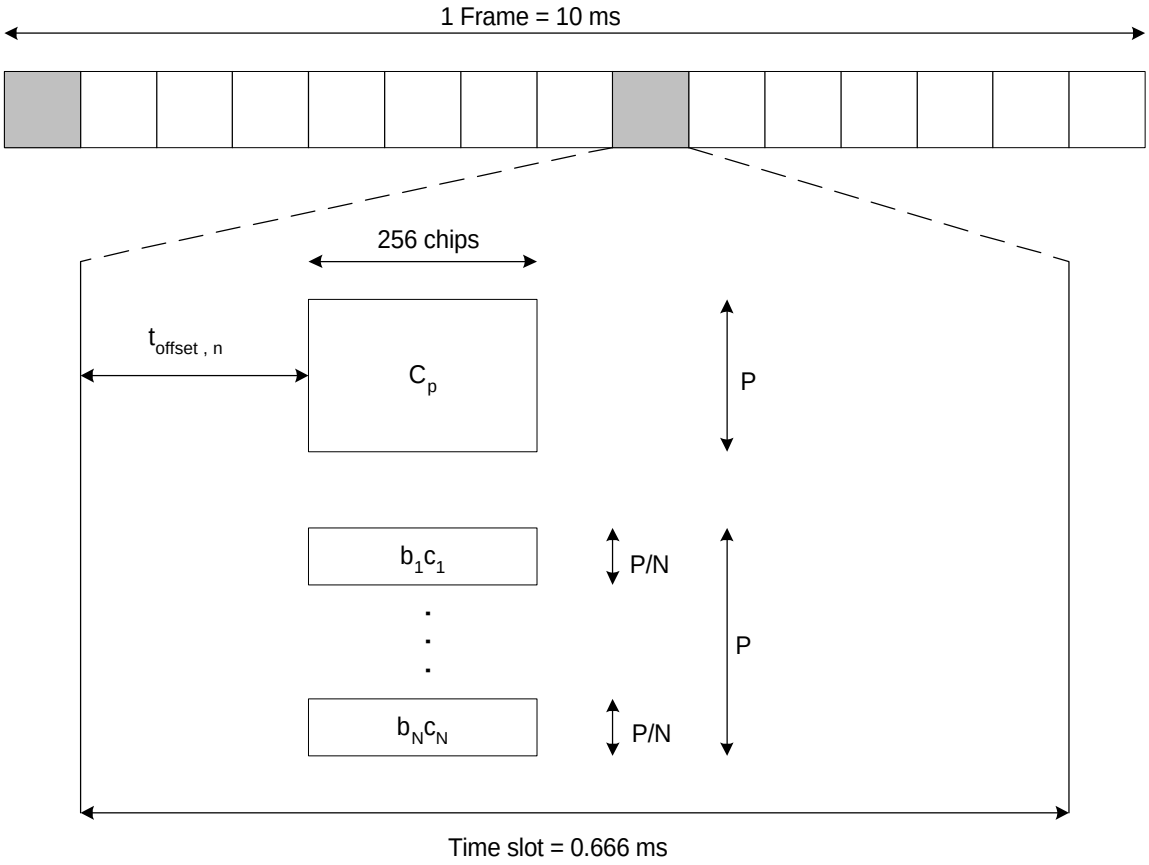



**Figure 1~~1~~1~~1~~11 Scheme for Physical Synchronisation channel PSCH consisting of one primary sequence $C_p$ and N=3 parallel secondary sequences ~~one secondary sequence $C_s$~~ in slot k and k+8 (example for k=0 in Case 2 or Case 3)**

As depicted in Figure 1~~Figure 1~~Figure 1Figure 1~~Figure 11~~, the PSCH consists of a primary and three secondary code sequences with 256 chips length. The primary and secondary code sequences are defined in TS 25.223 chapter 7 'Synchronization codes'. The secondary codes are transmitted either in the I channel or the Q channel, depending on the code group.~~The used sequences $C_p$ and $C_s$ are the same as in FDD Mode, see TS25.223, chapter 7 'Synchronization codes'.~~

~~The time offset $t_{gap}$ is the time between the primary synchronisation code and the secondary synchronisation code. It provides enough time for calculations and a better interference distribution, since the codes do not superimpose. <Editor's note: The value of $t_{gap}$ is to be defined>~~

Due to mobile to mobile interference, it is mandatory for public TDD systems to keep synchronisation between base stations. As a consequence of this, a capture effect concerning PSCH can arise. The time offset $t_{offset}$ enables the system to overcome the capture effect.

The time offset $t_{offset}$ is one of 32 values, depending on the cell parameter, thus on the code group of the cell, cf. 'Table 9 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and $t_{offset}$' in 'TS25.223 Spreading and modulation (TDD)'. The exact value for $t_{offset}$, regarding column 'Associated $t_{offset}$' in Table 9 from TS25.221, is given by:

~~$$t_n = t_{offset,n} = n \cdot T_C \cdot \left\lfloor \frac{2560 - 96 - 512 - \frac{t_{gap}}{T_C}}{31} \right\rfloor \quad ; n = 0 \ldots 31$$~~

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

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

# Text Proposal for 25.223

# 7. Synchronisation codes

## 7.1 Code Generation

~~The code generation for synchronisation codes is handled in the same way as in FDD Mode. Thus we refer to TS 25.213, chapter '5.2.3 Synchronisation Codes'. From this procedure we obtain one primary synchronisation code $C_p = C_{SCH,0}$ and seventeen different secondary synchronisation codes $C_{S,i} = C_{SCH,i}$ with i=1…17.~~

~~To avoid misunderstandings when documents are reorganised in the future, we repeat the actual content of this chapter below using small font.~~

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 a = < $x_1$, $x_2$, $x_3$, …, $x_{16}$ > = < 0, 0, 0, 0, 0, 0, 1, 1, 0, 1,0, 1, 0, 1, 1, 0 > and

~~b = < $x_1$, $x_2$, $x_3$, …, $x_8$, $x_1$, $x_2$, $x_3$, …, $x_8$ >~~ b = $< x_1, \ldots, x_8, \bar{x}_9, \ldots, \bar{x}_{16} >$ = <0,0,0,0,0,0,1,1,1,0,1,0,1,0,0,1>.~~

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

Letting $y = < a, a, a, \bar{a}, \bar{a}, a, \bar{a}, \bar{a}, a, a, a, \bar{a}, a, \bar{a}, a, a >$

The definition of the PSC code word $C_p$ follows (the left most index corresponds to the chip transmitted first in each time slot):
$C_p$=< y(0),y(1),y(2),...,y(255) >.

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

~~Let the sequence z = < b, b, b, b, b, b, b, b, b, b, b, b, b, b, b, b>.~~ Then the Secondary Synchronization code words, $\{C_{0}, \ldots, C_{15}\}$ 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:

$$H_0 = (0)$$

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

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~~8~~th row of the matrix $H_8$., which yields ~~Therefore, there are~~ ~~32~~16 possible codewords~~ out of which~~ *n* = 0~~1~~, 1~~2~~,…,15~~7 are used~~.

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

~~Then $h_n$ is equal to the row of $H_8$ numbered by the bit reverse of the 8 bit binary representation of *n*.~~

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

$C_{SCH,n}$ = < $h_n(0)$+ z(0), $h_n(1)$+ z(1), $h_n(2)$+ z(2), …,$h_n(255)$+ z(255) >,

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' ->

The Secondary SCHcode words are defined in terms of $C_{SCH,n}$ and the definition of {$C_{0}$,…,$C_{15}$} now follows as:

$C_i = C_{SCH,i}$, i=0,…,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. ~~Sequences of 8 secondary SCH codes, thus composed of $C_{s,i}$ from chapter 7.1 above, are used to transmit information on the PSCH. In general the information on the code group of a cell and on the frame timing (see TS 25.224, Section '6.6.1 Cell Search') is transmitted in the PSCH. According to TS 25.221 section '7.4 The Physical Synchronisation Channel (PSCH)', there is case (3) where additional information from SCH transport channel is to be transmitted in the PSCH.~~

- 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 CCCH (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:

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:

| 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: $C_1, C_{11}, C_{12}$.
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 sequences of secondary SCH codes are constructed such that their cyclic shifts are unique, i.e. a non-zero cyclic shift less than 8 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 8 of any of the sequences is not equivalent to itself with any other cyclic shift less than 8. This property is used to uniquely determine the transmitted sequence in the receiver.~~

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.

