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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Special Mobile Group (SMG).
The present document describes spreading and modulation for UTRA Physical Layer FDD mode.

The contents of the present document are subject to continuing work within SMG2 and SMG2 UMTS layer 1 expert group and may change following approval by either of these two groups

1 Scope

This Technical Report describes spreading and modulation for UTRA Physical Layer FDD mode.

Text without revision marks has been approved in the previous SMG2 Layer 1 expert group meetings, while text with revision marks is subject to approval.

Status

The status of all the clauses in this specification is working assumption.
Code allocation issues to be solved for dedicated channels vs. common channels.

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

[1] Reference 1.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document the following terms and definitions apply:
Definition 1: to be completed

3.2 Abbreviations

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

ARQ	Automatic Repeat Request
BCH	Broadcast Control Channel
BER	Bit Error Rate
BLER	Block Error Rate
BS	Base Station
CCPCH	Common Control Physical Channel
DCH	Dedicated Channel
DL	Downlink (Forward link)
DPCH	Dedicated Physical Channel
DPCCH	Dedicated Physical Control Channel
DPDCH	Dedicated Physical Data Channel
DS-CDMA	Direct-Sequence Code Division Multiple Access
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FER	Frame Error Rate
Mcps	Mega Chip Per Second
MS	Mobile Station
ODMA	Opportunity Driven Multiple Access
OVSF	Orthogonal Variable Spreading Factor (codes)
PCH	Paging Channel
PG	Processing Gain

PRACH	Physical Random Access Channel
PUF	Power Up Function
RACH	Random Access Channel
RX	Receive
SCH	Synchronisation Channel
SF	Spreading Factor
SIR	Signal-to-Interference Ratio
TDD	Time Division Duplex
TFI	Transport-Format Indicator
TPC	Transmit Power Control
TX	Transmit
UL	Uplink (Reverse link)
VA	Voice Activity

4 Uplink spreading and modulation

4.1 Spreading

4.1.1 Uplink Dedicated Physical Channels (uplink DPDCH/DPCCH)

Figure 1 illustrates the spreading and modulation for the case of a single uplink DPDCH. Data modulation is dual-channel QPSK, where the uplink DPDCH and DPCCH are mapped to the I and Q branch respectively. The I and Q branch are then spread to the chip rate with two different channelization codes c_D/c_C and subsequently complex scrambled by a mobile-station specific complex scrambling code c_{scramb}.

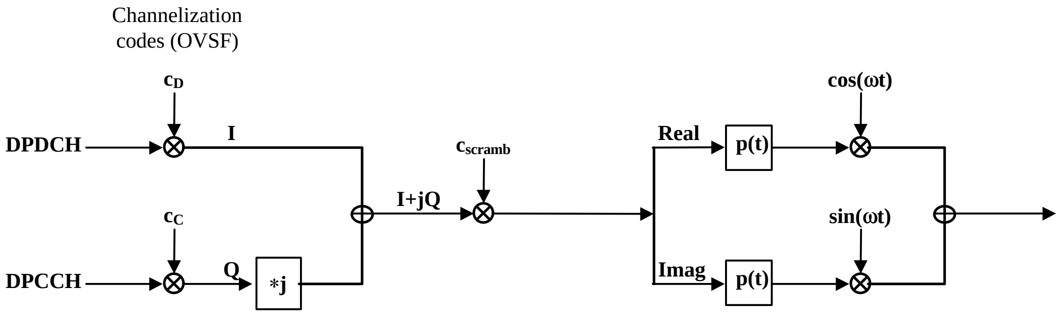

Figure 1: Spreading/modulation for uplink DPDCH/DPCCH

For multi-code transmission, each additional uplink DPDCH may be transmitted on either the I or the Q branch. For each branch, each additional uplink DPDCH should be assigned its own channelization code. Uplink DPDCHs on different branches may share a common channelization code.

4.1.2 PRACH

The spreading and modulation of the message part of the Random-Access burst is basically the same as for the uplink dedicated physical channels, see Figure 1, where the uplink DPDCH and uplink DPCCH are replaced by the data part and the control part respectively. The scrambling code for the message part is chosen based on the base-station-specific preamble code.

