TSG-RAN Meeting #6 ***TSGRP#6(99)683***
Nice, France, 13 – 15 December 1999

Title: **Agreed CRs of category "C" (Modification) and "F" (Correction) to TS 25.213**

Source: **TSG-RAN WG1**

Agenda item: **5.1.3**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc
25.213	006	-	R99	Update of downlink spreading description	F	3.0.0	3.1.0	R1-99i60
25.213	008	-	R99	Updated modulation description	F	3.0.0	3.1.0	R1-99i62
25.213	009	-	R99	Restriction for spreading factor 512 allocation in the UTRA	C	3.0.0	3.1.0	R1-99i00
25.213	011	1	R99	CPCH codes in power control preamble	C	3.0.0	3.1.0	R1-99k83
25.213	012	2	R99	Support of short codes for CPCH	C	3.0.0	3.1.0	R1-99l67
25.213	014	1	R99	Editorial Change	D	3.0.0	3.1.0	R1-99l14
25.213	016	-	R99	Channelization Code Allocation for USTS	C	3.0.0	3.1.0	R1-99l30
25.213	017	1	R99	Correction (Editorial Change)	F	3.0.0	3.1.0	R1-99l15
25.213	019	-	R99	Correction to code allocation for compressed mode	F	3.0.0	3.1.0	R1-99l12

NOTE: The source of this document is TSG-RAN WG1. The source shown on each CR cover sheet is the originating organisation.

TSG-RAN Working Group 1 meeting #9
Dresden, Germany
November 30 – December 3, 1999

TSGR1#9(99)i60

Agenda item:

Source: Ericsson

Title: CR 25.213-006: Update of downlink spreading sections

Document for: Decision

This CR requests some changes to the description of downlink spreading in 25.213, Section 5.1. It also requests some changes to the description of SCH codes in 25.213, Section 5.2.3.

The following changes are requested for Section 5.1

- Figure 8 shows the spreading operation for all downlink physical channels except the SCH, i.e. also for the P-CCPCH. Based on the definition of P-CCPCH in 25.211, there seems to be no reason to have a specific description for the P-CCPCH spreading.
- The illustration of multi-code transmission in Figure 8 is removed. Spreading in case of multi-code transmission is basically identical to spreading of multiple downlink channels in general, i.e. it does not need to be described explicitly.
- Multiplexing of SCH is no longer described as time multiplex with P-CCPCH. According to 25.211, SCH is defined for the entire slot, i.e. it is not really correct to state that the P-CCPCH and SCH are time multiplexed.
- The AICH description is moved to 25.211, see related change request 25.211 CR XXX. The AICH generation deals with symbols, i.e. it does not belong to 25.213 which deals with spreading.

Changes are requested for Section 5.2.3 in order to clarify the following unclear areas:

- Connection between code number and row to use in the Hadamard matrix for generation of SSCs is incorrect, since not all rows are used in the Hadamard matrix.
- PSC and SSC is currently defined as real-valued codes that are later transmitted on both in-phase and quadrature branches. It is simpler to define the codes as being complex-valued from the beginning. This corresponds better with e.g. the PRACH/PCPCH preamble definitions.
- The mapping of 0/1 to +1/-1 is not very specific. It is proposed to describe the entire generation using the +1/-1 notation.
- Different variables are defined not where they are needed, but randomly within the section, e.g. the sequence *b* is used only for the generation of the SSC and should be described in connection with those codes and not the PSC.
- The use of the symbol $C_{sch,n}$ is unnecessary and leads to confusion. Description can be done directly without this symbol, so it is proposed to delete it.
- The text in 5.2.3.2 does not explicitly state that it is the secondary SCH sequence that is found in Table5.
- It is not explained very clearly what is shown in Table 5.

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.213 CR 006 Current Version: 3.0.0

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

For submission to: TSG-RAN #6
list expected approval meeting # here ↑

for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

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

Source: Ericsson **Date:** 1999-10-22

Subject: Update of downlink spreading description

Work item:

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

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change:

Remove some inconsistencies between 25.213, Section 5.1 and 25.211.
- Removal of time-multiplex of SCH and P-CCPCH

Correction to 25.213, Section 5.2.3:
- Connection between code number and row to use in the Hadamard matrix for generation of SSCs is incorrect, since not all rows are used in the Hadamard matrix.

Editorial enhancements:
- No specific description for P-CCPCH spreading
- No specific description for multi-code spreading
- AICH description moved to 25.211
- The PSC and SSC are now defined as complex-valued codes directly.
- The mapping of 0/1 to +1/-1 is not very specific. It is proposed to describe the entire generation using the +1/-1 notation.
- Different variables are defined not where they are needed, but randomly within the section, e.g. the sequence *b* is used only for the generation of the SSC and should be described in connection with those codes and not the PSC.
- The use of the symbol $C_{sch,n}$ is unnecessary and leads to confusion. Description can be done directly without this symbol, so it is proposed to delete it.
- The text in 5.2.3.2 does not explicitly state that it is the secondary SCH sequence that is found in Table 5.
- It is not explained very clearly what is shown in Table 5.

Clauses affected: 3.2, 5.1, 5.2.3.1, 5.2.3.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.211 CR 010
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:

1 Scope

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

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, the latest version applies.

[1] TS 25.201: "Physical layer - general description".

[2] TS 25.211: “Physical channels and mapping of transport channels onto physical channels (FDD)”

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

3.2 Symbols

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

$C_{ch,SF,n}$: n:th channelisation code with spreading factor SF
C_{scramb}: scrambling code for uplink
$C_{sig,s}$: RACH signature code.
$S_{ul,n}$: UL scrambling code for desicated channels
$S_{r\text{-}pre,n}$: RACH preamble scrambling code
$S_{r\text{-}msg,n}$: RACH message scrambling code
$S_{c\text{-}acc}$: CPCH access preamble scrambling code
$S_{c\text{-}cd}$: CPCH CD preamble scrambling code
$S_{c\text{-}msg,n}$: CPCH message scrambling code
$S_{dl,n}$: DL scrambling code

C_{psc}: PSC code
$C_{ssc,n}$: n:th SSC code

3.3 Abbreviations

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

AICH Acquisition Indicator Channel
AP Access Preamble
BCH Broadcast Control Channel
CCPCH Common Control Physical Channel
CD Collision Detection
CPCH Common Packet Channel

CPICH	Common Pilot Channel
DCH	Dedicated Channel
DPCH	Dedicated Physical Channel
DPCCH	Dedicated Physical Control Channel
DPDCH	Dedicated Physical Data Channel
FDD	Frequency Division Duplex
Mcps	Mega Chip Per Second
OVSF	Orthogonal Variable Spreading Factor (codes)
PDSCH	Physical Dedicated Shared Channel
PICH	Page Indication Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
SCH	Synchronisation Channel
SSC	Secondary Synchronisation Code
SF	Spreading Factor
UE	User Equipment

5.1 Spreading

Figure 8 illustrates the spreading operation for all downlink physical channels except SCH, i.e. for P-CCPCH, S-CCPCH, CPICH, AICH, PICH, and downlink DPCH. The non-spread physical channel consists of a sequence of real-valued symbols. For all channels except AICH, the symbols can take the three values +1, -1, and 0, where 0 indicates DTX. For AICH, the symbol values depend on the exact combination of acquisition indicators to be transmitted, compare [2] Section 5.3.3.6.

Each pair of two consecutive symbols is first serial-to-parallel converted and mapped to an I and Q branch. The mapping is such that even and odd numbered symbols are mapped to the I and Q branch respectively. For all channels except AICH, symbol number zero is defined as the first symbol in each frame. For AICH, symbol number zero is defined as the first symbol in each access slot. The I and Q branches are then spread to the chip rate by the same real-valued channelization code $C_{ch,SF,m}$.The sequences of real-valued chips on the I and Q branch are then treated as a single complex-valued sequence of chips. This sequence of chips is scrambled (complex chip-wise multiplication) by a complex-valued scrambling code $S_{dl,n}$. In case of P-CCPCH, the scrambling code is applied aligned with the P-CCPCH frame boundary, i.e. the first complex chip of the spread P-CCPCH frame is multiplied with chip number zero of the scrambling code. In case of other downlink channels, the scrambling code is applied aligned with the scrambling code applied to the P-CCPCH. In this case, the scrambling code is thus not necessarily applied aligned with the frame boundary of the physical channel to be scrambled.

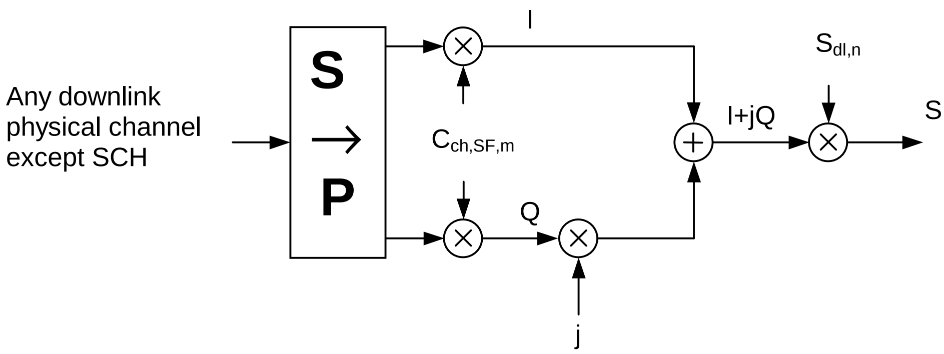

Figure 8: Spreading for all downlink physical channels except SCH

Figure 9 illsutrates how different downlink channels are combined. Each complex-valued spread channel, corresponding to point S in Figure 8, is separately weighted by a weight factor G_i. The complex-valued P-SCH and S-SCH, as described in [1], section 5.3.3.4, are separately weighted by weight factors G_p and G_s. All downlink physical channels are then combined using complex addition.