| Code Group | Code Set | Frame 1 | | | Frame 2 | | | Associated $t_{offset}$ |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | $C_1$ | $C_2$ | $C_3$ | $C_1$ | $C_2$ | $-C_3$ | $t_0$ |
| 1 | 1 | $C_1$ | $-C_2$ | $C_3$ | $C_1$ | $-C_2$ | $-C_3$ | $t_1$ |
| 2 | 1 | $-C_1$ | $C_2$ | $C_3$ | $-C_1$ | $C_2$ | $-C_3$ | $t_2$ |
| 3 | 1 | $-C_1$ | $-C_2$ | $C_3$ | $-C_1$ | $-C_2$ | $-C_3$ | $t_3$ |
| 4 | 1 | $jC_1$ | $jC_2$ | $C_3$ | $jC_1$ | $jC_2$ | $-C_3$ | $t_4$ |
| 5 | 1 | $jC_1$ | $-jC_2$ | $C_3$ | $jC_1$ | $-jC_2$ | $-C_3$ | $t_5$ |
| 6 | 1 | $-jC_1$ | $jC_2$ | $C_3$ | $-jC_1$ | $jC_2$ | $-C_3$ | $t_6$ |
| 7 | 1 | $-jC_1$ | $-jC_2$ | $C_3$ | $-jC_1$ | $-jC_2$ | $-C_3$ | $t_7$ |
| 8 | 1 | $jC_1$ | $jC_3$ | $C_2$ | $jC_1$ | $jC_3$ | $-C_2$ | $t_8$ |
| 9 | 1 | $jC_1$ | $-jC_3$ | $C_2$ | $jC_1$ | $-jC_3$ | $-C_2$ | $t_9$ |
| 10 | 1 | $-jC_1$ | $jC_3$ | $C_2$ | $-jC_1$ | $jC_3$ | $-C_2$ | $t_{10}$ |
| 11 | 1 | $-jC_1$ | $-jC_3$ | $C_2$ | $-jC_1$ | $-jC_3$ | $-C_2$ | $t_{11}$ |
| 12 | 1 | $jC_2$ | $jC_3$ | $C_1$ | $jC_2$ | $jC_3$ | $-C_1$ | $t_{12}$ |
| 13 | 1 | $jC_2$ | $-jC_3$ | $C_1$ | $jC_2$ | $-jC_3$ | $-C_1$ | $t_{13}$ |
| 14 | 1 | $-jC_2$ | $jC_3$ | $C_1$ | $-jC_2$ | $jC_3$ | $-C_1$ | $t_{14}$ |
| 15 | 1 | $-jC_2$ | $-jC_3$ | $C_1$ | $-jC_2$ | $-jC_3$ | $-C_1$ | $t_{15}$ |
| 16 | 2 | $C_4$ | $C_5$ | $C_6$ | $C_4$ | $C_5$ | $-C_6$ | $t_{16}$ |
| 17 | 2 | $C_4$ | $-C_5$ | $C_6$ | $C_4$ | $-C_5$ | $-C_6$ | $t_{17}$ |
| … | … | … | … | … | … | … | … | … |
| 20 | 2 | $jC_4$ | $jC_5$ | $C_6$ | $jC_4$ | $jC_5$ | $-C_6$ | $t_{20}$ |
| … | … | … | … | … | … | … | … | … |
| 24 | 2 | $jC_4$ | $jC_6$ | $C_5$ | $jC_4$ | $jC_6$ | $-C_5$ | $t_{24}$ |
| … | … | … | … | … | … | … | … | … |
| 31 | 2 | $-jC_5$ | $-jC_6$ | $C_4$ | $-jC_5$ | $-jC_6$ | $-C_4$ | $t_{31}$ |

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:

| Code Group | Code Set | Frame 1 | | | | | | Frame 2 | | | | | | Associated $t_{offset}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slot k | | | Slot k+8 | | | Slot k | | | Slot k+8 | | | |
| 0 | 1 | $C_1$ | $C_2$ | $C_3$ | $C_1$ | $C_2$ | $-C_3$ | $-C_1$ | $-C_2$ | $C_3$ | $-C_1$ | $-C_2$ | $-C_3$ | $t_0$ |
| 1 | 1 | $C_1$ | $-C_2$ | $C_3$ | $C_1$ | $-C_2$ | $-C_3$ | $-C_1$ | $C_2$ | $C_3$ | $-C_1$ | $C_2$ | $-C_3$ | $t_1$ |
| 2 | 1 | $jC_1$ | $jC_2$ | $C_3$ | $jC_1$ | $jC_2$ | $-C_3$ | $-jC_1$ | $-jC_2$ | $C_3$ | $-jC_1$ | $-jC_2$ | $-C_3$ | $t_2$ |
| 3 | 1 | $jC_1$ | $-jC_2$ | $C_3$ | $jC_1$ | $-jC_2$ | $-C_3$ | $-jC_1$ | $jC_2$ | $C_3$ | $-jC_1$ | $jC_2$ | $-C_3$ | $t_3$ |
| 4 | 1 | $jC_1$ | $jC_3$ | $C_2$ | $jC_1$ | $jC_3$ | $-C_2$ | $-jC_1$ | $-jC_3$ | $C_2$ | $-jC_1$ | $-jC_3$ | $-C_2$ | $t_4$ |
| 5 | 1 | $jC_1$ | $-jC_3$ | $C_2$ | $jC_1$ | $-jC_3$ | $-C_2$ | $-jC_1$ | $jC_3$ | $C_2$ | $-jC_1$ | $jC_3$ | $-C_2$ | $t_5$ |
| 6 | 1 | $jC_2$ | $jC_3$ | $C_1$ | $jC_2$ | $jC_3$ | $-C_1$ | $-jC_2$ | $-jC_3$ | $C_1$ | $-jC_2$ | $-jC_3$ | $-C_1$ | $t_6$ |
| 7 | 1 | $jC_2$ | $-jC_3$ | $C_1$ | $jC_2$ | $-jC_3$ | $-C_1$ | $-jC_2$ | $jC_3$ | $C_1$ | $-jC_2$ | $jC_3$ | $-C_1$ | $t_7$ |
| 8 | 2 | $C_4$ | $C_5$ | $C_6$ | $C_4$ | $C_5$ | $-C_6$ | $-C_4$ | $-C_5$ | $C_6$ | $-C_4$ | $-C_5$ | $-C_6$ | $t_8$ |
| 9 | 2 | $C_4$ | $-C_5$ | $C_6$ | $C_4$ | $-C_5$ | $-C_6$ | $-C_4$ | $C_5$ | $C_6$ | $-C_4$ | $C_5$ | $-C_6$ | $t_9$ |
| 10 | 2 | $jC_4$ | $jC_5$ | $C_6$ | $jC_4$ | $jC_5$ | $-C_6$ | $-jC_4$ | $-jC_5$ | $C_6$ | $-jC_4$ | $-jC_5$ | $-C_6$ | $t_{10}$ |
| 11 | 2 | $jC_4$ | $-jC_5$ | $C_6$ | $jC_4$ | $-jC_5$ | $-C_6$ | $-jC_4$ | $jC_5$ | $C_6$ | $-jC_4$ | $jC_5$ | $-C_6$ | $t_{11}$ |
| 12 | 2 | $jC_4$ | $jC_6$ | $C_5$ | $jC_4$ | $jC_6$ | $-C_5$ | $-jC_4$ | $-jC_6$ | $C_5$ | $-jC_4$ | $-jC_6$ | $-C_5$ | $t_{12}$ |
| 13 | 2 | $jC_4$ | $-jC_6$ | $C_5$ | $jC_4$ | $-jC_6$ | $-C_5$ | $-jC_4$ | $jC_6$ | $C_5$ | $-jC_4$ | $jC_6$ | $-C_5$ | $t_{13}$ |
| 14 | 2 | $jC_5$ | $jC_6$ | $C_4$ | $jC_5$ | $jC_6$ | $-C_4$ | $-jC_5$ | $-jC_6$ | $C_4$ | $-jC_5$ | $-jC_6$ | $-C_4$ | $t_{14}$ |
| 15 | 2 | $jC_5$ | $-jC_6$ | $C_4$ | $jC_5$ | $-jC_6$ | $-C_4$ | $-jC_5$ | $jC_6$ | $C_4$ | $-jC_5$ | $jC_6$ | $-C_4$ | $t_{15}$ |
| 16 | 3 | $C_7$ | $C_8$ | $C_9$ | $C_7$ | $C_8$ | $-C_9$ | $-C_7$ | $-C_8$ | $C_9$ | $-C_7$ | $-C_8$ | $-C_9$ | $t_{16}$ |
| … | … | … | … | … | … | … | … | … | … | … | … | … | … | … |
| 23 | 3 | $jC_8$ | $-jC_9$ | $C_7$ | $jC_8$ | $-jC_9$ | $-C_7$ | $-jC_8$ | $jC_9$ | $C_7$ | $-jC_8$ | $jC_9$ | $-C_7$ | $t_{20}$ |
| 24 | 4 | $C_{10}$ | $C_{11}$ | $C_{12}$ | $C_{10}$ | $C_{11}$ | $-C_{12}$ | $C_{10}$ | $C_{11}$ | $C_{12}$ | $C_{10}$ | $C_{11}$ | $-C_{12}$ | $t_{24}$ |
| … | … | … | … | … | … | … | … | … | … | … | … | … | … | … |
| 31 | 4 | $jC_{11}$ | $-jC_{12}$ | $C_{10}$ | $jC_{11}$ | $jC_{12}$ | $-C_{10}$ | $-jC_{11}$ | $jC_{12}$ | $C_{10}$ | $-jC_{11}$ | $jC_{12}$ | $-C_{10}$ | $t_{31}$ |

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.