4.2 Code generation and allocation

4.2.1 Channelization codes

The channelization codes of Figure 1 are Orthogonal Variable Spreading Factor (OVSF) codes that preserves the orthogonality between a user's different physical channels. The OVSF codes can be defined using the code tree of Figure 2.

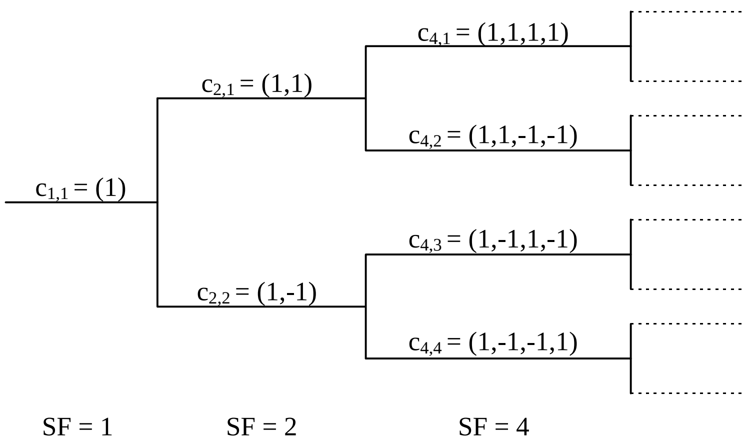

Figure 2: Code-tree for generation of Orthogonal Variable Spreading Factor (OVSF) codes

Each level in the code tree defines channelization codes of length SF, corresponding to a spreading factor of SF in Figure 2. All codes within the code tree cannot be used simultaneously by one mobile station. A code can be used by a mobile station if and only if no other code on the path from the specific code to the root of the tree or in the sub-tree below the specific code is used by the same mobile station. This means that the number of available channelization codes is not fixed but depends on the rate and spreading factor of each physical channel.

Each connection is allocated at least one uplink channelization code, to be used for the uplink DPCCH. In most cases, at least one additional uplink channelization code is allocated for a uplink DPDCH. Further uplink channelization codes may be allocated if more than one uplink DPDCH are required. All channelization codes used for the DPDCHs must be orthogonal to the code used for the DPCCH.

As different mobile stations use different uplink scrambling codes, the uplink channelization codes may be allocated with no co-ordination between different connections. The uplink channelization codes are therefore always allocated in a pre-defined order. The mobile-station and network only need to agree on the number and length (spreading factor) of the uplink channelization codes. The exact codes to be used are then implicitly given. In order to obtain the benefits associated with the scrambling code design at the mobile station transmitter (see subclause 4.2.2), the OVSF codes should be selected as follows:

The OVSF code is described as CSF,code number, where SFd,n represents the spreading factor of nth DPDCH. Then the DPCCH is spread by code number 1 with a spreading factor of SFc and the first DPDCH is spread by code number (SFd,1 / 4 + 1). Subsequently added DPDCHs for multi-code transmission are spread by codes in ascending order starting from code number 2 excepting the one used for the first DPDCH. However to guarantee the orthogonality between channels, any subtree below the specified node is not used for the channelization code of a DPDCH.

NOTE: The case of OVSF code allocation with multiple DPDCHs with different spreading factors is for further study.

4.2.2 Scrambling codes

Either short or long scrambling codes should be used on the uplink. The short scrambling code is typically used in cells where the base station is equipped with a an advanced receiver, such as a multi-user detector or interference canceller. With the short scrambling code the cross-correlation properties between different physical channels and users does not vary in time in the same way as when a long code is used. This means that the cross-correlation matrices used in the advanced receiver do not have to be updated as often as for the long scrambling codes case, thereby reducing the complexity of the receiver implementation. In cells where there is no gain in implementation complexity using the short scrambling code, the long code is used instead due to its better interference averaging properties.

Both short and long scrambling codes are formed as follows:

$$C_{scramb} = c_1(w_0 + jc_2'w_1)$$

where w_0 and w_1 are chip rate sequences defined as repetitions of:

$w_0 = \{1 \quad 1\}$

$w_1 = \{1 \quad -1\}$

and where c_1 is a real chip rate code, and c_2' is a decimated version of the real chip rate code c_2. The preferred decimation factor is 2, however other decimation factors should be possible in future evolutions of UMTS if proved desirable.