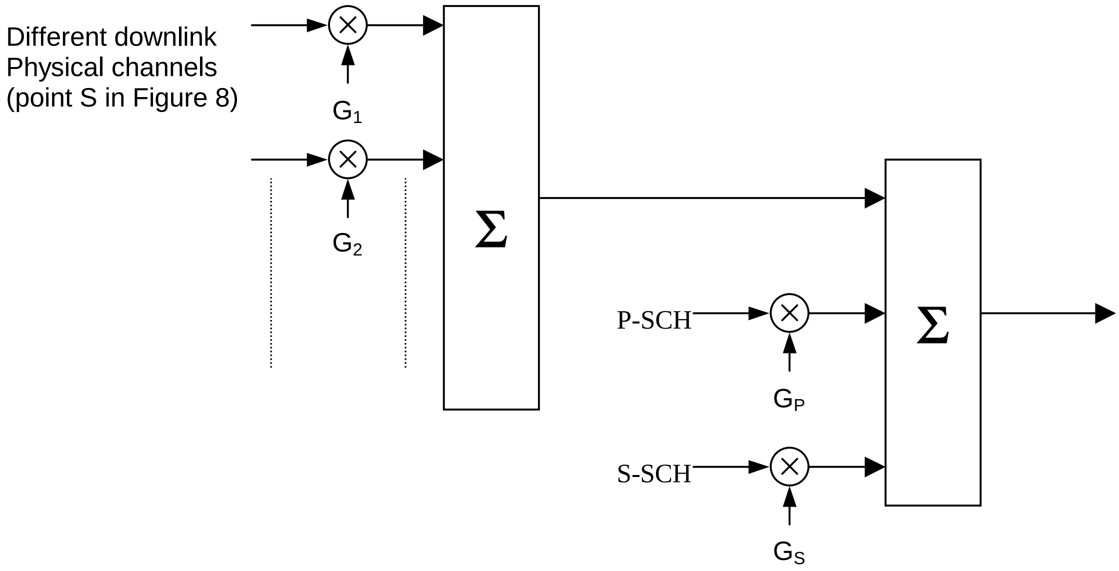

Figure 9: Spreading and modulation for SCH and P-CCPCH

5.2.3 Synchronisation codes

5.2.3.1 Code generation

The primary synchronisation code (PSC), C_{psc} is constructed as a so-called generalised hierarchical Golay sequence. The PSC is furthermore chosen to have good aperiodic auto correlation properties.

Define

$a = \langle x_1, x_2, x_3, \ldots, x_{16}\rangle = \langle 1, 1, 1, 1, 1, 1, -1, -1, 1, -1, 1, -1, 1, -1, -1, 1\rangle$.

The PSC 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 C_{psc} is defined as

$C_{psc} = (1 + j) \times \langle a, a, a, -a, -a, a, -a, -a, a, a, a, -a, a, -a, a, a\rangle$,

where the leftmost chip in the sequence corresponds to the chip transmitted first in time

The 16 secondary synchronization codes (SSCs), $\{C_{ssc,1}, \ldots, C_{ssc,16}\}$, are complex-valued with identical real and imaginary components, and are constructed from position wise multiplication of a Hadamard sequence and a sequence *z*, defined as

$z = \langle b, b, b, -b, b, b, -b, -b, b, -b, b, -b, -b, -b, -b, -b\rangle$, where

$b = \langle x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, -x_9, -x_{10}, -x_{11}, -x_{12}, -x_{13}, -x_{14}, -x_{15}, -x_{16}\rangle$.

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 ones sequence).

Denote the *n*:th Hadamard sequence as a row of H_8 numbered from the top, n = 0, 1, 2, …, 255, h_n in the sequel.Furthermore, let $h_n(i)$ and $z(i)$ denote the *i*:th symbol of the sequences h_n and *z*, respectively, where $i = 0, 1, 2, \ldots, 255$ and $i = 0$ corresponds to the leftmost symbol.

The *k*:th SSC, $C_{ssc,k}$, $k = 1, 2, 3, \ldots, 16$ is then defined as

$C_{ssc,k} = (1 + j) \times \langle h_m(0) \times z(0), h_m(1) \times z(1), h_m(2) \times z(2), \ldots, h_m(255) \times z(255)\rangle$,

where $m = 16\times(k - 1)$ and the leftmost chip in the sequence corresponds to the chip transmitted first in time.

5.2.3.2 Code allocation of SSC

The 64 secondary SCH sequences are constructed such that their cyclic-shifts are unique, i.e., a non-zero cyclic shift less than 15 of any of the 64 sequences is not equivalent to some cyclic shift of any other of the 64 sequences. Also, a non-zero cyclic shift less than 15 of any of the sequences is not equivalent to itself with any other cyclic shift less than 15. Table 5 describes the sequences of SSCs used to encode the 64 different scrambling code groups. The entries in table 5 denote what SSC to use in the different slots for the different scrambling code groups, e.g. the entry "7" means that SSC $C_{ssc,7}$ shall be used for the corresponding scrambling code group and slot.

Table 5: Allocation of SSCs for secondary SCH.

Scrambling Code Group	slot number														
	#0	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**	**#11**	**#12**	**#13**	**#14**
Group 1	1	1	2	8	9	10	15	8	10	16	2	7	15	7	16
Group 2	1	1	5	16	7	3	14	16	3	10	5	12	14	12	10
Group 3	1	2	1	15	5	5	12	16	6	11	2	16	11	15	12
Group 4	1	2	3	1	8	6	5	2	5	8	4	4	6	3	7
Group 5	1	2	16	6	6	11	15	5	12	1	15	12	16	11	2
Group 6	1	3	4	7	4	1	5	5	3	6	2	8	7	6	8
Group 7	1	4	11	3	4	10	9	2	11	2	10	12	12	9	3
Group 8	1	5	6	6	14	9	10	2	13	9	2	5	14	1	13
Group 9	1	6	10	10	4	11	7	13	16	11	13	6	4	1	16
Group 10	1	6	13	2	14	2	6	5	5	13	10	9	1	14	10
Group 11	1	7	8	5	7	2	4	3	8	3	2	6	6	4	5
Group 12	1	7	10	9	16	7	9	15	1	8	16	8	15	2	2
Group 13	1	8	12	9	9	4	13	16	5	1	13	5	12	4	8
Group 14	1	8	14	10	14	1	15	15	8	5	11	4	10	5	4
Group 15	1	9	2	15	15	16	10	7	8	1	10	8	2	16	9
Group 16	1	9	15	6	16	2	13	14	10	11	7	4	5	12	3
Group 17	1	10	9	11	15	7	6	4	16	5	2	12	13	3	14
Group 18	1	11	14	4	13	2	9	10	12	16	8	5	3	15	6
Group 19	1	12	12	13	14	7	2	8	14	2	1	13	11	8	11
Group 20	1	12	15	5	4	14	3	16	7	8	6	2	10	11	13
Group 21	1	15	4	3	7	6	10	13	12	5	14	16	8	2	11
Group 22	1	16	3	12	11	9	13	5	8	2	14	7	4	10	15
Group 23	2	2	5	10	16	11	3	10	11	8	5	13	3	13	8
Group 24	2	2	12	3	15	5	8	3	5	14	12	9	8	9	14
Group 25	2	3	6	16	12	16	3	13	13	6	7	9	2	12	7
Group 26	2	3	8	2	9	15	14	3	14	9	5	5	15	8	12
Group 27	2	4	7	9	5	4	9	11	2	14	5	14	11	16	16
Group 28	2	4	13	12	12	7	15	10	5	2	15	5	13	7	4
Group 29	2	5	9	9	3	12	8	14	15	12	14	5	3	2	15
Group 30	2	5	11	7	2	11	9	4	16	7	16	9	14	14	4
Group 31	2	6	2	13	3	3	12	9	7	16	6	9	16	13	12
Group 32	2	6	9	7	7	16	13	3	12	2	13	12	9	16	6
Group 33	2	7	12	15	2	12	4	10	13	15	13	4	5	5	10
Group 34	2	7	14	16	5	9	2	9	16	11	11	5	7	4	14
Group 35	2	8	5	12	5	2	14	14	8	15	3	9	12	15	9
Group 36	2	9	13	4	2	13	8	11	6	4	6	8	15	15	11
Group 37	2	10	3	2	13	16	8	10	8	13	11	11	16	3	5
Group 38	2	11	15	3	11	6	14	10	15	10	6	7	7	14	3
Group 39	2	16	4	5	16	14	7	11	4	11	14	9	9	7	5
Group 40	3	3	4	6	11	12	13	6	12	14	4	5	13	5	14
Group 41	3	3	6	5	16	9	15	5	9	10	6	4	15	4	10
Group 42	3	4	5	14	4	6	12	13	5	13	6	11	11	12	14
Group 43	3	4	9	16	10	4	16	15	3	5	10	5	15	6	6
Group 44	3	4	16	10	5	10	4	9	9	16	15	6	3	5	15
Group 45	3	5	12	11	14	5	11	13	3	6	14	6	13	4	4
Group 46	3	6	4	10	6	5	9	15	4	15	5	16	16	9	10
Group 47	3	7	8	8	16	11	12	4	15	11	4	7	16	3	15
Group 48	3	7	16	11	4	15	3	15	11	12	12	4	7	8	16
Group 49	3	8	7	15	4	8	15	12	3	16	4	16	12	11	11
Group 50	3	8	15	4	16	4	8	7	7	15	12	11	3	16	12