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### 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.

| 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 | $C_1$ | $C_2$ | $C_3$ | $C_1$ | $C_2$ | $-C_3$ | $-C_1$ | $-C_2$ | $C_3$ | $-C_1$ | $-C_2$ | $-C_3$ | $t_0$ | 000 |
| 0 | 1 | $C_1$ | $-C_2$ | $C_3$ | $C_1$ | $-C_2$ | $-C_3$ | $-C_1$ | $C_2$ | $C_3$ | $-C_1$ | $C_2$ | $-C_3$ | | 001 |
| 0 | 1 | $jC_1$ | $jC_2$ | $C_3$ | $jC_1$ | $jC_2$ | $-C_3$ | $-jC_1$ | $-jC_2$ | $C_3$ | $-jC_1$ | $-jC_2$ | $-C_3$ | | 010 |
| 0 | 1 | $jC_1$ | $-jC_2$ | $C_3$ | $jC_1$ | $-jC_2$ | $-C_3$ | $-jC_1$ | $jC_2$ | $C_3$ | $-jC_1$ | $jC_2$ | $-C_3$ | | 011 |
| 0 | 1 | $jC_1$ | $jC_3$ | $C_2$ | $jC_1$ | $jC_3$ | $-C_2$ | $-jC_1$ | $-jC_3$ | $C_2$ | $-jC_1$ | $-jC_3$ | $-C_2$ | | 100 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | $jC_1$ | $-jC_3$ | $C_2$ | $jC_1$ | $-jC_3$ | $-C_2$ | $-jC_1$ | $jC_3$ | $C_2$ | $-jC_1$ | $jC_3$ | $-C_2$ | | | 101 |
| 0 | 1 | $jC_2$ | $jC_3$ | $C_1$ | $jC_2$ | $jC_3$ | $-C_1$ | $-jC_2$ | $-jC_3$ | $C_1$ | $-jC_2$ | $-jC_3$ | $-C_1$ | | | 110 |
| 0 | 1 | $jC_2$ | $-jC_3$ | $C_1$ | $jC_2$ | $-jC_3$ | $-C_1$ | $-jC_2$ | $jC_3$ | $C_1$ | $-jC_2$ | $jC_3$ | $-C_1$ | | | 111 |
| 1 | 2 | $C_4$ | $C_5$ | $C_6$ | $C_4$ | $C_5$ | $-C_6$ | $-C_4$ | $-C_5$ | $C_6$ | $-C_4$ | $-C_5$ | $-C_6$ | $t_2$ | | 000 |
| 1 | 2 | $C_4$ | $-C_5$ | $C_6$ | $C_4$ | $-C_5$ | $-C_6$ | $-C_4$ | $C_5$ | $C_6$ | $-C_4$ | $C_5$ | $-C_6$ | | | 001 |
| 1 | 2 | $jC_4$ | $jC_5$ | $C_6$ | $jC_4$ | $jC_5$ | $-C_6$ | $-jC_4$ | $-jC_5$ | $C_6$ | $-jC_4$ | $-jC_5$ | $-C_6$ | | | 010 |
| 1 | 2 | $jC_4$ | $-jC_5$ | $C_6$ | $jC_4$ | $-jC_5$ | $-C_6$ | $-jC_4$ | $jC_5$ | $C_6$ | $-jC_4$ | $jC_5$ | $-C_6$ | | | 011 |
| 1 | 2 | $jC_4$ | $jC_6$ | $C_5$ | $jC_4$ | $jC_6$ | $-C_5$ | $-jC_4$ | $-jC_6$ | $C_5$ | $-jC_4$ | $-jC_6$ | $-C_5$ | | | 100 |
| 1 | 2 | $jC_4$ | $-jC_6$ | $C_5$ | $jC_4$ | $-jC_6$ | $-C_5$ | $-jC_4$ | $jC_6$ | $C_5$ | $-jC_4$ | $jC_6$ | $-C_5$ | | | 101 |
| 1 | 2 | $jC_5$ | $jC_6$ | $C_4$ | $jC_5$ | $jC_6$ | $-C_4$ | $-jC_5$ | $-jC_6$ | $C_4$ | $-jC_5$ | $-jC_6$ | $-C_4$ | | | 110 |
| 1 | 2 | $jC_5$ | $-jC_6$ | $C_4$ | $jC_5$ | $-jC_6$ | $-C_4$ | $-jC_5$ | $jC_6$ | $C_4$ | $-jC_5$ | $jC_6$ | $-C_4$ | | | 111 |
| 2 | 3 | $C_7$ | $C_8$ | $C_9$ | $C_7$ | $C_8$ | $-C_9$ | $-C_7$ | $-C_8$ | $C_9$ | $-C_7$ | $-C_8$ | $-C_9$ | $t_3$ | | 000 |
| … | … | … | … | … | … | … | … | … | … | … | … | … | … | | | … |
| 2 | 3 | $jC_8$ | $-jC_9$ | $C_7$ | $jC_8$ | $-jC_9$ | $-C_7$ | $-jC_8$ | $jC_9$ | $C_7$ | $-jC_8$ | $jC_9$ | $-C_7$ | | | 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.

The evaluation of transmitted information on code group and frame timing is shown in table 9, where the 32 code groups are listed. Each code group is containing 4 specific scrambling codes, each scrambling code associated with a specific short and long basic midamble code.

Each code group is additionally linked to a specific $t_{Offset}$, 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 $t_{Offset}$. ~~Positioning of the secondary SCH codes is depicted in the last line of table 10 and 11.~~

The complete mapping of Code Group to Scrambling Code, Midamble Codes and $t_{Offset}$ is depicted in table 9.

| CELL PARA-METER | Code Group | Associated Codes | | | Associated $t_{Offset}$ |
|---|---|---|---|---|---|
| | | Scrambling Code | Long Basic Midamble Code | Short Basic Midamble Code | |
| 0 | Group 1 | Code 0 | $m_{PL0}$ | $m_{SL0}$ | $t_0$ |
| 1 | | Code 1 | $m_{PL1}$ | $m_{SL1}$ | |
| 2 | | Code 2 | $m_{PL2}$ | $m_{SL2}$ | |
| 3 | | Code 3 | $m_{PL3}$ | $m_{SL3}$ | |
| 4 | Group 2 | Code 4 | $m_{PL4}$ | $m_{SL4}$ | $t_1$ |
| 5 | | Code 5 | $m_{PL5}$ | $m_{SL5}$ | |
| 6 | | Code 6 | $m_{PL6}$ | $m_{SL6}$ | |
| 7 | | Code 7 | $m_{PL7}$ | $m_{SL7}$ | |
| . . . . | | | | | |
| 124 | Group 32 | Code 124 | $m_{PL124}$ | $m_{SL124}$ | $t_{31}$ |
| 125 | | Code 125 | $m_{PL125}$ | $m_{SL125}$ | |
| 126 | | Code 126 | $m_{PL126}$ | $m_{SL126}$ | |
| 127 | | Code 127 | $m_{PL127}$ | $m_{SL127}$ | |

**Table 9 Mapping scheme for Cell Parameters, Code Groups, Scrambling Codes, Midambles and $t_{Offset}$.**

For basic midamble codes $m_P$ cf.TS 25.221, annex A 'Basic Midamble Codes'.
~~For CELL PARAMETERS also cf. TS 25.231.~~

~~The following subchapters 7.2.1 and 7.2.2 are referring 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 and 2~~