With a decimation factor N=2, c_2' is given as:

$c_2'(2k) = c_2'(2k+1) = c_2(2k), \quad k=0,1,2\ldots.$

These scrambling codes are designed such that at N-1 out of N consecutive chip times they produce +/-90° rotations of the IQ multiplexed data and control channels. At the remaining 1 out of N chip times, they produce 0, +/-90 or 180°

rotations. This limits the transitions of the complex baseband signal which is inputted to the root raised cosine pulse shaping filter. This in turn reduces the peak to average ratio of the signal at the filter output, allowing a more efficient power amplifier implementation. To guarantee these desirable properties, restrictions on the choice of uplink OVSF codes are also required (see 4.2.2.1).

The constituent codes c_1 and c_2 are formed differently for the short and long scrambling codes as described in subclauses 4.2.2.1 and 4.2.2.2.

4.2.2.1 Short scrambling code

The short scrambling codes are formed as described in subclause 4.2.2, where, c_1 and c_2 are two different codes from the extended Very Large Kasami set of length 256.

The uplink short scrambling code is decided by the network. The mobile station is informed about what short scrambling code to use in the downlink Access Grant message that is the base-station response to an uplink Random Access Request.

The short scrambling code may, in rare cases, be changed during a connection.

4.2.2.2 Long scrambling code

The long uplink scrambling code is typically used in cells without multi-user detection in the base station. The mobile station is informed if a long scrambling code should be used in the Access Grant Message following a Random-Access request and in the handover message.

The long scrambling codes are formed as described in subclause 4.2.2, where c_1 and c_2 are constructed as the position wise modulo 2 sum of 40960 chip segments of two binary *m*-sequences generated by means of two generator polynomials of degree 41. Let *x*, and *y* be the two *m*-sequences respectively. The *x* sequence is constructed using the primitive (over GF(2)) polynomial $1+X^3+X^{41}$. The *y* sequence is constructed using the polynomial $1+ X^{20}+X^{41}$. The resulting sequences thus constitute segments of a set of Gold sequences.

The code, c_2, used in generating the quadrature component of the complex spreading code is a 1024-chip shifted version of the code, c_1, used in generating the in phase component.

The uplink scrambling code word has a period of one radio frame of 10 ms.

Let $n_{40} \ldots n_0$ be the binary representation of the scrambling code number *n* (decimal) with n_0 being the least significant bit. The *x* sequence depends on the chosen scrambling code number *n* and is denoted x_n, in the sequel. Furthermore, let $x_n(i)$ and $y(i)$ denote the *i*:th symbol of the sequence x_n and *y*, respectively.

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

Initial conditions:

$x_n(0)=n_0$, $x_n(1)= n_1$, … $=x_n(39)= n_{39}$, $x_n(40)= n_{40}$

$y(0)=y(1)= \ldots =y(39)= y(40)=1$

Recursive definition of subsequent symbols:

$x_n(i+41) =x_n(i+3) + x_n(i)$ *modulo 2, i=0,…,* 2^{41}-43,

$y(i+41) = y(i+20)+y(i)$ *modulo 2, i=0,…,* 2^{41}-43.

The definition of the *n*:th scrambling code word for the in phase and quadrature components follows as (the left most index correspond to the chip scrambled first in each radio frame):

$c_{1,long,n} = < x_n(0)+y(0), x_n(1)+y(1), \ldots, x_n(40959)+y(40959) >$,

$c_{2,long,n} = < x_n(1024)+y(1024), x_n(1025)+y(1025), \ldots, x_n(41983) + y(41983) >$,

again all sums being modulo 2 additions.

The code generator must be able to generate the sequence shifted arbitrarily from the initial state.

4.2.3 Random access codes

4.2.3.1 Preamble spreading code

The spreading code for the preamble part is cell specific and is broadcast by the base station. More than one preamble code can be used in a base station if the traffic load is high. The preamble codes must be code planned, since two neighbouring cells should not use the same preamble code.

The code used is a real-valued 256 chip Orthogonal Gold code. All 256 codes are used in the system.

The code sequences are constructed with the help of two binary *m*-sequences of length 255, *x*, and *y*, respectively. The *x* sequence is constructed using the polynomial $1+X^2+X^3+X^4+X^8$. The *y* sequence is constructed using the polynomial $1+X^3+X^5+X^6+X^8$.