Group 51	3	10	10	15	16	5	4	6	16	4	3	15	9	6	9
Group 52	3	13	11	5	4	12	4	11	6	6	5	3	14	13	12
Group 53	3	14	7	9	14	10	13	8	7	8	10	4	4	13	9
Group 54	5	5	8	14	16	13	6	14	13	7	8	15	6	15	7
Group 55	5	6	11	7	10	8	5	8	7	12	12	10	6	9	11
Group 56	5	6	13	8	13	5	7	7	6	16	14	15	8	16	15
Group 57	5	7	9	10	7	11	6	12	9	12	11	8	8	6	10
Group 58	5	9	6	8	10	9	8	12	5	11	10	11	12	7	7
Group 59	5	10	10	12	8	11	9	7	8	9	5	12	6	7	6
Group 60	5	10	12	6	5	12	8	9	7	6	7	8	11	11	9
Group 61	5	13	15	15	14	8	6	7	16	8	7	13	14	5	16
Group 62	9	10	13	10	11	15	15	9	16	12	14	13	16	14	11
Group 63	9	11	12	15	12	9	13	13	11	14	10	16	15	14	16
Group 64	9	12	10	15	13	14	9	14	15	11	11	13	12	16	10

TSG-RAN Working Group 1 meeting #9 **TSGR1#9(99)i62**
Dresden, Germany
November 30 – December 3, 1999

Agenda item:

Source: Ericsson

Title: CR 25.213-008: Updated modulation description

Document for: Decision

In earlier versions of TS 25.213, e.g. V2.1.0, there were figures describing the QPSK modulation step. From the figures it was clear that the real part of the spread signal shall be modulated with cos(ωt), while the imaginary part shall be modulated with –sin(ωt). This information has since then been removed, and is currently missing.

To re-introduce this information, this CR has been generated.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

Document ??99???
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.213 CR 008 Current Version: 3.0.0

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

For submission to: TSG-RAN #6 — for approval [X] — for information [ ] — strategic [ ] — non-strategic [ ] *(for SMG use only)*

list expected approval meeting # here ↑

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

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

Source: Ericsson **Date:** 1999-11-18

Subject: Updated modulation description

Work item:

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

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: In earlier versions of TS 25.213, e.g. V2.1.0, there were figures describing the QPSK modulation step. From the figures it was clear that the real part of the spread signal shall be modulated with cos(ωt), while the imaginary part shall be modulated with -sin(ωt). This information has since then been removed, and is currently missing. This CR reintroduces this information, which is essential to have a non-ambiguous specification.

Clauses affected: 2, 4.4.2, 5.3.1, 5.3.2

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:

1 Scope

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

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, the latest version applies.

[1] TS 25.201: "Physical layer - general description".

[2] TS 25.101: " UE Radio transmission and Reception (FDD)".

[3] TS 25.104: " UTRA (BS) FDD; Radio transmission and Reception".

3 Definitions, symbols and abbreviations

3.1 Definitions

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$S_{c\text{-}cd}$: CPCH CD preamble scrambling code
$S_{c\text{-}msg,n}$: CPCH message scrambling code
$S_{dl,n}$: DL scrambling code
$C_{sch,n}$: n:th SCH code (primary or secondary)
C_{psc}: PSC code
$C_{ssc,n}$: n:th SSC code

4.3.4.4 Scrambling code for the CPCH message part

In addition to spreading, the message part is also subject to scrambling with a 10 ms complex code. The scrambling code is cell-specific and has a one-to-one correspondence to the scrambling code used for the preamble part.

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 8192…46591 of $C_{scramb,n}$.

In the case when the access resources are shared between the RACH and CPCH,

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 4096…42495 of $C_{scramb,n}$.

The generation of these codes is explained in 4.3.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the dedicated uplink channels and is described in 4.3.2.1.

NOTE: Use of short scrambling code for CPCH message part is ffs.

4.4 Modulation

4.4.1 Modulating chip rate

The modulating chip rate is 3.84 Mcps.

4.4.2 Modulation

In the uplink, the complex-valued chip sequence generated by the spreading process is QPSK modulated as shown in Figure 8 below. ~~modulation of both DPCCH and DPDCH is BPSK.~~

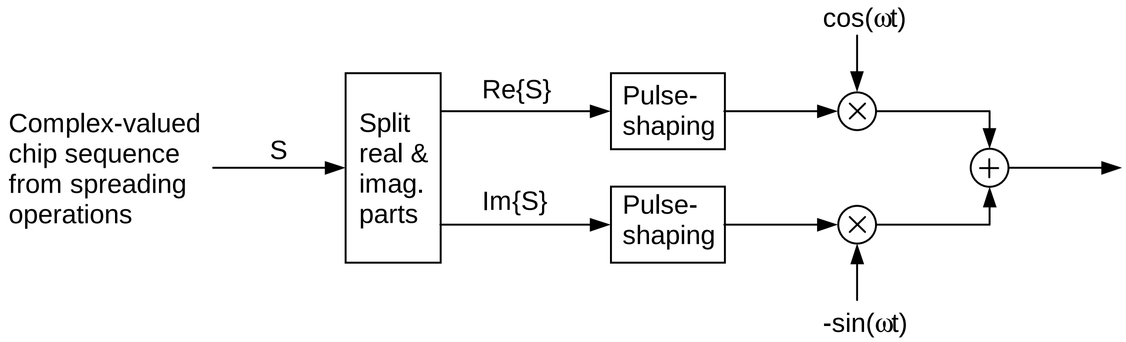

Figure 8: Uplink modulation.

The pulse-shaping characteristics are described in [2].

Group 51	3	10	10	15	16	5	4	6	16	4	3	15	9	6	9
Group 52	3	13	11	5	4	12	4	11	6	6	5	3	14	13	12
Group 53	3	14	7	9	14	10	13	8	7	8	10	4	4	13	9
Group 54	5	5	8	14	16	13	6	14	13	7	8	15	6	15	7
Group 55	5	6	11	7	10	8	5	8	7	12	12	10	6	9	11
Group 56	5	6	13	8	13	5	7	7	6	16	14	15	8	16	15
Group 57	5	7	9	10	7	11	6	12	9	12	11	8	8	6	10
Group 58	5	9	6	8	10	9	8	12	5	11	10	11	12	7	7
Group 59	5	10	10	12	8	11	9	7	8	9	5	12	6	7	6
Group 60	5	10	12	6	5	12	8	9	7	6	7	8	11	11	9
Group 61	5	13	15	15	14	8	6	7	16	8	7	13	14	5	16
Group 62	9	10	13	10	11	15	15	9	16	12	14	13	16	14	11
Group 63	9	11	12	15	12	9	13	13	11	14	10	16	15	14	16
Group 64	9	12	10	15	13	14	9	14	15	11	11	13	12	16	10

5.3 Modulation

5.3.1 Modulating chip rate

The m~~QA~~odulating chip rate is 3.84 Mcps.

5.3.2 Modulation

~~QPSK modulation is used.~~ In the downlink, the complex-valued chip sequence generated by the spreading process is QPSK modulated as shown in Figure 11 below.

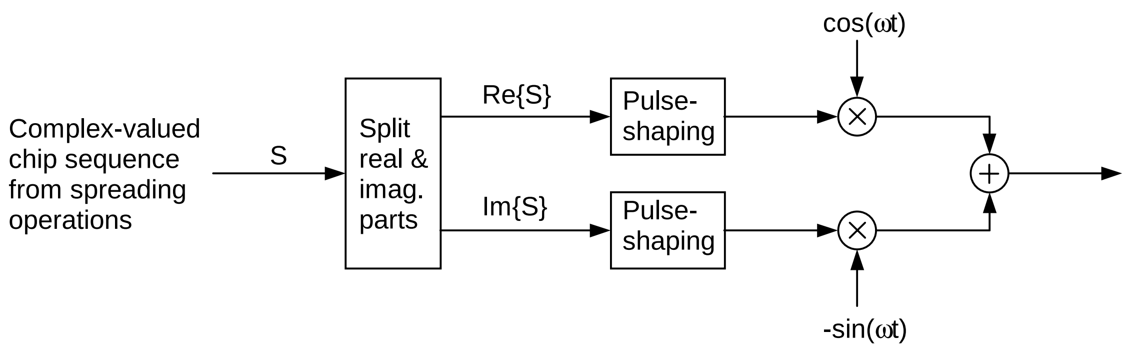

Figure 11: Downlink modulation.