~~In table 10 the 32 sequences used in the cases 1 and 2 of PSCH/CCPCH scheme are listed. Again, these are used to encode the 32 different code groups.~~

~~It should be mentioned that the sequences used here can be derived from FDD sequences by puncturing every 2nd position, thus a UE can use same database for FDD and TDD.~~

| Code Group | Secondary SCH Code Position | | | | | | | | Associated $t_{Offset}$ |
|---|---|---|---|---|---|---|---|---|---|
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | |
| Group1 | $C_1$ | $C_2$ | $C_6$ | $C_{15}$ | $C_8$ | $C_7$ | $C_3$ | $C_{11}$ | $t_0$ |
| Group2 | $C_1$ | $C_9$ | $C_{10}$ | $C_{13}$ | $C_{11}$ | $C_3$ | $C_2$ | $C_{16}$ | $t_1$ |
| Group 3 | $C_1$ | $C_{16}$ | $C_{14}$ | $C_{11}$ | $C_{14}$ | $C_{16}$ | $C_1$ | $C_4$ | $t_2$ |
| Group 4 | $C_1$ | $C_6$ | $C_1$ | $C_9$ | $C_{17}$ | $C_{12}$ | $C_{17}$ | $C_9$ | $t_3$ |
| Group 5 | $C_1$ | $C_{13}$ | $C_5$ | $C_7$ | $C_4$ | $C_8$ | $C_{16}$ | $C_{14}$ | $t_4$ |
| Group 6 | $C_1$ | $C_3$ | $C_9$ | $C_5$ | $C_8$ | $C_4$ | $C_{15}$ | $C_2$ | $t_5$ |
| Group 7 | $C_1$ | $C_{10}$ | $C_{13}$ | $C_3$ | $C_9$ | $C_{17}$ | $C_{14}$ | $C_7$ | $t_6$ |
| Group 8 | $C_1$ | $C_{17}$ | $C_{17}$ | $C_1$ | $C_{12}$ | $C_1$ | $C_{13}$ | $C_{12}$ | $t_7$ |
| Group 9 | $C_1$ | $C_7$ | $C_4$ | $C_{16}$ | $C_{15}$ | $C_9$ | $C_{12}$ | $C_{17}$ | $t_8$ |
| Group 10 | $C_1$ | $C_{14}$ | $C_8$ | $C_{14}$ | $C_1$ | $C_5$ | $C_{11}$ | $C_5$ | $t_9$ |
| Group 11 | $C_1$ | $C_4$ | $C_{12}$ | $C_{12}$ | $C_4$ | $C_1$ | $C_{10}$ | $C_{10}$ | $t_{10}$ |
| Group 12 | $C_1$ | $C_{11}$ | $C_{16}$ | $C_{10}$ | $C_7$ | $C_{14}$ | $C_9$ | $C_{15}$ | $t_{11}$ |
| Group 13 | $C_1$ | $C_1$ | $C_3$ | $C_8$ | $C_{10}$ | $C_{10}$ | $C_8$ | $C_3$ | $t_{12}$ |
| Group 14 | $C_1$ | $C_8$ | $C_7$ | $C_6$ | $C_{13}$ | $C_6$ | $C_7$ | $C_8$ | $t_{13}$ |
| Group 15 | $C_1$ | $C_{15}$ | $C_{11}$ | $C_4$ | $C_{16}$ | $C_2$ | $C_6$ | $C_{13}$ | $t_{14}$ |
| Group 16 | $C_1$ | $C_5$ | $C_{15}$ | $C_2$ | $C_2$ | $C_{15}$ | $C_5$ | $C_1$ | $t_{15}$ |
| Group 17 | $C_1$ | $C_{12}$ | $C_2$ | $C_{17}$ | $C_5$ | $C_{11}$ | $C_4$ | $C_6$ | $t_{16}$ |
| Group 18 | $C_2$ | $C_{11}$ | $C_{14}$ | $C_4$ | $C_{10}$ | $C_1$ | $C_{15}$ | $C_8$ | $t_{17}$ |
| Group 19 | $C_2$ | $C_1$ | $C_1$ | $C_2$ | $C_{13}$ | $C_{14}$ | $C_{14}$ | $C_{13}$ | $t_{18}$ |
| Group 20 | $C_2$ | $C_8$ | $C_5$ | $C_{17}$ | $C_{16}$ | $C_{10}$ | $C_{13}$ | $C_1$ | $t_{19}$ |
| Group 21 | $C_2$ | $C_{15}$ | $C_9$ | $C_{15}$ | $C_2$ | $C_8$ | $C_{12}$ | $C_6$ | $t_{20}$ |
| Group 22 | $C_2$ | $C_5$ | $C_{13}$ | $C_{13}$ | $C_5$ | $C_2$ | $C_{11}$ | $C_{11}$ | $t_{21}$ |
| Group 23 | $C_2$ | $C_{12}$ | $C_{17}$ | $C_{11}$ | $C_8$ | $C_{15}$ | $C_{10}$ | $C_{16}$ | $t_{22}$ |
| Group 24 | $C_2$ | $C_2$ | $C_4$ | $C_9$ | $C_{11}$ | $C_{11}$ | $C_9$ | $C_4$ | $t_{23}$ |
| Group 25 | $C_2$ | $C_9$ | $C_8$ | $C_7$ | $C_{14}$ | $C_7$ | $C_8$ | $C_9$ | $t_{24}$ |
| Group 26 | $C_2$ | $C_{16}$ | $C_{12}$ | $C_5$ | $C_{17}$ | $C_3$ | $C_7$ | $C_{14}$ | $t_{25}$ |
| Group 27 | $C_2$ | $C_6$ | $C_{16}$ | $C_3$ | $C_3$ | $C_{16}$ | $C_6$ | $C_2$ | $t_{26}$ |
| Group 28 | $C_2$ | $C_{13}$ | $C_3$ | $C_1$ | $C_6$ | $C_{12}$ | $C_5$ | $C_7$ | $t_{27}$ |
| Group 29 | $C_2$ | $C_3$ | $C_7$ | $C_{16}$ | $C_9$ | $C_8$ | $C_4$ | $C_{12}$ | $t_{28}$ |
| Group 30 | $C_2$ | $C_{10}$ | $C_{11}$ | $C_{14}$ | $C_{12}$ | $C_4$ | $C_3$ | $C_{17}$ | $t_{29}$ |
| Group 31 | $C_2$ | $C_{17}$ | $C_{15}$ | $C_{12}$ | $C_{15}$ | $C_{17}$ | $C_2$ | $C_5$ | $t_{30}$ |
| Group 32 | $C_2$ | $C_7$ | $C_2$ | $C_{10}$ | $C_1$ | $C_{13}$ | $C_1$ | $C_{10}$ | $t_{31}$ |
| Frame position | Frame #1 | | Frame #2 | | Frame #3 | | Frame #4 | | |

**Table 10 Spreading Code allocation for Secondary SCH Code, case 2) of PSCH/CCPCH scheme**

## 7.2.2 Code allocation for case 3

In table 11 the 256 sequences used in case 3 of PSCH/CCPCH scheme are listed. In addition to the information on code group three bits from SCH transport channel are transmitted to the UE with these codes.

~~*<Editors note: The usage of CCPCH pointing is for further study (cf. TDoc R1#2(99) 74)>*~~