Let $n_7 \ldots n_0$ be the binary representation of the code number *n* (decimal) with n_0 being the least significant bit. The *x* sequence depends on the chosen code number *n* and is denoted x_n in the sequel. Furthermore, let $x_n(i)$ and $y(i)$ denote the *i*:th symbol of the sequence x_n and *y*, respectively.

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

Initial conditions:
$x_n(0)=n_0$, $x_n(1)= n_1$, … $=x_n(6)= n_6$, $x_n(7)= n_7$
$y(0)=y(1)= … =y(6)= y(7)=1$
Recursive definition of subsequent symbols:
$x_n(i+8) =x_n(i+4) + x_n(i+3) + x_n(i+2) + x_n(i)$ *modulo 2, i=0,…,* 246,
$y(i+8) = y(i+6)+ y(i+5)+ y(i+3)+y(i)$ *modulo 2, i=0,…,* 246.
The definition of the *n*:th code word follows (the left most index correspond to the chip transmitted first in each slot):
$C_{RACH,n} = < 0, x_n(0)+y(0), x_n(1)+y(1), …,x_n(254)+y(254) >$,
All sums of symbols are taken modulo 2.

NOTE: The code words always start with a constant ‘0’ symbol.

Before modulation and transmission these binary code words are converted to real valued sequences by the transformation ‘0’ -> ‘+1’, ‘1’ -> ‘-1’.

4.2.3.2 Preamble signature

The preamble part carries one of 16 different orthogonal complex signatures of length 16, $<P_0, P_1, ..., P_{15}>$. The signatures are based on a set of Orthogonal Gold codes of length 16 and are specified in Table 1. The base station broadcasts which signatures are allowed to be used in a cell.

Table 1: Preamble signatures A = 1+j

	Preamble symbols															
Signature	P_0	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}	P_{15}
1	A	A	A	-A	-A	-A	A	-A	-A	A	A	-A	A	-A	A	A
2	-A	A	-A	-A	A	A	A	-A	A	A	A	-A	-A	A	-A	A
3	A	-A	A	A	A	-A	A	A	-A	A	A	A	-A	A	-A	A
4	-A	A	-A	A	-A	-A	-A	-A	-A	A	-A	A	-A	A	A	A
5	A	-A	-A	-A	-A	A	A	-A	-A	-A	-A	A	-A	-A	-A	A
6	-A	-A	A	-A	A	-A	A	-A	A	-A	-A	A	A	A	A	A
7	-A	A	A	A	-A	-A	A	A	A	-A	-A	-A	-A	-A	-A	A
8	A	A	-A	-A	-A	-A	-A	A	A	-A	A	A	A	A	-A	A
9	A	-A	A	-A	-A	A	-A	A	A	A	-A	-A	-A	A	A	A
10	-A	A	A	-A	A	A	-A	A	-A	-A	A	A	-A	-A	A	A
11	A	A	A	A	A	A	-A	-A	A	A	-A	A	A	-A	-A	A
12	A	A	-A	A	A	A	A	A	-A	-A	-A	-A	A	A	A	A
13	A	-A	-A	A	A	-A	-A	-A	A	-A	A	-A	-A	-A	A	A
14	-A	-A	-A	A	-A	A	A	A	A	A	A	A	A	-A	A	A
15	-A	-A	-A	-A	A	-A	-A	A	-A	A	-A	-A	A	-A	-A	A
16	-A	-A	A	A	-A	A	-A	-A	-A	-A	A	-A	A	A	-A	A

4.2.3.3 Channelization codes for the 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, as shown in Figure 3. The sub-tree below the specified node is used for spreading of the message part. The control (Q-branch) is spread with the channelization code of spreading factor 256 in the lowest branch of the sub-tree. The data part (I-branch) can use any of the channelization codes from spreading factor 32 to 256 in the upper-most branch of the sub-tree. However, the system may restrict the set of codes (spreading factors) actually allowed in the cell, through the use of a BCH message.