The pulse-shaping characteristics are described in [3].

3GPP TSG RAN WG1#9 **Tdoc R1-(99)i00**
Dresden, Germany
November 30th - December 3rd, 1999 **Meeting No. 9**
Agenda Item:.

Source: Nokia

Use of Spreading factor 512 with UTRA FDD

Introduction

Earlier is has been agreed to include the spreading factor 512 in UTRA FDD downlink. The 25.211 defines the timing adjustment step for all spreading factors to be 256. As this is not suitable without restrictions to spreading factor 512, a more detailed statement for the operation in connection with spreading factor 512 in soft handover is proposed to be added. This was presented last time at the WG1#7 meeting in Hannover, but the restriction was noted to be to strict and is thus modified here in line with the comments made. The issue dates back to the merging discussions of different specifications early 1999.

Background of the restrictions (from R1-99C92)

The use of spreading factor 512 is expected to be limited to the special cases, like with CPCH or perhaps with AICH as has been proposed. None of there uses involves soft handover, thus making the timing adjustment step to conform to the spreading factor 512 would only make it difficult to achieve single slot power control delay in soft handover. Spreading factor 512 may be also used on DCH with DSCH, where DCH may be in soft handover.

Therefore having restrictions in code allocation with spreading factor 512 for the case of soft handover is not expected to cause practical problems for the system operation. The following restriction has been proposed on the reflector in connection with the discussions on 25.211. The following definition was given on the reflector:

"In case entering the SHO with SF 512, the Node B shall allocate for the SF 512 the branch with contains both the codes that can be derived from the SF 256 code on the branch above"

This can be spelled out with more specification style as follows for 25.213, with the comments given in the WG1#7 taken into account as follows:

"*With the spreading factor 512 a specific restriction is applied. When the code word $C_{ch,512,n}$, with n=0,2,4….510, is used in soft handover, then the code word $C_{512,n+1}$ is not allocated in the Node Bs where timing adjustment is to be used. Respectively if $C_{ch,512,n}$, with n=1,3,5….511 is used, then the code word $C_{512,n-1}$ is not allocated in the Node B where timing adjustment is to be used . This restriction shall not apply for the softer handover operation or in case UTRAN is synchronised to such a level that timing adjustments in soft handover are not used with spreading factor 512".*

This is proposed to be included to 25.213 for the channelization code section (subsection of the code generation and allocation), see attached CR.

Conclusions

The proposed definition is proposed to be added to 25.213 to avoid uncertainty of the use of spreading factor 512 in connection with timing adjustment.

3GPP TSG RAN WG1 Meeting No. 9
Dresden, Germany, 30th Nov-3 rd Dec 1999

Document R1-99i00
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25.213 CR 009 Current Version: 3.0.0

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

For submission to: TSG RAN#6
list expected approval meeting # here ↑

for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

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

Source: ~~Nokia~~RAN WG1 **Date:** 22.11.1999

Subject: Restriction for spreading factor 512 allocation in the UTRA FDD Downlink

Work item:

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

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	X
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: The time adjustment is 256 chips in UTRA FDD in soft handover. To allow similar step with spreading factor 512, restrictions on the code allocation in case if having spreading factor 512 are introduced.

Clauses affected: 5.2.1

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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5.2 Code generation and allocation

5.2.1 Channelization codes

The channelization codes of figures 8 and 9 are the same codes as used in the uplink, namely Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between downlink channels of different rates and spreading factors. The OVSF codes are defined in figure 4 in section 4.3.1.

The channelization code for the Primary CPICH is fixed to $C_{ch,256,0}$ and the channelization code for the Primary CCPCH is fixed to $C_{ch,256,1}$.The channelization codes for all other physical channels are assigned by UTRAN.

With the spreading factor 512 a specific restriction is applied. When the code word $C_{ch,512,n}$, with n=0,2,4….510, is used in soft handover, then the code word $C_{512,n+1}$ is not allocated in the Node Bs where timing adjustment is to be used. Respectively if $C_{ch,512,n}$, with n=1,3,5….511 is used, then the code word $C_{512,n-1}$ is not allocated in the Node B where timing adjustment is to be used. This restriction shall not apply for the softer handover operation or in case UTRAN is synchronised to such a level that timing adjustments in soft handover are not used with spreading factor 512.

When compressed mode is implemented by reducing the spreading factor by 2, the OVSF code of spreading factor SF/2 on the path to the root of the code tree from the OVSF code assigned for normal frames is used in the compressed frames. For the case where the scrambling code is changed during compressed frames, an even numbered OVSF code used in normal mode results in using the even alternative scrambling code during compressed frames, while an odd numbered OVSF code used in normal mode results in using the odd alternative scrambling code during compressed frames. The even and odd alternative scrambling codes are described in the next section.

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated such a way that the OVSF code(s) below the smallest spreading factor will be from the branch of the code tree pointed by the smallest spreading factor used for the connection. This means that all the codes for UE for the PDSCH connection can be generated according to the OVSF code generation principle from smallest spreading factor code used by the UE on PDSCH.

In case of mapping the DSCH to multiple parallel PDSCHs, the same rule applies, but all of the branches identified by the multiple codes, corresponding to the smallest spreading factor, may be used for higher spreading factor allocation.

5.2.2 Scrambling code

A total of 2^{18}-1 = 262,143 scrambling codes, numbered 0…262,142 can be generated. However not all the scrambling codes are used. The scrambling codes are divided into 512 sets each of a primary scrambling code and 15 secondary scrambling codes.

The primary scrambling codes consist of scrambling codes n=16*i where i=0…511. The i:th set of secondary scrambling codes consists of scrambling codes 16*i+k, where k=1…15.

There is a one-to-one mapping between each primary scrambling code and 15 secondary scrambling codes in a set such that i:th primary scrambling code corresponds to i:th set of scrambling codes.

Hence, according to the above, scrambling codes k = 0, 1, …, 8191 are used. Each of these codes are associated with an even alternative scrambling code and an odd alternative scrambling code, that may be used for compressed frames. The even alternative scrambling code corresponding to scrambling code k is scrambling code number k + 8192, while the odd alternative scrambling code corresponding to scrambling code k is scrambling code number k + 16384.

The set of primary scrambling codes is further divided into 64 scrambling code groups, each consisting of 8 primary scrambling codes. The j:th scrambling code group consists of primary scrambling codes 16*8*j+16*k, where j=0..63 and k=0..7.

Each cell is allocated one and only one primary scrambling code. The primary CCPCH is always transmitted using the primary scrambling code. The other downlink physical channels can be transmitted with either the primary scrambling code or a secondary scrambling code from the set associated with the primary scrambling code of the cell.

The mixture of primary scrambling code and secondary scrambling code for one CCTrCH is allowable.

3GPP TSG RAN WG1 ***TSGR1#9(99)k83***
November 30 – December 3, 1999, Dresden, Germany

Agenda item: **AH14**

Source: **Philips**

Title: **Text proposal and Change Request for CPCH codes**

Document for: **Decision**

Introduction

This paper is a revision of R1-99i16, incorporating the following change agreed in the Adhoc 14 meeting at WG1#9:

The channelisation code in the PCPCH power control preamble is the same as for the control channel in the message part.

A comment has also been added to the CR form explaining how this change should be processed in view of the major structural changes made in CR25213-007.

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

***Document* R1-99k83**
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3G25.213	**CR**	**011rev1**	Current Version:	3.0.0

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

For submission to:	TSG-RAN #6	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

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

Source: Philips **Date:** 1999-12-02

Subject: CPCH codes in power control preamble

Work item:

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature	X		Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: Defines previously-unspecified codes for PCPCH power control preamble.

Clauses affected: 4.3.4

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:
This CR is based on version 3.0.0 of 25.213.
However, CR213-007 has made major changes to the structure of 25.213 since v3.0.0.
The new section entitled “Channelisation code for PCPCH power control preamble” should be inserted immediately before section 4.3.1.4 “Code allocation for PCPCH message part” in CR213-007.
The new section entitled “PCPCH power control preamble scrambling code” should be inserted immediately before section 4.3.2.6 “PCPCH message part scrambling code” in CR213-007.

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4.3.4.3 CPCH preamble signatures

4.3.4.3.1 Access preamble signature

The access preamble part of the CPCH-access burst carries one of the sixteen different orthogonal complex signatures identical to the ones used by the preamble part of the random-access burst.

4.3.4.2.2 CD preamble signature

The CD-preamble part of the CPCH-access burst carries one of sixteen different orthogonal complex signatures identical to the ones used by the preamble part of the random-access burst.

4.3.4.4 Channelisation code for PCPCH power control preamble

The channelisation code for the PCPCH power control preamble is the same as that used for the CPPCCH of the message part, as described in the following section.

4.3.4.53 Channelization codes for the CPCH message part

The signature in the preamble specifies one of the 16 nodes in the code-tree that corresponds to channelization codes of length 16. The sub-tree below the specified node is used for spreading of the message part. The control part is always spread with a channelization code of spreading factor 256. The code is chosen from the lowest branch of the sub-tree. The data part may use channelization codes from spreading factor 4 to 64. A UE is allowed to increase its spreading factor during the message transmission by choosing any channelization code from the uppermost branch of the sub-tree code. For channelization codes with spreading factors less that 16, the node is located on the same sub-tree as the channelization code of the access preamble.