| ~~Code Group~~ | ~~Secondary PSCH Code at Position~~ | | | | | | | | ~~Additional Bits from SCH Transport Channel~~ | ~~Associated $t_{Offset}$~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| | ~~#1~~ | ~~#2~~ | ~~#3~~ | ~~#4~~ | ~~#5~~ | ~~#6~~ | ~~#7~~ | ~~#8~~ | | |
| ~~Group 1~~ | ~~C2~~ | ~~C14~~ | ~~C6~~ | ~~C8~~ | ~~C4~~ | ~~C9~~ | ~~C17~~ | ~~C15~~ | ~~000~~ | ~~$t_0$~~ |
| | ~~C2~~ | ~~C4~~ | ~~C10~~ | ~~C6~~ | ~~C7~~ | ~~C5~~ | ~~C16~~ | ~~C3~~ | ~~001~~ | |
| | ~~C3~~ | ~~C3~~ | ~~C5~~ | ~~C10~~ | ~~C12~~ | ~~C12~~ | ~~C10~~ | ~~C5~~ | ~~010~~ | |
| | ~~C3~~ | ~~C10~~ | ~~C9~~ | ~~C8~~ | ~~C15~~ | ~~C8~~ | ~~C9~~ | ~~C10~~ | ~~011~~ | |
| | ~~C3~~ | ~~C17~~ | ~~C13~~ | ~~C6~~ | ~~C1~~ | ~~C4~~ | ~~C8~~ | ~~C15~~ | ~~100~~ | |
| | ~~C3~~ | ~~C7~~ | ~~C17~~ | ~~C4~~ | ~~C4~~ | ~~C17~~ | ~~C7~~ | ~~C3~~ | ~~101~~ | |
| | ~~C3~~ | ~~C14~~ | ~~C4~~ | ~~C2~~ | ~~C7~~ | ~~C13~~ | ~~C6~~ | ~~C8~~ | ~~110~~ | |
| | ~~C3~~ | ~~C4~~ | ~~C8~~ | ~~C17~~ | ~~C10~~ | ~~C9~~ | ~~C5~~ | ~~C13~~ | ~~111~~ | |
| ~~Group 2~~ | ~~C3~~ | ~~C11~~ | ~~C12~~ | ~~C15~~ | ~~C13~~ | ~~C5~~ | ~~C4~~ | ~~C1~~ | ~~000~~ | ~~$t_1$~~ |
| | ~~C3~~ | ~~C1~~ | ~~C16~~ | ~~C13~~ | ~~C16~~ | ~~C1~~ | ~~C3~~ | ~~C6~~ | ~~001~~ | |
| | ~~C3~~ | ~~C8~~ | ~~C3~~ | ~~C11~~ | ~~C2~~ | ~~C14~~ | ~~C2~~ | ~~C11~~ | ~~010~~ | |
| | ~~C3~~ | ~~C15~~ | ~~C7~~ | ~~C9~~ | ~~C5~~ | ~~C10~~ | ~~C1~~ | ~~C16~~ | ~~011~~ | |
| | ~~C3~~ | ~~C5~~ | ~~C11~~ | ~~C7~~ | ~~C8~~ | ~~C6~~ | ~~C17~~ | ~~C4~~ | ~~100~~ | |
| | ~~C3~~ | ~~C12~~ | ~~C15~~ | ~~C5~~ | ~~C11~~ | ~~C2~~ | ~~C16~~ | ~~C9~~ | ~~101~~ | |
| | ~~C3~~ | ~~C2~~ | ~~C2~~ | ~~C3~~ | ~~C14~~ | ~~C15~~ | ~~C15~~ | ~~C14~~ | ~~110~~ | |
| | ~~C3~~ | ~~C9~~ | ~~C6~~ | ~~C1~~ | ~~C17~~ | ~~C11~~ | ~~C14~~ | ~~C2~~ | ~~111~~ | |
| ~~Group 3~~ | ~~C3~~ | ~~C16~~ | ~~C10~~ | ~~C16~~ | ~~C3~~ | ~~C7~~ | ~~C13~~ | ~~C7~~ | ~~000~~ | ~~$t_2$~~ |
| | ~~C3~~ | ~~C6~~ | ~~C14~~ | ~~C14~~ | ~~C6~~ | ~~C3~~ | ~~C12~~ | ~~C12~~ | ~~001~~ | |
| | ~~C3~~ | ~~C13~~ | ~~C1~~ | ~~C12~~ | ~~C9~~ | ~~C16~~ | ~~C11~~ | ~~C17~~ | ~~010~~ | |
| | ~~C4~~ | ~~C12~~ | ~~C13~~ | ~~C16~~ | ~~C14~~ | ~~C6~~ | ~~C5~~ | ~~C2~~ | ~~011~~ | |
| | ~~C4~~ | ~~C2~~ | ~~C17~~ | ~~C14~~ | ~~C17~~ | ~~C2~~ | ~~C4~~ | ~~C7~~ | ~~100~~ | |
| | ~~C4~~ | ~~C9~~ | ~~C4~~ | ~~C12~~ | ~~C3~~ | ~~C15~~ | ~~C3~~ | ~~C12~~ | ~~101~~ | |
| | ~~C4~~ | ~~C16~~ | ~~C8~~ | ~~C10~~ | ~~C6~~ | ~~C11~~ | ~~C2~~ | ~~C17~~ | ~~110~~ | |
| | ~~C4~~ | ~~C6~~ | ~~C12~~ | ~~C8~~ | ~~C9~~ | ~~C7~~ | ~~C1~~ | ~~C5~~ | ~~111~~ | |
| ~~Group 4~~ | ~~C4~~ | ~~C13~~ | ~~C16~~ | ~~C6~~ | ~~C12~~ | ~~C3~~ | ~~C17~~ | ~~C10~~ | ~~000~~ | ~~$t_3$~~ |
| | ~~C4~~ | ~~C3~~ | ~~C3~~ | ~~C4~~ | ~~C15~~ | ~~C16~~ | ~~C16~~ | ~~C15~~ | ~~001~~ | |
| | ~~C4~~ | ~~C10~~ | ~~C7~~ | ~~C2~~ | ~~C1~~ | ~~C12~~ | ~~C15~~ | ~~C3~~ | ~~010~~ | |
| | ~~C4~~ | ~~C17~~ | ~~C11~~ | ~~C17~~ | ~~C4~~ | ~~C8~~ | ~~C14~~ | ~~C8~~ | ~~011~~ | |
| | ~~C4~~ | ~~C7~~ | ~~C15~~ | ~~C15~~ | ~~C7~~ | ~~C4~~ | ~~C13~~ | ~~C13~~ | ~~100~~ | |
| | ~~C4~~ | ~~C14~~ | ~~C2~~ | ~~C13~~ | ~~C10~~ | ~~C17~~ | ~~C12~~ | ~~C1~~ | ~~101~~ | |
| | ~~C4~~ | ~~C4~~ | ~~C6~~ | ~~C11~~ | ~~C13~~ | ~~C13~~ | ~~C11~~ | ~~C6~~ | ~~110~~ | |
| | ~~C4~~ | ~~C11~~ | ~~C10~~ | ~~C9~~ | ~~C16~~ | ~~C9~~ | ~~C10~~ | ~~C11~~ | ~~111~~ | |
| ~~Group 5~~ | ~~C4~~ | ~~C1~~ | ~~C14~~ | ~~C7~~ | ~~C2~~ | ~~C5~~ | ~~C9~~ | ~~C16~~ | ~~000~~ | ~~$t_4$~~ |
| | ~~C4~~ | ~~C8~~ | ~~C1~~ | ~~C5~~ | ~~C5~~ | ~~C1~~ | ~~C8~~ | ~~C4~~ | ~~001~~ | |
| | ~~C4~~ | ~~C15~~ | ~~C5~~ | ~~C3~~ | ~~C8~~ | ~~C14~~ | ~~C7~~ | ~~C9~~ | ~~010~~ | |
| | ~~C4~~ | ~~C5~~ | ~~C9~~ | ~~C1~~ | ~~C11~~ | ~~C10~~ | ~~C6~~ | ~~C14~~ | ~~011~~ | |
| | ~~C5~~ | ~~C4~~ | ~~C4~~ | ~~C5~~ | ~~C16~~ | ~~C17~~ | ~~C17~~ | ~~C16~~ | ~~100~~ | |
| | ~~C5~~ | ~~C11~~ | ~~C8~~ | ~~C3~~ | ~~C2~~ | ~~C13~~ | ~~C16~~ | ~~C4~~ | ~~101~~ | |
| | ~~C5~~ | ~~C1~~ | ~~C12~~ | ~~C1~~ | ~~C5~~ | ~~C9~~ | ~~C15~~ | ~~C9~~ | ~~110~~ | |
| | ~~C5~~ | ~~C8~~ | ~~C16~~ | ~~C16~~ | ~~C8~~ | ~~C5~~ | ~~C14~~ | ~~C14~~ | ~~111~~ | |
| ~~Group 6~~ | ~~C5~~ | ~~C15~~ | ~~C3~~ | ~~C14~~ | ~~C11~~ | ~~C1~~ | ~~C13~~ | ~~C2~~ | ~~000~~ | ~~$t_5$~~ |
| | ~~C5~~ | ~~C5~~ | ~~C7~~ | ~~C12~~ | ~~C14~~ | ~~C14~~ | ~~C12~~ | ~~C7~~ | ~~001~~ | |
| | ~~C5~~ | ~~C12~~ | ~~C11~~ | ~~C10~~ | ~~C17~~ | ~~C10~~ | ~~C11~~ | ~~C12~~ | ~~010~~ | |
| | ~~C5~~ | ~~C2~~ | ~~C15~~ | ~~C8~~ | ~~C3~~ | ~~C6~~ | ~~C10~~ | ~~C17~~ | ~~011~~ | |
| | ~~C5~~ | ~~C9~~ | ~~C2~~ | ~~C6~~ | ~~C6~~ | ~~C2~~ | ~~C9~~ | ~~C5~~ | ~~100~~ | |
| | ~~C5~~ | ~~C16~~ | ~~C6~~ | ~~C4~~ | ~~C9~~ | ~~C15~~ | ~~C8~~ | ~~C10~~ | ~~101~~ | |
| | ~~C5~~ | ~~C6~~ | ~~C10~~ | ~~C2~~ | ~~C12~~ | ~~C11~~ | ~~C7~~ | ~~C15~~ | ~~110~~ | |
| | ~~C5~~ | ~~C13~~ | ~~C14~~ | ~~C17~~ | ~~C15~~ | ~~C7~~ | ~~C6~~ | ~~C3~~ | ~~111~~ | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Group7 | C5 | C3 | C1 | C15 | C1 | C3 | C5 | C8 | 000 | $t_6$ |
| | C5 | C10 | C5 | C13 | C4 | C16 | C4 | C13 | 001 | |
| | C5 | C17 | C9 | C11 | C7 | C12 | C3 | C1 | 010 | |
| | C5 | C7 | C13 | C9 | C10 | C8 | C2 | C6 | 011 | |
| | C5 | C14 | C17 | C7 | C13 | C4 | C1 | C11 | 100 | |
| | C6 | C13 | C12 | C11 | C1 | C11 | C12 | C13 | 101 | |
| | C6 | C3 | C16 | C9 | C4 | C7 | C11 | C1 | 110 | |
| | C6 | C10 | C3 | C7 | C7 | C3 | C10 | C6 | 111 | |
| Group 8 | C6 | C17 | C7 | C5 | C10 | C16 | C9 | C11 | 000 | $t_7$ |
| | C6 | C7 | C11 | C3 | C13 | C12 | C8 | C16 | 001 | |
| | C6 | C14 | C15 | C1 | C16 | C8 | C7 | C4 | 010 | |
| | C6 | C4 | C2 | C16 | C2 | C4 | C6 | C9 | 011 | |
| | C6 | C11 | C6 | C14 | C5 | C17 | C5 | C14 | 100 | |
| | C6 | C1 | C10 | C12 | C8 | C13 | C4 | C2 | 101 | |
| | C6 | C8 | C14 | C10 | C11 | C9 | C3 | C7 | 110 | |