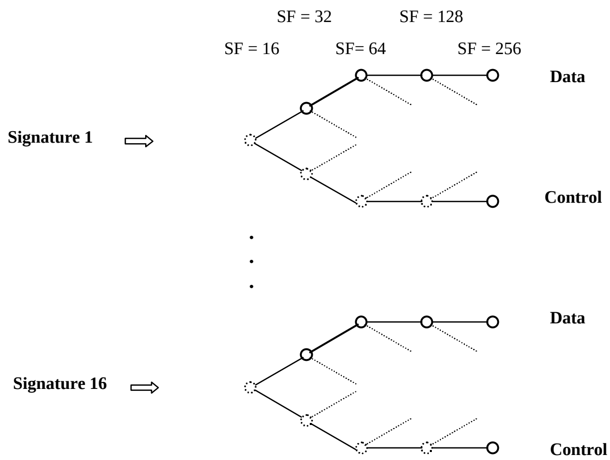

Figure 3: Channelization codes for the random access message part

Since the control part is always spread with a known channelization code of length 256, it can be detected by the base station. The rate information field of the control part informs the base station about the spreading factor used on the data part. With knowledge of the sub-tree (obtained from the preamble signature) and the spreading factor (obtained from the rate information), the base station knows which channelization code is used for the data part.
This structure allows for simultaneous detection of multiple random access messages arriving in the same access slot, as long as different signatures are used.

4.2.3.4 Scrambling code for the 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 spreading code used for the preamble part. Note that although the scrambling code is the same for every access slot, there is no scrambling-code collision problems between different access slots due to the 1,25 ms time shifts between the access slots.
The scrambling codes used are from the same set of codes as is used for the other dedicated uplink channels when the long scrambling codes are used for these channels. The first 256 of the long scrambling codes are used for the random access channel. The generation of these codes is explained in subclause 4.2.2.2. The mapping of these codes to provide a complex scrambling code is also the same as for the other dedicated uplink channels and is described in subclause 4.2.2.

4.3 Modulation

4.3.1 Modulating chip rate

The modulating chip rate is 4.096 Mcps. This basic chip rate can be extended to 8.192 or 16.384 Mcps.

4.3.2 Pulse shaping

The pulse-shaping filters are root-raised cosine (RRC) with roll-off α=0.22 in the frequency domain.

4.3.3 Modulation

QPSK modulation is used. Note that phase restrictions are introduced by the scrambling code design.

5 Downlink spreading and modulation

5.1 Spreading

Figure 4 illustrates the spreading and modulation for the downlink DPCH and CCPCHs. Data modulation is QPSK where each pair of two bits are serial-to-parallel converted and mapped to the I and Q branch respectively. The I and Q branch are then spread to the chip rate with the same channelization code c_{ch} (real spreading) and subsequently scrambled by the same cell specific scrambling code C_{scramb} (complex scrambling).

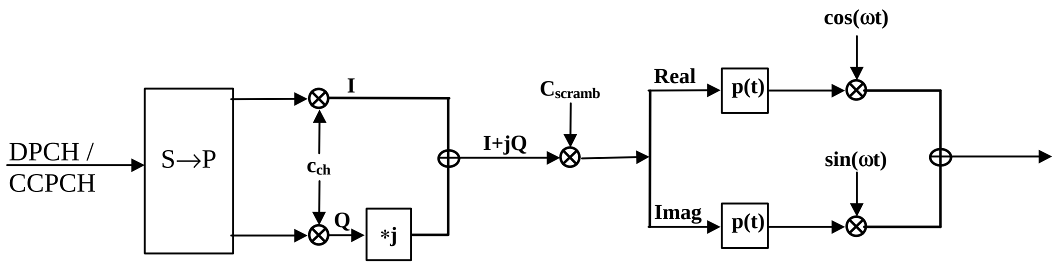

Figure 4: Spreading/modulation for downlink DPCH and CCPCHs

The different physical channels use different channelization codes, while the scrambling code is the same for all physical channels in one cell.

The multiplexing of the SCH with the other downlink physical channels (DPCH and CCPCH) is illustrated in Figure 5. The figure illustrates that the SCH is only transmitted intermittently (one codeword per slot) and also that the SCH is multiplexed *after* long code scrambling of the DPCH and CCPCH. Consequently, the SCH is *non-orthogonal* to the other downlink physical channels.