4.3.4.6 PCPCH power control preamble scrambling code

The scrambling code for the PCPCH power control preamble is the same as for the PCPCH message part, as described in the following section. The phase of the scrambling code shall be such that the end of the code is aligned with the frame boundary at the end of the power control preamble.

4.3.4.74 Scrambling code for the CPCH message part

In addition to spreading, the message part is also subject to scrambling with a 10 ms complex code. The scrambling code is cell-specific and has a one-to-one correspondence to the scrambling code used for the preamble part.

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 8192…46591 of $C_{scramb,n}$.

In the case when the access resources are shared between the RACH and CPCH,

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 4096…42495 of $C_{scramb,n}$.

The generation of these codes is explained in 4.3.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the dedicated uplink channels and is described in 4.3.2.1.

Note: Use of short scrambling code for CPCH message part is ffs.

4.4 Modulation

4.4.1 Modulating chip rate

The modulating chip rate is 3.84 Mcps.

TSG RAN Working Group 1#9 **TSGR1#9 (99)L67**
Dresden, Germany
November 30-December 3, 1999

Agenda Item:	**AH14**
Source:	**GBT**
Title:	**CR 012 rev (2.0) for 25.213 (Support of short Codes for CPCH)**
Document for	**Approval**

Revision information

The document R-199i33 was presented in AH14. It was agreed to include short codes for CPCH. However, the group asked for -clarifications in use of indexes for the short codes and required notation alignment for the short codes.

3GPP TSG RAN WG1 (Radio) Meeting #9
Dresden, Germany Nov 30 – Dec 3, 1999

Document ***R1-99L67***
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25.213	**CR**	**012 r2.0**	Current Version:	V3.0.0

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

For submission to:	RAN	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

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

Source:	GBT	**Date:**	Dec 1 1999
Subject:	Support of short codes for CPCH		
Work item:	TS25.213		

Category:	F	Correction		**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature	X		Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:	To support short codes for CPCH
Clauses affected:	4.3.4.4

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:	

4.3.4.4 Scrambling code for the CPCH message part

In addition to spreading, the message part is also subject to scrambling with a 10 ms complex code. The scrambling code is cell-specific and has a one-to-one correspondence to the scrambling code used for the preamble part. Both long or short scrambling codes can be used to scramble the CPCH message part.

In the case when the long scrambling codes are used,

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 8192…46591 of $C_{scramb,n}$.

In the case when the access resources are shared between the RACH and CPCH,

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 4096…42495 of $C_{scramb,n}$.

The generation of these codes is explained in 4.3.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the dedicated uplink channels and is described in 4.3.2.1.

Note: Use of short scrambling code for CPCH message part is ffs.:

In the case the short scrambling codes are used,

$S_{c\text{-}short,n}(i) = C_{short,n}(i)$, $i = 0, 1, \ldots, 38399$,

TSG RAN Working Group 1#9 **TSGR1#9(99)L14**
Dresden, Germany
Nov 30 to Dec 3, 1999

Agenda:	**AH14**
Source	**GBT**
Title:	**CR 014 for TS25.213 “Editorial Change”**
Document for	**Approval**

There seems to be an inconsistency in 25.213 and 25.211 on the issue Spreading Factor for CPCH. Use of all Spreading Factors for CPCH is an agreement in WG1 and therefore we propose to resolve the issue by adding the appropriate Spreading Factors to 25.213 text.

Revision information

This CR and contribution is the revised version of J32 to comply with the acceptable CR format.

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25.213	**CR**	**014 r1.0**	Current Version:	3.0.0

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

For submission to:	RAN	for approval	X	strategic		*(for SMG use only)*
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Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

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

Source: GBT **Date:** 1 Dec 1999

Subject: Editorial Change

Work item: TS25.213

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

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Inconsistency on the value of Spreading Factor for CPCH

Clauses affected: 4.3.4.3

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:

4.3.4.3 Channelization codes for the CPCH message part

The signature in the preamble specifies one of the 16 nodes in the code-tree that corresponds to channelization codes of length 16. The sub-tree below the specified node is used for spreading of the message part. The control part is always spread with a channelization code of spreading factor 256. The code is chosen from the lowest branch of the sub-tree. The data part may use channelization codes from spreading factor 4 to 256 ~~64~~. A UE is allowed to increase its spreading factor during the message transmission by choosing any channelization code from the uppermost branch of the sub-tree code. For channelization codes with spreading factors less that 16, the node is located on the same sub-tree as the channelization code of the access preamble.

TSG-RAN Working Group 1 meeting #9 ***TSGR1#9(99)L30***
Dresden, Germany, Nov. 30 – Dec. 3, 1999

Agenda Item:
Source: **SK Telecom, ETRI**
Title: **CR for channelization code allocation for USTS in 25.213**
Document for: **Decision**

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1. Introduction

The procedure for Uplink Synchronous Transmission Scheme (USTS) was accepted in text (in section 9 of TS25.214) at the last Kyongju meeting [1]. However it is required to elaborate the specification related to USTS. More detailed information on the method of channelization code allocation for USTS should be included in section 4.3.1 of TS25.213 which is the section for uplink channelization code allocation method. This document have CR for the additional description on the method of channelization code allocation for USTS in TS25.213.

2. References

[1] SK Telecom, "Uplink Synchronous Transmission Scheme," TSGR1#7 (99)e68

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

***Document* R1-99L30**

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25.213	**CR**	**016**	Current Version:	3.0.0

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

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

Source: SK Telecom, ETRI   **Date:** 1999-12-03

Subject: Channelization Code Allocation for USTS

Work item:

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature	X		Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: The additional descriptions are required to support the channelization code allocation method for USTS.

Clauses affected: 4.3.1

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:

4.3 Code generation and allocation

4.3.1 Channelization codes

The channelization codes of figure 1 are Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between a user's different physical channels. The OVSF codes can be defined using the code tree of figure 4.

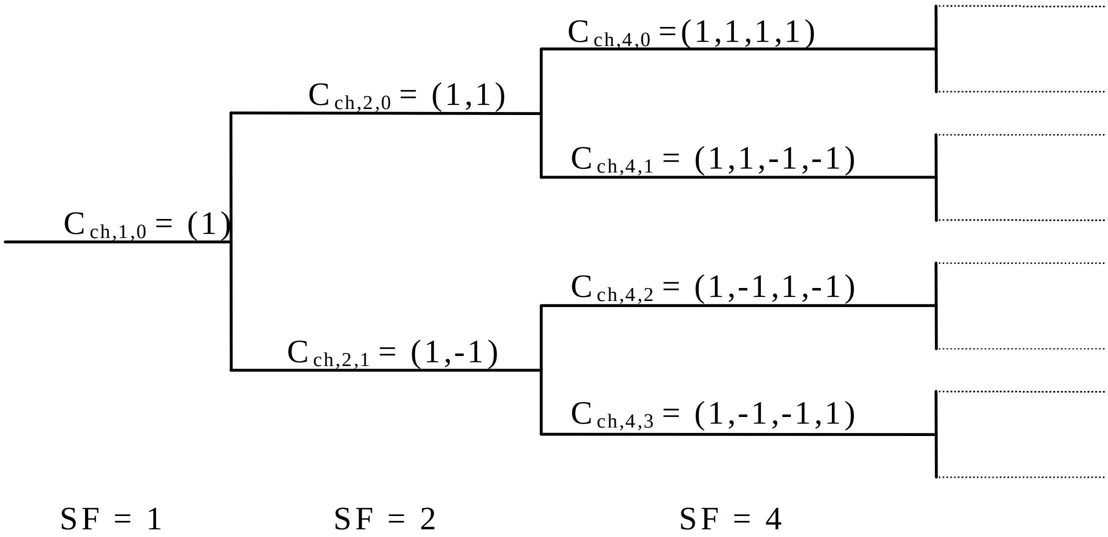

Figure 4: Code-tree for generation of Orthogonal Variable Spreading Factor (OVSF) codes

In figure 4, the channelization codes are uniquely described as $C_{ch,SF,k}$, where SF is the spreading factor of the code and *k* is the code number, $0 \le k \le SF-1$.
Each level in the code tree defines channelization codes of length SF, corresponding to a spreading factor of SF in figure 4.
The generation method for the channelization code is defined as:

$$C_{ch,1,0} = 1,$$

$$\begin{bmatrix} C_{ch,2,0} \\ C_{ch,2,1} \end{bmatrix} = \begin{bmatrix} C_{ch,1,0} & C_{ch,1,0} \\ C_{ch,1,0} & -C_{ch,1,0} \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$\begin{bmatrix} C_{ch,2^{(n+1)},0} \\ C_{ch,2^{(n+1)},1} \\ C_{ch,2^{(n+1)},2} \\ C_{ch,2^{(n+1)},3} \\ \vdots \\ C_{ch,2^{(n+1)},2^{(n+1)}-2} \\ C_{ch,2^{(n+1)},2^{(n+1)}-1} \end{bmatrix} = \begin{bmatrix} C_{ch,2^n,0} & C_{ch,2^n,0} \\ C_{ch,2^n,0} & -C_{ch,2^n,0} \\ C_{ch,2^n,1} & C_{ch,2^n,1} \\ C_{ch,2^n,1} & -C_{ch,2^n,1} \\ \vdots & \vdots \\ C_{ch,2^n,2^n-1} & C_{ch,2^n,2^n-1} \\ C_{ch,2^n,2^n-1} & -C_{ch,2^n,2^n-1} \end{bmatrix}$$

The leftmost value in each channelization code word corresponds to the chip transmitted first in time.