| | C6 | C15 | C1 | C8 | C14 | C5 | C2 | C12 | 111 | |
| Group 9 | C6 | C5 | C5 | C6 | C17 | C1 | C1 | C17 | 000 | $t_8$ |
| | C6 | C12 | C9 | C4 | C3 | C14 | C17 | C5 | 001 | |
| | C6 | C2 | C13 | C2 | C6 | C10 | C16 | C10 | 010 | |
| | C6 | C9 | C17 | C17 | C9 | C6 | C15 | C15 | 011 | |
| | C6 | C16 | C4 | C15 | C12 | C2 | C14 | C3 | 100 | |
| | C6 | C6 | C8 | C13 | C15 | C15 | C13 | C8 | 101 | |
| | C7 | C5 | C3 | C17 | C3 | C5 | C7 | C10 | 110 | |
| | C7 | C12 | C7 | C15 | C6 | C1 | C6 | C15 | 111 | |
| Group 10 | C7 | C2 | C11 | C13 | C9 | C14 | C5 | C3 | 000 | $t_9$ |
| | C7 | C9 | C15 | C11 | C12 | C10 | C4 | C8 | 001 | |
| | C7 | C16 | C2 | C9 | C15 | C6 | C3 | C13 | 010 | |
| | C7 | C6 | C6 | C7 | C1 | C2 | C2 | C1 | 011 | |
| | C7 | C13 | C10 | C5 | C4 | C15 | C1 | C6 | 100 | |
| | C7 | C3 | C14 | C3 | C7 | C11 | C17 | C11 | 101 | |
| | C7 | C10 | C1 | C1 | C10 | C7 | C16 | C16 | 110 | |
| | C7 | C17 | C5 | C16 | C13 | C3 | C15 | C4 | 111 | |
| Group 11 | C7 | C7 | C9 | C14 | C16 | C16 | C14 | C9 | 000 | $t_{10}$ |
| | C7 | C14 | C13 | C12 | C2 | C12 | C13 | C14 | 001 | |
| | C7 | C4 | C17 | C10 | C5 | C8 | C12 | C2 | 010 | |
| | C7 | C11 | C4 | C8 | C8 | C4 | C11 | C7 | 011 | |
| | C7 | C1 | C8 | C6 | C11 | C17 | C10 | C12 | 100 | |
| | C7 | C8 | C12 | C4 | C14 | C13 | C9 | C17 | 101 | |
| | C7 | C15 | C16 | C2 | C17 | C9 | C8 | C5 | 110 | |
| | C8 | C14 | C11 | C6 | C5 | C16 | C2 | C7 | 111 | |
| Group 12 | C8 | C4 | C15 | C4 | C8 | C12 | C1 | C12 | 000 | $t_{11}$ |
| | C8 | C11 | C2 | C2 | C11 | C8 | C17 | C17 | 001 | |
| | C8 | C1 | C6 | C17 | C14 | C4 | C16 | C5 | 010 | |
| | C8 | C8 | C10 | C15 | C17 | C17 | C15 | C10 | 011 | |
| | C8 | C15 | C14 | C13 | C3 | C13 | C14 | C15 | 100 | |
| | C8 | C5 | C1 | C11 | C6 | C9 | C13 | C3 | 101 | |
| | C8 | C12 | C5 | C9 | C9 | C5 | C12 | C8 | 110 | |
| | C8 | C2 | C9 | C7 | C12 | C1 | C11 | C13 | 111 | |
| Group 13 | C8 | C9 | C13 | C5 | C15 | C14 | C10 | C1 | 000 | $t_{12}$ |
| | C8 | C16 | C17 | C3 | C1 | C10 | C9 | C6 | 001 | |
| | C8 | C6 | C4 | C1 | C4 | C6 | C8 | C11 | 010 | |
| | C8 | C13 | C8 | C16 | C7 | C2 | C7 | C16 | 011 | |
| | C8 | C3 | C12 | C14 | C10 | C15 | C6 | C4 | 100 | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | C8 | C10 | C16 | C12 | C13 | C11 | C5 | C9 | 101 | |
| | C8 | C17 | C3 | C10 | C16 | C7 | C4 | C14 | 110 | |
| | C8 | C7 | C7 | C8 | C2 | C3 | C3 | C2 | 111 | |
| Group 14 | C9 | C6 | C2 | C12 | C7 | C10 | C14 | C4 | 000 | $t_{13}$ |
| | C9 | C13 | C6 | C10 | C10 | C6 | C13 | C9 | 001 | |
| | C9 | C3 | C10 | C8 | C13 | C2 | C12 | C14 | 010 | |
| | C9 | C10 | C14 | C6 | C16 | C15 | C11 | C2 | 011 | |
| | C9 | C17 | C1 | C4 | C2 | C11 | C10 | C7 | 100 | |
| | C9 | C7 | C5 | C2 | C5 | C7 | C9 | C12 | 101 | |
| | C9 | C14 | C9 | C17 | C8 | C3 | C8 | C17 | 110 | |
| | C9 | C4 | C13 | C15 | C11 | C16 | C7 | C5 | 111 | |
| Group 15 | C9 | C11 | C17 | C13 | C14 | C12 | C6 | C10 | 000 | $t_{14}$ |
| | C9 | C1 | C4 | C11 | C17 | C8 | C5 | C15 | 001 | |
| | C9 | C8 | C8 | C9 | C3 | C4 | C4 | C3 | 010 | |
| | C9 | C15 | C12 | C7 | C6 | C17 | C3 | C8 | 011 | |
| | C9 | C5 | C16 | C5 | C9 | C13 | C2 | C13 | 100 | |
| | C9 | C12 | C3 | C3 | C12 | C9 | C1 | C1 | 101 | |
| | C9 | C2 | C7 | C1 | C15 | C5 | C17 | C6 | 110 | |
| | C9 | C9 | C11 | C16 | C1 | C1 | C16 | C11 | 111 | |
| Group 16 | C9 | C16 | C15 | C14 | C4 | C14 | C15 | C16 | 000 | $t_{15}$ |
| | C10 | C15 | C10 | C1 | C9 | C4 | C9 | C1 | 001 | |
| | C10 | C5 | C14 | C16 | C12 | C17 | C8 | C6 | 010 | |
| | C10 | C12 | C1 | C14 | C15 | C13 | C7 | C11 | 011 | |
| | C10 | C2 | C5 | C12 | C1 | C9 | C6 | C16 | 100 | |
| | C10 | C9 | C9 | C10 | C4 | C5 | C5 | C4 | 101 | |
| | C10 | C16 | C13 | C8 | C7 | C1 | C4 | C9 | 110 | |
| | C10 | C6 | C17 | C6 | C10 | C14 | C3 | C14 | 111 | |
| Group 17 | C10 | C13 | C4 | C4 | C13 | C10 | C2 | C2 | 000 | $t_{16}$ |
| | C10 | C3 | C8 | C2 | C16 | C6 | C1 | C7 | 001 | |
| | C10 | C10 | C12 | C17 | C2 | C2 | C17 | C12 | 010 | |
| | C10 | C17 | C16 | C15 | C5 | C15 | C16 | C17 | 011 | |
| | C10 | C7 | C3 | C13 | C8 | C11 | C15 | C5 | 100 | |
| | C10 | C14 | C7 | C11 | C11 | C7 | C14 | C10 | 101 | |
| | C10 | C4 | C11 | C9 | C14 | C3 | C13 | C15 | 110 | |
| | C10 | C11 | C15 | C7 | C17 | C16 | C12 | C3 | 111 | |
| Group 18 | C10 | C1 | C2 | C5 | C3 | C12 | C11 | C8 | 000 | $t_{17}$ |
| | C10 | C8 | C6 | C3 | C6 | C8 | C10 | C13 | 001 | |
| | C11 | C7 | C1 | C7 | C11 | C15 | C4 | C15 | 010 | |
| | C11 | C14 | C5 | C5 | C14 | C11 | C3 | C3 | 011 | |
| | C11 | C4 | C9 | C3 | C17 | C7 | C2 | C8 | 100 | |
| | C11 | C11 | C13 | C1 | C3 | C3 | C1 | C13 | 101 | |
| | C11 | C1 | C17 | C16 | C6 | C16 | C17 | C1 | 110 | |
| | C11 | C8 | C4 | C14 | C9 | C12 | C16 | C6 | 111 | |
| Group 19 | C11 | C15 | C8 | C12 | C12 | C8 | C15 | C11 | 000 | $t_{18}$ |
| | C11 | C5 | C12 | C10 | C15 | C4 | C14 | C16 | 001 | |
| | C11 | C12 | C16 | C8 | C1 | C17 | C13 | C4 | 010 | |
| | C11 | C2 | C3 | C6 | C4 | C13 | C12 | C9 | 011 | |
| | C11 | C9 | C7 | C4 | C7 | C9 | C11 | C14 | 100 | |
| | C11 | C16 | C11 | C2 | C10 | C5 | C10 | C2 | 101 | |
| | C11 | C6 | C15 | C17 | C13 | C1 | C9 | C7 | 110 | |
| | C11 | C13 | C2 | C15 | C16 | C14 | C8 | C12 | 111 | |
| Group 20 | C11 | C3 | C6 | C13 | C2 | C10 | C7 | C17 | 000 | $t_{19}$ |
| | C11 | C10 | C10 | C11 | C5 | C6 | C6 | C5 | 001 | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | C11 | C17 | C14 | C9 | C8 | C2 | C5 | C10 | 010 | |
| | C12 | C16 | C9 | C13 | C13 | C9 | C16 | C12 | 011 | |
| | C12 | C6 | C13 | C11 | C16 | C5 | C15 | C17 | 100 | |
| | C12 | C13 | C17 | C9 | C2 | C1 | C14 | C5 | 101 | |
| | C12 | C3 | C4 | C7 | C5 | C14 | C13 | C10 | 110 | |
| | C12 | C10 | C8 | C5 | C8 | C10 | C12 | C15 | 111 | |