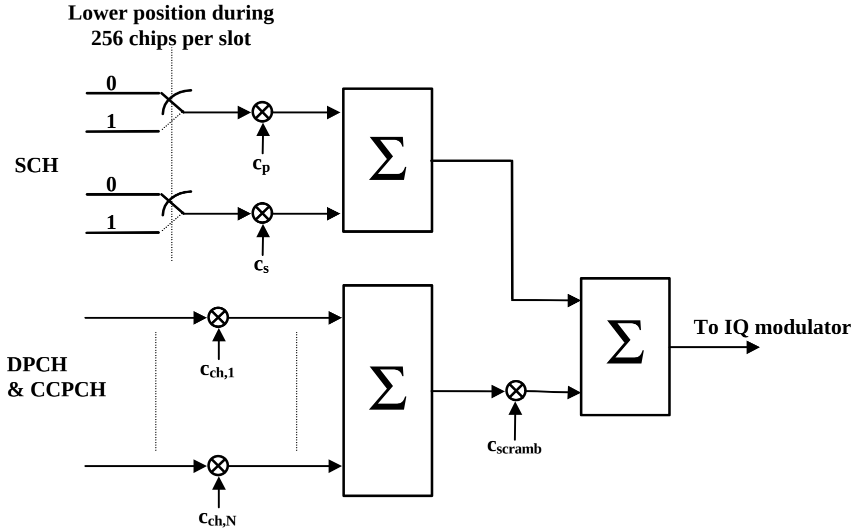

Figure 5: Multiplexing of SCH

<Editor's note: The above two figures should be drawn in a more consistent way, maybe as one figure only. >

5.2 Code generation and allocation

5.2.1 Channelization codes

The channelization codes of Figure 4 are the same codes 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 2 in subclause 4.2.1.The same restriction on code allocation applies as for the uplink, but for a cell and not a mobile station as in the uplink. Hence, in the downlink a code can be used in a cell if and only if no other code on the path from the specific code to the root of the tree or in the sub-tree below the specific code is used in the same cell.

The channelization code for the BCH is a predefined code which is the same for all cells within the system.

The channelization code(s) used for the Secondary Common Control Physical Channel is broadcast on the BCH.

The channelization codes for the downlink dedicated physical channels are decided by the network. The mobile station is informed about what downlink channelization codes to receive in the downlink Access Grant message that is the base-station response to an uplink Random Access request. The set of channelization codes may be changed during the duration of a connection, typically as a result of a change of service or an inter-cell handover. A change of downlink channelization codes is negotiated over a DCH.

5.2.2 Scrambling code

The total number of available scrambling codes is 512, divided into 32 code groups with 16 codes in each group. The grouping of the downlink codes is done in order to facilitate a fast cell search, seedocument XX.07. The downlink scrambling code is assigned to the cell (sector) at the initial deployment. The mobile station learns about the downlink scrambling code during the cell search process, see document XX.07.

In order to avoid code limitation in some cases, e.g. when increasing the capacity using adaptive antennas, the possibility to associate several scrambling codes with one cell (BCH area) has been identified as one solution. The exact implementation of such a scheme is still to be determined.

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 40960 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 $1+X^5+X^7+ X^{10}+X^{18}$.

Let $n_{17} \dots n_0$ be the binary representation of the scrambling code number n (decimal) with n_0 being the least significant bit. The x sequence depends on the chosen scrambling code number n and is denoted x_n, in the sequel. Furthermore, let $x_n(i)$ and $y(i)$ denote the *i:*th symbol of the sequence x_n and y, respectively.

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

Initial conditions:

$x_n(0)=n_0 , x_n(1)= n_1 , \dots =x_n(16)= n_{16} , x_n(17)= n_{17}$

$y(0)=y(1)= \dots =y(16)= y(17)=1$

Recursive definition of subsequent symbols:

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

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

The n:th Gold code sequence z_n is then defined as

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

The antipodal version of z_n, the sequence z'_n, is defined as, for $i=0,\dots, 2^{18}-2$, if $z_n(i)=0$ *then* $z'_n(i)=1$, *and if* $z_n(i)=1$ *then* $z'_n(i)=-1$.

Finally, the n:th complex scrambling code sequence C_{scramb} is defined as (the lowest index corresponding to the chip scrambled first in each radio frame):

$C_{scramb}(i) = z'_n(i) + j\, z'_n(i+3584), i=0,1,\dots,40959.$

The index n runs from 0 to 511 giving 512 distinct 40960 chip sequences.