For the DPCCH and DPDCHs the following applies:

- The DPCCH is always spread by code $C_{ch,0} = C_{ch,256,0}$.

- When only one DPDCH is to be transmitted, $DPDCH_1$ is spread by code $C_{ch,SF,k}$ where SF is the spreading factor of $DPDCH_1$ and k= $SF_{d,1}$ / 4

- When more than one DPDCH is to be transmitted, all DPDCHs have spreading factors equal to 4. $DPDCH_n$ is spread by the the code $C_{ch,n} = C_{ch,4,k}$, where $k = 1$ if $n \in \{1, 2\}$, $k = 3$ if $n \in \{3, 4\}$, and $k = 2$ if $n \in \{5, 6\}$.

In case of USTS, for the DPCCH, the UTRAN assigns a node number v_c ($0 \le v_c \le 255$) in the code-tree that corresponds to a channelization code of length 256. For a DPDCH, the UTRAN assigns a node number v_d ($0 \le v_d \le L-1$) in the code-tree that corresponds to a channelization code of length L (i.e., SF for the UE). The sub-tree below the assigned node is used for spreading of DPDCH. When more than one DPDCH is to be transmitted, all DPDCHs have spreading factors equal to 4. In this case, the UTRAN assigns node numbers v_{d1}, v_{d2}, and v_{d3} ($0 \le v_{d1}$, v_{d2}, and $v_{d3} \le 3$) that correspond to channelization codes of length 4.

- The DPCCH is always spread by code $C_{ch,0} = C_{ch,256,k}$, where $k=v_c$.

- When only one DPDCH is to be transmitted, $DPDCH_1$ is spread by code $C_{ch,SF,k}$, where SF is the spreading factor of $DPDCH_1$ and $k= v_d$*SF/L.

- When more than one DPDCH is to be transmitted, all DPDCHs have spreading factors equal to 4 (i.e., L=4). $DPDCH_n$ is spread by the code $C_{ch,n} = C_{ch,4,k}$, where $k = v_{d1}$ if $n \in \{1, 2\}$, $k = v_{d2}$ if $n \in \{3, 4\}$, and $k = v_{d3}$ if $n \in \{5, 6\}$.

3GPP TSG RAN WG1 (Radio) Meeting #9
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CHANGE REQUEST

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25.213 CR 017 r1.0 Current Version: V3.0.0

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

For submission to: RAN	for approval	X	strategic		(for SMG use only)
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Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

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

Source:	GBT	**Date:**	1 Dec 1999
Subject:	Correction ~~Editorial change~~		
Work item:	TS25.213		

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: Correction ~~Editorial change~~

Clauses affected: 4.3.4.4

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:

4.3.4.4 Scrambling code for the CPCH message part

In addition to spreading, the message part is also subject to scrambling with a 10 ms complex code. The set of scrambling codes are is cell-specific and haves a one-to-one correspondence to the signature sequences and the access sub-channels scrambling code used by for the access preamble part.

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 8192…46591 of $C_{scramb,n}$.

In the case when the access resources are shared between the RACH and CPCH,

$S_{c\text{-}msg,n} = C_{scramb,n}$,for chip indexes 4096…42495 of $C_{scramb,n}$.

The generation of these codes is explained in 4.3.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the dedicated uplink channels and is described in 4.3.2.1.

NOTE: Use of short scrambling code for CPCH message part is ffs.

TSG-RAN Working Group 1 meeting #9
Dresden, Germany
November 30 – December 3, 1999

TSGR1#9(99)L12

Agenda item:

Source: Ericsson

Title: CR 25.213-019: Correction to code allocation for compressed mode

Document for: Decision

This CR requests a correction to the description of downlink spreading in Section 5.2 of 25.213.

It has been noted that the current rule for code allocation in case of compresed mode using alternative scrambling codes may lead to collisions in some cases. This CR proposes a somewhat different rule that avoids this.

In the current allocation scheme, channelization codes in a left-branch are mapped to a "left" code tree and codes in a right-branch are mapped to a "right" code tree. The channelization-code allocation is the same as for the case of ordinary scrambling code for compressed frames. Figure 1 illustrates a possible collision in case of the current scheme.

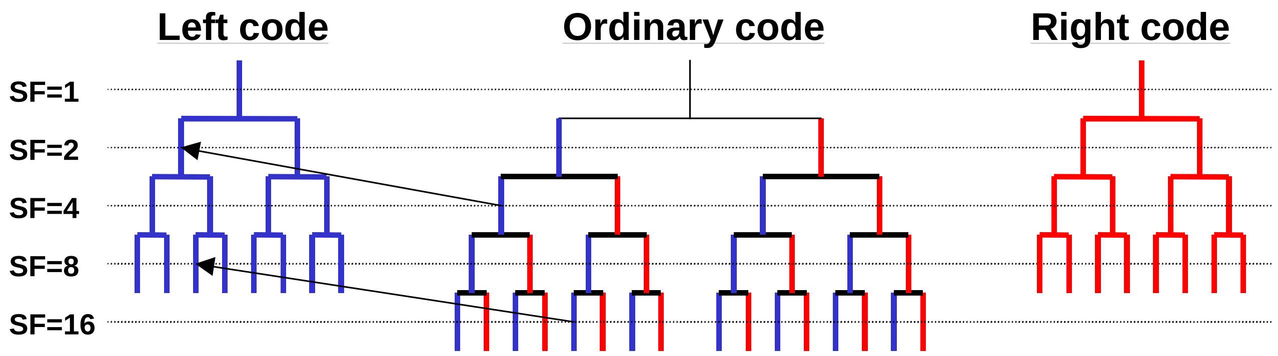

Figure 1

Figure 2 illustrates the proposed mapping in case of alternative scrambling codes. Channelization codes in the *left half-part* of the ordinary code tree are mapped to a "left"-code tree and codes in the *right half-part* of the ordinary code tree are mapped to a "right"-code tree. The mapping is such that the position in the alternative code tree is identical to the position in the ordinary code tree for non-compressed frames, except that the spreading factor is reduced by 50%. With this allocation, all codes that are mapped to the same alternative scrambling code keep their relative position. Collisions can thus not occur.

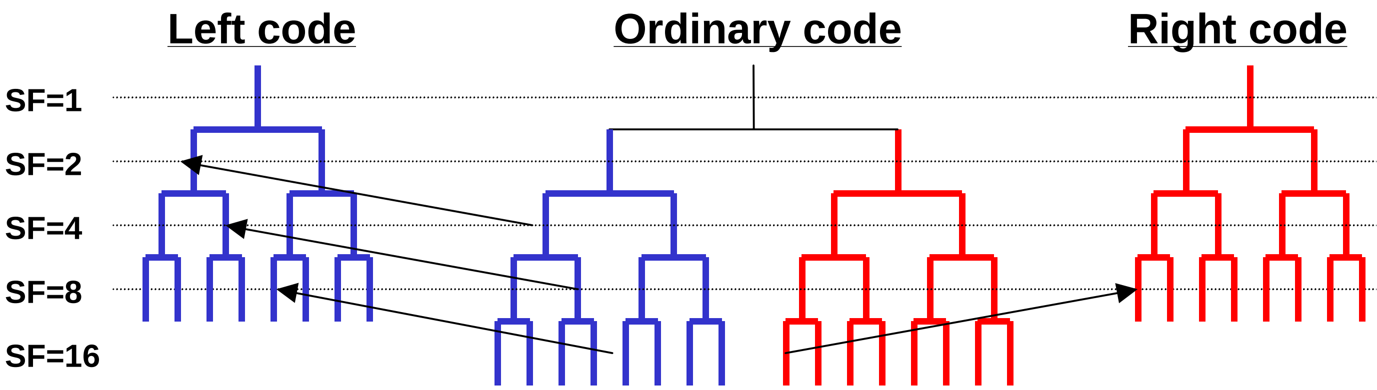

Figure 2

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25.213 CR 019 Current Version: 3.0.0

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For submission to:	TSG-RAN #6	for approval	X	strategic	(for SMG use only)
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Proposed change affects: (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Ericsson **Date:** 1999-12-03

Subject: Correction to code allocation for compressed mode

Work item:

Category:				**Release:**	
	F	Correction	X	Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: The current code allocation in case of alternative scrambling code in compressed mode is incorrect and may lead to collision in some rare case. This change request corrects this incorrectness.

Clauses affected: 5.2

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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5.2 Code generation and allocation

5.2.1 Channelization codes

The channelization codes of figures 8 and 9 are the same codes as used in the uplink, namely Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between downlink channels of different rates and spreading factors. The OVSF codes are defined in figure 4 in section 4.3.1.