| Group 21 | C12 | C17 | C12 | C3 | C11 | C6 | C11 | C3 | 000 | $t_{20}$ |
| | C12 | C7 | C16 | C1 | C14 | C2 | C10 | C8 | 001 | |
| | C12 | C14 | C3 | C16 | C17 | C15 | C9 | C13 | 010 | |
| | C12 | C4 | C7 | C14 | C3 | C11 | C8 | C1 | 011 | |
| | C12 | C11 | C11 | C12 | C6 | C7 | C7 | C6 | 100 | |
| | C12 | C1 | C15 | C10 | C9 | C3 | C6 | C11 | 101 | |
| | C12 | C8 | C2 | C8 | C12 | C16 | C5 | C16 | 110 | |
| | C12 | C15 | C6 | C6 | C15 | C12 | C4 | C4 | 111 | |
| Group 22 | C12 | C5 | C10 | C4 | C1 | C8 | C3 | C9 | 000 | $t_{21}$ |
| | C12 | C12 | C14 | C2 | C4 | C4 | C2 | C14 | 001 | |
| | C12 | C2 | C1 | C17 | C7 | C17 | C1 | C2 | 010 | |
| | C12 | C9 | C5 | C15 | C10 | C13 | C17 | C7 | 011 | |
| | C13 | C8 | C17 | C2 | C15 | C3 | C11 | C9 | 100 | |
| | C13 | C15 | C4 | C17 | C1 | C16 | C10 | C14 | 101 | |
| | C13 | C5 | C8 | C15 | C4 | C12 | C9 | C2 | 110 | |
| | C13 | C12 | C12 | C13 | C7 | C8 | C8 | C7 | 111 | |
| Group 23 | C13 | C2 | C16 | C11 | C10 | C4 | C7 | C12 | 000 | $t_{22}$ |
| | C13 | C9 | C3 | C9 | C13 | C17 | C6 | C17 | 001 | |
| | C13 | C16 | C7 | C7 | C16 | C13 | C5 | C5 | 010 | |
| | C13 | C6 | C11 | C5 | C2 | C9 | C4 | C10 | 011 | |
| | C13 | C13 | C15 | C3 | C5 | C5 | C3 | C15 | 100 | |
| | C13 | C3 | C2 | C1 | C8 | C1 | C2 | C3 | 101 | |
| | C13 | C10 | C6 | C16 | C11 | C14 | C1 | C8 | 110 | |
| | C13 | C17 | C10 | C14 | C14 | C10 | C17 | C13 | 111 | |
| Group 24 | C13 | C7 | C14 | C12 | C17 | C6 | C16 | C1 | 000 | $t_{23}$ |
| | C13 | C14 | C1 | C10 | C3 | C2 | C15 | C6 | 001 | |
| | C13 | C4 | C5 | C8 | C6 | C15 | C14 | C11 | 010 | |
| | C13 | C11 | C9 | C6 | C9 | C11 | C13 | C16 | 011 | |
| | C13 | C1 | C13 | C4 | C12 | C7 | C12 | C4 | 100 | |
| | C14 | C17 | C8 | C8 | C17 | C14 | C6 | C6 | 101 | |
| | C14 | C7 | C12 | C6 | C3 | C10 | C5 | C11 | 110 | |
| | C14 | C14 | C16 | C4 | C6 | C6 | C4 | C16 | 111 | |
| Group 25 | C14 | C4 | C3 | C2 | C9 | C2 | C3 | C4 | 000 | $t_{24}$ |
| | C14 | C11 | C7 | C17 | C12 | C15 | C2 | C9 | 001 | |
| | C14 | C1 | C11 | C15 | C15 | C11 | C1 | C14 | 010 | |
| | C14 | C8 | C15 | C13 | C1 | C7 | C17 | C2 | 011 | |
| | C14 | C15 | C2 | C11 | C4 | C3 | C16 | C7 | 100 | |
| | C14 | C5 | C6 | C9 | C7 | C16 | C15 | C12 | 101 | |
| | C14 | C12 | C10 | C7 | C10 | C12 | C14 | C17 | 110 | |
| | C14 | C2 | C14 | C5 | C13 | C8 | C13 | C5 | 111 | |
| Group 26 | C14 | C9 | C1 | C3 | C16 | C4 | C12 | C10 | 000 | $t_{25}$ |
| | C14 | C16 | C5 | C1 | C2 | C17 | C11 | C15 | 001 | |
| | C14 | C6 | C9 | C16 | C5 | C13 | C10 | C3 | 010 | |
| | C14 | C13 | C13 | C14 | C8 | C9 | C9 | C8 | 011 | |
| | C14 | C3 | C17 | C12 | C11 | C5 | C8 | C13 | 100 | |
| | C14 | C10 | C4 | C10 | C14 | C1 | C7 | C1 | 101 | |
| | C15 | C9 | C16 | C14 | C2 | C8 | C1 | C3 | 110 | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | C15 | C16 | C3 | C12 | C5 | C4 | C17 | C8 | 111 | |
| Group 27 | C15 | C6 | C7 | C10 | C8 | C17 | C16 | C13 | 000 | $t_{26}$ |
| | C15 | C13 | C11 | C8 | C11 | C13 | C15 | C1 | 001 | |
| | C15 | C3 | C15 | C6 | C14 | C9 | C14 | C6 | 010 | |
| | C15 | C10 | C2 | C4 | C17 | C5 | C13 | C11 | 011 | |
| | C15 | C17 | C6 | C2 | C3 | C1 | C12 | C16 | 100 | |
| | C15 | C7 | C10 | C17 | C6 | C14 | C11 | C4 | 101 | |
| | C15 | C14 | C14 | C15 | C9 | C10 | C10 | C9 | 110 | |
| | C15 | C4 | C1 | C13 | C12 | C6 | C9 | C14 | 111 | |
| Group 28 | C15 | C11 | C5 | C11 | C15 | C2 | C8 | C2 | 000 | $t_{27}$ |
| | C15 | C1 | C9 | C9 | C1 | C15 | C7 | C7 | 001 | |
| | C15 | C8 | C13 | C7 | C4 | C11 | C6 | C12 | 010 | |
| | C15 | C15 | C17 | C5 | C7 | C7 | C5 | C17 | 011 | |
| | C15 | C5 | C4 | C3 | C10 | C3 | C4 | C5 | 100 | |
| | C15 | C12 | C8 | C1 | C13 | C16 | C3 | C10 | 101 | |
| | C15 | C2 | C12 | C16 | C16 | C12 | C2 | C15 | 110 | |
| | C16 | C1 | C7 | C3 | C4 | C2 | C13 | C17 | 111 | |
| Group 29 | C16 | C8 | C11 | C1 | C7 | C15 | C12 | C5 | 000 | $t_{28}$ |
| | C16 | C15 | C15 | C16 | C10 | C11 | C11 | C10 | 001 | |
| | C16 | C5 | C2 | C14 | C13 | C7 | C10 | C15 | 010 | |
| | C16 | C12 | C6 | C12 | C16 | C3 | C9 | C3 | 011 | |
| | C16 | C2 | C10 | C10 | C2 | C16 | C8 | C8 | 100 | |
| | C16 | C9 | C14 | C8 | C5 | C12 | C7 | C13 | 101 | |
| | C16 | C16 | C1 | C6 | C8 | C8 | C6 | C1 | 110 | |
| | C16 | C6 | C5 | C4 | C11 | C4 | C5 | C6 | 111 | |
| Group 30 | C16 | C13 | C9 | C2 | C14 | C17 | C4 | C11 | 000 | $t_{29}$ |
| | C16 | C3 | C13 | C17 | C17 | C13 | C3 | C16 | 001 | |
| | C16 | C10 | C17 | C15 | C3 | C9 | C2 | C4 | 010 | |
| | C16 | C17 | C4 | C13 | C6 | C5 | C1 | C9 | 011 | |
| | C16 | C7 | C8 | C11 | C9 | C1 | C17 | C14 | 100 | |
| | C16 | C14 | C12 | C9 | C12 | C14 | C16 | C2 | 101 | |
| | C16 | C4 | C16 | C7 | C15 | C10 | C15 | C7 | 110 | |
| | C16 | C11 | C3 | C5 | C1 | C6 | C14 | C12 | 111 | |
| Group 31 | C17 | C10 | C15 | C9 | C6 | C13 | C8 | C14 | 000 | $t_{30}$ |
| | C17 | C17 | C2 | C7 | C9 | C9 | C7 | C2 | 001 | |
| | C17 | C7 | C6 | C5 | C12 | C5 | C6 | C7 | 010 | |
| | C17 | C14 | C10 | C3 | C15 | C1 | C5 | C12 | 011 | |
| | C17 | C4 | C14 | C1 | C1 | C14 | C4 | C17 | 100 | |
| | C17 | C11 | C1 | C16 | C4 | C10 | C3 | C5 | 101 | |
| | C17 | C1 | C5 | C14 | C7 | C6 | C2 | C10 | 110 | |
| | C17 | C8 | C9 | C12 | C10 | C2 | C1 | C15 | 111 | |
| Group 32 | C17 | C15 | C13 | C10 | C1 | C15 | C17 | C3 | 000 | $t_{31}$ |
| | C17 | C5 | C17 | C8 | C16 | C11 | C16 | C8 | 001 | |
| | C17 | C12 | C4 | C6 | C2 | C7 | C15 | C13 | 010 | |
| | C17 | C2 | C8 | C4 | C5 | C3 | C14 | C1 | 011 | |
| | C17 | C9 | C12 | C2 | C8 | C16 | C13 | C6 | 100 | |
| | C17 | C16 | C16 | C17 | C11 | C12 | C12 | C11 | 101 | |
| | C17 | C6 | C3 | C15 | C14 | C8 | C11 | C16 | 110 | |
| | C17 | C13 | C7 | C13 | C17 | C4 | C10 | C4 | 111 | |
| Frame position | Frame #1 | | Frame #2 | | Frame #3 | | Frame #4 | | | |