5.2.3 Synchronisation codes

The Primary and Secondary code words, C_p and $\{C_1,\dots,C_{17}\}$ respectively, consist of pair wise mutually orthogonal Gold codes of length 256. The Primary SCH is furthermore chosen to have good aperiodic auto correlation properties. All sequences are constructed as the position wise addition modulo 2 of a Hadamard sequence and a fixed so called hierarchical sequence.

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

$y(i) = x_2(i \bmod n_2) + x_1(i \operatorname{div} n_2) \text{ modulo } 2, i = 0 \dots (n_1 * n_2) - 1$

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

$x_1 = x_2 = < 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0 >$

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

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

$C_{SCH,n} = < h_n(0)+y(0), h_n(1)+y(1), h_n(2)+y(2), \dots,h_n(255)+y(255) >,$

All sums of symbols are taken modulo 2.

Before modulation and transmission these binary code words are converted to real valued sequences by the transformation ‘0’ -> ‘+1’, ‘1’ -> ‘-1’.

The Primary and Secondary code words are defined in terms of $C_{SCH,n}$ and the definition of C_p and $\{C_1,\dots,C_{17}\}$ now follows as:

$C_p= C_{SCH, 0}$

and

$C_i = C_{SCH, i}$, i=1,…,17

The definitions of C_p and $\{C_1,\ldots,C_{17}\}$ are such that a 32 point fast Hadamard transform can be utilised for detection.

5.3 Modulation

5.3.1 Modulating chip rate

The modulating chip rate is 4.096 Mcps. This basic chip rate can be extended to 8.192 or 16.384 Mcps.

5.3.2 Pulse shaping

The pulse-shaping filters are root raised cosine (RRC) with roll-off α=0.22 in the frequency domain.

5.3.3 Modulation

QPSK modulation is used.

History

Document history		
V0.0.1	1998-08-17	'UTRA Physical Layer Description, FDD part' was split into several subdocuments xx.xx. This new subdocument xx.05 contains chapter 4 of the former FDD master document v0.4. It is updated with modifications agreed upon at the UMTS-L1 meeting in London 15-17.7.
V0.1.0	1998-09-16	Document edited into ESTI template as requested at UMTS-L1 meeting in Helsinki. Title corrected. Subclause 4.2.1 modified in line with reflector correspondence as agreed in Helsinki. Cross reference in Subclause 4.2.3.4 corrected
V0.2.0	1998-11-02	Status information added from XX.18. Subclause 5.2.3 modified in line with Tdoc 409. Subclause 4.2.3.1 originally referenced Subclause 5.2.3 – modified to include unmodified text of Subclause 5.2.3. Subclause 4.2.3.4 incorrectly referenced Subclause 5.2.2 – corrected to Subclause 4.2.2.2. Additional text included to remove ambiguity from the reference. Description of long scrambling codes in Subclause 4.2.2.2 was inconsistent with the definition of the HPSK mapping in Subclause 4.2.2. Editorial changes made to remove the inconsistency.
V0.3.0	1998-11-13	Modified Subclause 5.2.3 in line with Tdoc 502. Removed entries ‘b’ & ‘c’ in Clause 4 as requested by meeting L1#8. Change BCCH to BCH throughout as requested by L2/3
V0.4.0	1999-1-11	Inconsistencies in subclause 4.2.2 corrected in line with Tdoc 616. Subclauses 5.1 and 5.2.2 were modified to reflect Tdoc 754. Minor correction to Table 1.
V0.5.0	1999-1-19	Correction to subclause 5.2.3 in line with Tdoc 020/99
V0.6.0	1999-1-21	Minor editorial – Subclause 4.2.3.1 correct name of preamble spreading code from $C_{SCH,n}$ to $C_{RACH,n}$. The proposal for OVSF code allocation of Tdoc 005/99 has been incorporated in Subclause 4.2.1 with a note about different spreading factors.
Editor for UTRA FDD, spreading and modulation description, is: Pete Hulbert Siemens Roke Manor Research Tel: +44 (0) 1794 833490 Fax: +44 (0) 1794 833589 Email: pete.hulbert@roke.co.uk The present document is written in Microsoft Word 97.		

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