The channelization code for the Primary CPICH is fixed to $C_{ch,256,0}$ and the channelization code for the Primary CCPCH is fixed to $C_{ch,256,1}$.The channelization codes for all other physical channels are assigned by UTRAN.

When compressed mode is implemented by reducing the spreading factor by 2, the OVSF code used for compressed frames is:

- $C_{ch,SF/2,\lfloor n/2 \rfloor}$ if ordinary scrambling code is used
- $c_{ch,SF/2,n \bmod SF/2}$ if alternative scrambling code is used (see section 5.2.2)

where $c_{ch,SF,n}$ is the channelization code used for non-compressed frames.

~~of spreading factor SF/2 on the path to the root of the code tree from the OVSF code assigned for normal frames is used in the compressed frames. For the case where the scrambling code is changed during compressed frames, an even numbered OVSF code used in normal mode results in using the even alternative scrambling code during compressed frames, while an odd numbered OVSF code used in normal mode results in using the odd alternative scrambling code during compressed frames. The even and odd alternative scrambling codes are described in the next section.~~

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated such a way that the OVSF code(s) below the smallest spreading factor will be from the branch of the code tree pointed by the smallest spreading factor used for the connection. This means that all the codes for UE for the PDSCH connection can be generated according to the OVSF code generation principle from smallest spreading factor code used by the UE on PDSCH.

In case of mapping the DSCH to multiple parallel PDSCHs, the same rule applies, but all of the branches identified by the multiple codes, corresponding to the smallest spreading factor, may be used for higher spreading factor allocation.

5.2.2 Scrambling code

A total of 2^{18}-1 = 262,143 scrambling codes, numbered 0…262,142 can be generated. However not all the scrambling codes are used. The scrambling codes are divided into 512 sets each of a primary scrambling code and 15 secondary scrambling codes.

The primary scrambling codes consist of scrambling codes n=16*i where i=0…511. The i:th set of secondary scrambling codes consists of scrambling codes 16*i+k, where k=1…15.

There is a one-to-one mapping between each primary scrambling code and 15 secondary scrambling codes in a set such that i:th primary scrambling code corresponds to i:th set of scrambling codes.

Hence, according to the above, scrambling codes k = 0, 1, …, 8191 are used. Each of these codes are associated with a~~n~~ ~~even~~ left alternative scrambling code and a~~n odd~~ right alternative scrambling code, that may be used for compressed frames. The ~~even~~left alternative scrambling code corresponding to scrambling code k is scrambling code number k + 8192, while the ~~odd~~right alternative scrambling code corresponding to scrambling code k is scrambling code number k + 16384. The alternative scrambling codes can be used for compressed frames. In this case, the left alternative scrambling code is used if n<SF/2 and the right alternative scrambling code is used if n≥SF/2, where $c_{ch,SF,n}$ is the channelization code used for non-compressed frames. The usage of alternative scrambling code for compressed frames is signalled by higher layers for each physical channel respectively.

The set of primary scrambling codes is further divided into 64 scrambling code groups, each consisting of 8 primary scrambling codes. The j:th scrambling code group consists of primary scrambling codes 16*8*j+16*k, where j=0..63 and k=0..7.

Each cell is allocated one and only one primary scrambling code. The primary CCPCH is always transmitted using the primary scrambling code. The other downlink physical channels can be transmitted with either the primary scrambling code or a secondary scrambling code from the set associated with the primary scrambling code of the cell.

The mixture of primary scrambling code and secondary scrambling code for one CCTrCH is allowable.

The scrambling code sequences are constructed by combining two real sequences into a complex sequence. Each of the two real sequences are constructed as the position wise modulo 2 sum of 38400 chip segments of two binary *m*-sequences generated by means of two generator polynomials of degree 18. The resulting sequences thus constitute segments of a set of Gold sequences. The scrambling codes are repeated for every 10 ms radio frame. Let *x* and *y* be the two sequences respectively. The *x* sequence is constructed using the primitive (over GF(2)) polynomial $1+X^7+X^{18}$. The y sequence is constructed using the polynomial $1+X^5+X^7+ X^{10}+X^{18}$.

The sequence depending on the chosen scrambling code number *n* is denoted z_n, in the sequel. Furthermore, let *x(i)*, *y(i)* and z_n(i) denote the *i:*th symbol of the sequence *x, y,* and z_n, respectively

The *m*-sequences *x*and *y* are constructed as:

Initial conditions:

x is constructed with x (0)=1, x(1)= x(2)=...= x (16)= x (17)=0

y(0)=y(1)= … =y(16)= y(17)=1

Recursive definition of subsequent symbols:

$x(i+18) =x(i+7) + x(i) \text{ modulo } 2, i=0,…,2^{18}-20,$

$y(i+18) = y(i+10)+y(i+7)+y(i+5)+y(i) \text{ modulo } 2, i=0,…, 2^{18}-20.$

The n:th Gold code sequence z_n, *n=0,1,2,…,*2^{18}*-2,* is then defined as

$z_n(i) = x((i+n) \text{ modulo } 2^{18} - 2) + y(i) \text{ modulo } 2, i=0,…, 2^{18}-2.$

These binary code words are converted to real valued sequences by the transformation ‘0’ -> ‘+1’, ‘1’ -> ‘-1’.

Finally, the n:th complex scrambling code sequence $S_{dl,n}$ is defined as (the lowest index corresponding to the chip scrambled first in each radio frame)(where N is the period in chips and M is 131,072):

$S_{dl,n}(i) = z_n(i) + j\, z_n(i+M), i=0,1,…,N-1.$

Note that the pattern from phase 0 up to the phase of 38399 is repeated.

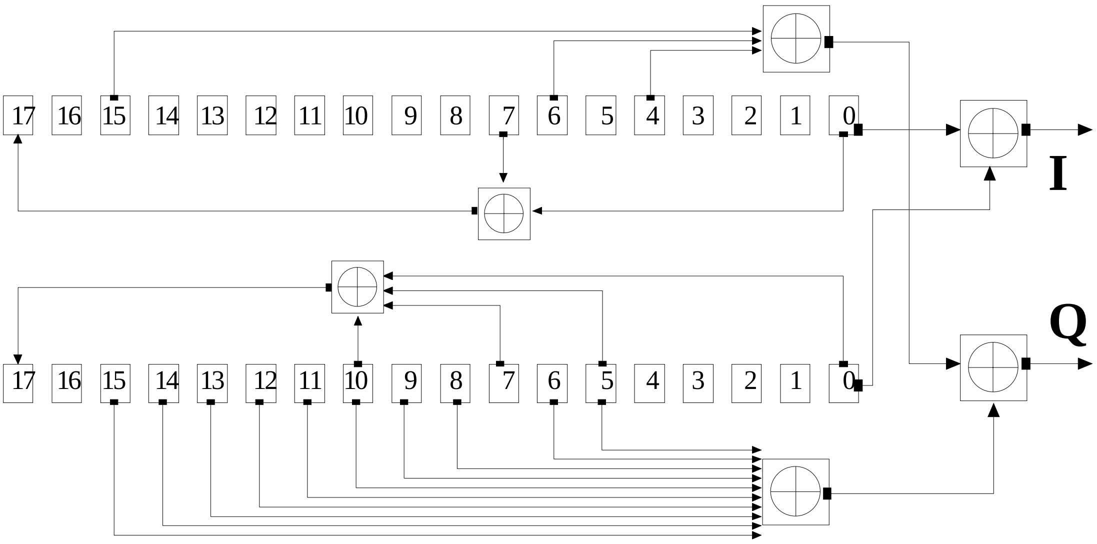

Figure 11: Configuration of downlink scrambling code generator

5.2.3 Synchronisation codes

5.2.3.1 Code Generation

The primary code sequence, C_{psc} 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

$$b = < x_1, x_2, .., x_8, \bar{x}_9, \bar{x}_{10}, .., \bar{x}_{16} >$$

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_{psc} follows (the left most index corresponds to the chip transmitted first in each time slot):

C_{psc} = <y(0),y(1),y(2),...,y(255)>.

Let the sequence $Z = \{b, b, b, \bar{b}, b, b, \bar{b}, \bar{b}, b, \bar{b}, b, \bar{b}, \bar{b}, \bar{b}, \bar{b}, \bar{b}\}$. Then the Secondary Synchronization code words, $\{C_{ssc,1},\ldots,C_{ssc,16}\}$ 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).

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 16th row of the matrix H_8 implying 16 possible code words given by n =0,16,32,48,64,80,96,112,128,144,160,176,192,208,224,240.

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):

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

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’ -> ‘+1’, ‘1’ -> ‘-1’.

The Secondary SCH code words are defined in terms of $C_{sch,n}$:

$C_{ssc,i} = C_{sch,i}$, i=1,…,16

5.2.3.2 Code Allocation

The 64 sequences are constructed such that their cyclic-shifts are unique, i.e., a non-zero cyclic shift less than 15 of any of the 64 sequences is not equivalent to some cyclic shift of any other of the 64 sequences. Also, a non-zero cyclic shift less than 15 of any of the sequences is not equivalent to itself with any other cyclic shift less than 15. The following sequences are used to encode the 64 different scrambling code groups (note that c_i indicates the i’th secondary code of the 16 codes). Note that a secondary code can be different from one time slot to another and that the sequence pattern can be different from one cell to another, depending on Scrambling Code Group the cell uses.