Table 11 Spreading Code allocation for Secondary SCH Code, case 3) of PSCH/CCPCH scheme

# Text Proposal for 25.224

## 4.5 Synchronisation and Cell Search Procedures

### 4.5.1 Cell Search

During the initial cell search, the UE searches for a cell. It then determines the midamble, the downlink scrambling code and frame synchronisation of that cell. The initial cell search uses the Physical Synchronisation Channel (PSCH) described in ~~S1.21~~TS 25.221. The generation of synchronisation codes is described in ~~S1.23~~TS 25.223

This initial cell search is carried out in three steps:

**Step 1: Slot synchronisation**

During the first step of the initial cell search procedure the UE uses the primary synchronisation code $c_p$ to acquire slot synchronisation to the strongest cell. Furthermore, frame synchronisation with the uncertainty of 1 out of 2 is obtained in this step. A single matched filter (or any similar device) is used for this purpose, that is matched to the primary synchronisation code which is common to all cells. ~~The procedure is according to the description for the FDD mode in S1.14.~~

**Step 2: Frame synchronisation and code-group identification**

The Step 2 is described for the case where PSCH and CCPCH are in timeslot k and k+8 with k=0…6.

During the second step of the initial cell search procedure, the UE uses the ~~sequence of~~modulated Secondary Synchronisation Codes to find frame synchronisation and identify one of 32 code groups. Each code group is linked to a specific $t_{Offset}$, thus to a specific frame timing, and is containing 4 specific scrambling codes. Each scrambling code is associated with a specific short and long basic midamble code.

In Cases 2 and 3 it is required to detect the position of the next synchronization slots. To detect the position of the next synchronization slots, the primary synchronization code is correlated with the received signal at offsets of 7 and 8 time slots from the position of the primary code that was detected in Step 1.

Then, the received signal at the positions of the synchronization codes is correlated with the primary synchronization Code $C_p$ and the secondary synchronization codes $\{C_1,\ldots,C_N\}$. Note that the correlations are performed coherently over M time slots, where at each slot a phase correction is provided by the correlation with the primary code. The minimal number of time slots is M=1, and the performance improves with increasing M.

~~The detection of secondary synchronisation sequence is done by correlating the received signal at the positions of the Secondary Synchronisation Code with all possible sequences of Secondary Synchronisation Codes, similar to FDD Mode. After four frames a sequence of eight codes is available providing all necessary information described above. Nevertheless, it should be noted that due to the special coding already three codes show the sequence unambiguously, i.e. a UE can determine the whole sequence when three codes have been received.~~

**Step 3: Scrambling code identification**

During the third and last step of the initial cell-search procedure, the UE determines the exact basic midamble code and the accompanying scrambling code used by the found cell. They are identified through correlation over the CCPCH with all four midambles of the code group identified in the second step . Thus the third step is a one out of four decision.

This step is taking into account that the CCPCH containing the BCH is transmitted using the first spreading code ( $a_{Q=16}^{(h=1)}$ in figure 2 of ~~S1.23~~TS 25.223 section '6.2 Spreading Codes') and using the first midamble $\mathbf{m}^{(1)}$ (derived from basic midamble code $\mathbf{m}_P$, cf. ~~S1.21~~TS 25.221 ~~-~~section '7.2.3 Training sequences for spread bursts'). Thus CCPCH code and midamble can be immediately derived when knowing scrambling code and basic midamble code.