Table 5: Spreading Code allocation for Secondary SCH Code, the index "i" of the code Ci

Scrambling Code Group	slot number														
	#0	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**	**#11**	**#12**	**#13**	**#14**
Group 1	1	1	2	8	9	10	15	8	10	16	2	7	15	7	16
Group 2	1	1	5	16	7	3	14	16	3	10	5	12	14	12	10
Group 3	1	2	1	15	5	5	12	16	6	11	2	16	11	15	12
Group 4	1	2	3	1	8	6	5	2	5	8	4	4	6	3	7
Group 5	1	2	16	6	6	11	15	5	12	1	15	12	16	11	2
Group 6	1	3	4	7	4	1	5	5	3	6	2	8	7	6	8
Group 7	1	4	11	3	4	10	9	2	11	2	10	12	12	9	3
Group 8	1	5	6	6	14	9	10	2	13	9	2	5	14	1	13
Group 9	1	6	10	10	4	11	7	13	16	11	13	6	4	1	16
Group 10	1	6	13	2	14	2	6	5	5	13	10	9	1	14	10
Group 11	1	7	8	5	7	2	4	3	8	3	2	6	6	4	5
Group 12	1	7	10	9	16	7	9	15	1	8	16	8	15	2	2
Group 13	1	8	12	9	9	4	13	16	5	1	13	5	12	4	8
Group 14	1	8	14	10	14	1	15	15	8	5	11	4	10	5	4
Group 15	1	9	2	15	15	16	10	7	8	1	10	8	2	16	9
Group 16	1	9	15	6	16	2	13	14	10	11	7	4	5	12	3
Group 17	1	10	9	11	15	7	6	4	16	5	2	12	13	3	14
Group 18	1	11	14	4	13	2	9	10	12	16	8	5	3	15	6
Group 19	1	12	12	13	14	7	2	8	14	2	1	13	11	8	11
Group 20	1	12	15	5	4	14	3	16	7	8	6	2	10	11	13
Group 21	1	15	4	3	7	6	10	13	12	5	14	16	8	2	11
Group 22	1	16	3	12	11	9	13	5	8	2	14	7	4	10	15
Group 23	2	2	5	10	16	11	3	10	11	8	5	13	3	13	8
Group 24	2	2	12	3	15	5	8	3	5	14	12	9	8	9	14
Group 25	2	3	6	16	12	16	3	13	13	6	7	9	2	12	7
Group 26	2	3	8	2	9	15	14	3	14	9	5	5	15	8	12
Group 27	2	4	7	9	5	4	9	11	2	14	5	14	11	16	16
Group 28	2	4	13	12	12	7	15	10	5	2	15	5	13	7	4
Group 29	2	5	9	9	3	12	8	14	15	12	14	5	3	2	15
Group 30	2	5	11	7	2	11	9	4	16	7	16	9	14	14	4
Group 31	2	6	2	13	3	3	12	9	7	16	6	9	16	13	12
Group 32	2	6	9	7	7	16	13	3	12	2	13	12	9	16	6
Group 33	2	7	12	15	2	12	4	10	13	15	13	4	5	5	10
Group 34	2	7	14	16	5	9	2	9	16	11	11	5	7	4	14
Group 35	2	8	5	12	5	2	14	14	8	15	3	9	12	15	9
Group 36	2	9	13	4	2	13	8	11	6	4	6	8	15	15	11
Group 37	2	10	3	2	13	16	8	10	8	13	11	11	16	3	5
Group 38	2	11	15	3	11	6	14	10	15	10	6	7	7	14	3
Group 39	2	16	4	5	16	14	7	11	4	11	14	9	9	7	5
Group 40	3	3	4	6	11	12	13	6	12	14	4	5	13	5	14
Group 41	3	3	6	5	16	9	15	5	9	10	6	4	15	4	10
Group 42	3	4	5	14	4	6	12	13	5	13	6	11	11	12	14
Group 43	3	4	9	16	10	4	16	15	3	5	10	5	15	6	6
Group 44	3	4	16	10	5	10	4	9	9	16	15	6	3	5	15
Group 45	3	5	12	11	14	5	11	13	3	6	14	6	13	4	4
Group 46	3	6	4	10	6	5	9	15	4	15	5	16	16	9	10
Group 47	3	7	8	8	16	11	12	4	15	11	4	7	16	3	15
Group 48	3	7	16	11	4	15	3	15	11	12	12	4	7	8	16
Group 49	3	8	7	15	4	8	15	12	3	16	4	16	12	11	11
Group 50	3	8	15	4	16	4	8	7	7	15	12	11	3	16	12

Group 51	3	10	10	15	16	5	4	6	16	4	3	15	9	6	9
Group 52	3	13	11	5	4	12	4	11	6	6	5	3	14	13	12
Group 53	3	14	7	9	14	10	13	8	7	8	10	4	4	13	9
Group 54	5	5	8	14	16	13	6	14	13	7	8	15	6	15	7
Group 55	5	6	11	7	10	8	5	8	7	12	12	10	6	9	11
Group 56	5	6	13	8	13	5	7	7	6	16	14	15	8	16	15
Group 57	5	7	9	10	7	11	6	12	9	12	11	8	8	6	10
Group 58	5	9	6	8	10	9	8	12	5	11	10	11	12	7	7
Group 59	5	10	10	12	8	11	9	7	8	9	5	12	6	7	6
Group 60	5	10	12	6	5	12	8	9	7	6	7	8	11	11	9
Group 61	5	13	15	15	14	8	6	7	16	8	7	13	14	5	16
Group 62	9	10	13	10	11	15	15	9	16	12	14	13	16	14	11
Group 63	9	11	12	15	12	9	13	13	11	14	10	16	15	14	16
Group 64	9	12	10	15	13	14	9	14	15	11	11	13	12	16	10

5.3 Modulation

5.3.1 Modulating chip rate

The mQAodulating chip rate is 3.84 Mcps.

5.3.2 Modulation

QPSK modulation is used.

Annex A (informative): Generalised Hierarchical Golay Sequences

A.1 Alternative generation

The generalised hierarchical Golay sequences for the PSC described in 5.2.3.1 may be also viewed as generated (in real valued representation) by the following methods:

Method 1.

The sequence y is constructed from two constituent sequences x_1 and x_2 of length n_1 and n_2 respectively using the following formula:

$$y(i) = x_2(i \bmod n_2) * x_1(i \operatorname{div} n_2),\ i = 0 \ldots (n_1 * n_2) - 1$$

The constituent sequences x_1 and x_2 are chosen to be the following length 16 (i.e. $n_1 = n_2 = 16$) sequences:

- x_1 is defined to be the length 16 ($N^{(1)}=4$) Golay complementary sequence obtained by the delay matrix $D^{(1)} = [8, 4, 1,2]$ and weight matrix $W^{(1)} = [1, -1, 1,1]$.
- x_2 is a generalised hierarchical sequence using the following formula, selecting s=2 and using the two Golay complementary sequences x_3 and x_4 as constituent sequences. The length of the sequence x_3 and x_4 is called n_3 respectively n_4.

  $$x_2(i) = x_4(i \bmod s + s*(i \operatorname{div} sn_3)) * x_3((i \operatorname{div} s) \bmod n_3),\ i = 0 \ldots (n_3 * n_4) - 1$$

  x_3 and x_4 are defined to be identical and the length 4 ($N^{(3)} = N^{(4)} = 2$) Golay complementary sequence obtained by the delay matrix $D^{(3)} = D^{(4)} = [1, 2]$ and weight matrix $W^{(3)} = W^{(4)} = [1, 1]$.

The Golay complementary sequences x_1,x_3 and x_4 are defined using the following recursive relation:

$a_0(k) = \delta(k)$ and $b_0(k) = \delta(k)$

$a_n(k) = a_{n-1}(k) + W^{(j)}{}_n \cdot b_{n-1}(k-D^{(j)}{}_n)$,

$b_n(k) = a_{n-1}(k) - W^{(j)}{}_n \cdot b_{n-1}(k-D^{(j)}{}_n)$,

$k = 0, 1, 2, \ldots, 2^{**}N^{(j)} -1$,

$n = 1, 2, \ldots, N^{(j)}$.

The wanted Golay complementary sequence x_j is defined by a_n assuming $n=N^{(j)}$. The Kronecker delta function is described by δ, k,j and n are integers.

<u>Method 2</u>

The sequence y can be viewed as a pruned Golay complementary sequence and generated using the following parameters which apply to the generator equations for a and b above:

(a) Let j = 0, $N^{(0)} = 8$

(b) $[D_1^0,D_2^0,D_3^0,D_4^0,D_5^0,D_6^0,D_7^0,D_8^0] = [128, 64, 16, 32, 8, 1, 4, 2]$

(c) $[W_1^0,W_2^0,W_3^0,W_4^0,W_5^0,W_6^0,W_7^0,W_8^0] = [1, -1, 1, 1, 1, 1, 1, 1]$

(d) For n = 4, 6, set $b_4(k) = a_4(k)$, $b_6(k) = a_6(k)$.