TSG-RAN Meeting #21 ***RP-030502***
Frankfurt, Germany, 16-19 September 2003

Title: **Scrambling code & phase reference combinations for HS-DSCH : Solution 1**
CRs (Rel-5) to 25.213 (RAN WG1) and TS 25.331.

Source: **TSG-RAN WG2**

Agenda item: **7.3.6**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.331	2065	-	Rel-5	Scrambling code & phase reference combinations for HS-DSCH (solution 1)	C	5.5.0	5.6.0	R2-032025	HSDPA-L23
25.213	063	1	Rel-5	Scrambling code & phase reference combinations for DL HS channels	F	5.3.0	5.4.0	R1-030862	HSDPA-Phys

3GPP TSG-RAN WG1 Meeting #33
NYC, USA, 25-29 August 2003

Tdoc ⌘R1-030862

CR-Form-v7

CHANGE REQUEST

⌘ **25.213** **CR** **063** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Scrambling code & phase reference combinations for DL HS channels
Source:	⌘	TSG RAN WG1
Work item code:	⌘	HSDPA-Phys
Date:	⌘	18/08/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Some combinations of scrambling code and reference for DL HS channels do not make practical sense.
Summary of change:	⌘	Removing the combinations where the reference channel for the associated DPCH and HS channels are not on the same scrambling code.
Consequences if not approved:	⌘	UE has to support and test feature combinations which may never be used in in the field.

Clauses affected:	⌘	5.2.2

	Y	N			
Other specs affected:	X		Other core specifications	⌘	RAN WG2 CR2065 to 25.331
		X	Test specifications		
		X	O&M Specifications		

Other comments: ⌘

Isolated impact analysis:
This CR removes possible combinations of phase reference and scrambling code assignements. The impact is limited to the affected combinations and to the HS-PDSCH. An hypothetical impact would be if a Node B based on earlier version of Release-5 would attempt to configure such combinations with a UE based on a later version of Release-5 in which case the UE will reject the particular configuartion as it would not support it.

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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 secondary scrambling codes.

Hence, according to the above, scrambling codes k = 0, 1, …, 8191 are used. Each of these codes are associated with a left alternative scrambling code and a right alternative scrambling code, that may be used for compressed frames. The left alternative scrambling code corresponding to scrambling code k is scrambling code number k + 8192, while the 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 channelisation 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, primary CPICH, PICH, AICH, AP-AICH, CD/CA-ICH, CSICH and S-CCPCH carrying PCH are 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. However, in the case of the CCTrCH of type DSCH then all the PDSCH channelisation codes that a single UE may receive shall be under a single scrambling code (either the primary or a secondary scrambling code).

In the case of CCTrCH of type of HS-DSCH then all the HS-PDSCH channelisation codes and HS-SCCH that a single UE may receive shall be under a single scrambling code (either the primary or a secondary scrambling code). In addition, the scrambling code assigned to the HS-SCCH and the HS-PDSCH channelisation codes shall be the same as the one assigned to the P-CPICH if the P-CPICH may be used as a reference for the associated DPCH and the same as the one assigned to a S-CPICH if that S-CPICH has been defined as a valid reference for the associated DPCH.

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

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

- $z_n(i) = x((i+n) \text{ modulo } (2^{18} - 1)) + y(i) \text{ modulo } 2$, i=0,…, 2^{18}-2.

These binary sequences are converted to real valued sequences Z_n by the following transformation:

$$Z_n(i) = \begin{cases} +1 & if \ z_n(i) = 0 \\ -1 & if \ z_n(i) = 1 \end{cases} \quad for \quad i = 0,1,\ldots,2^{18} - 2.$$

Finally, the n:th complex scrambling code sequence $S_{dl,n}$ is defined as:

- $S_{dl,n}(i) = Z_n(i) + j\, Z_n((i+131072) \text{ modulo } (2^{18}-1))$, i=0,1,…,38399.

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

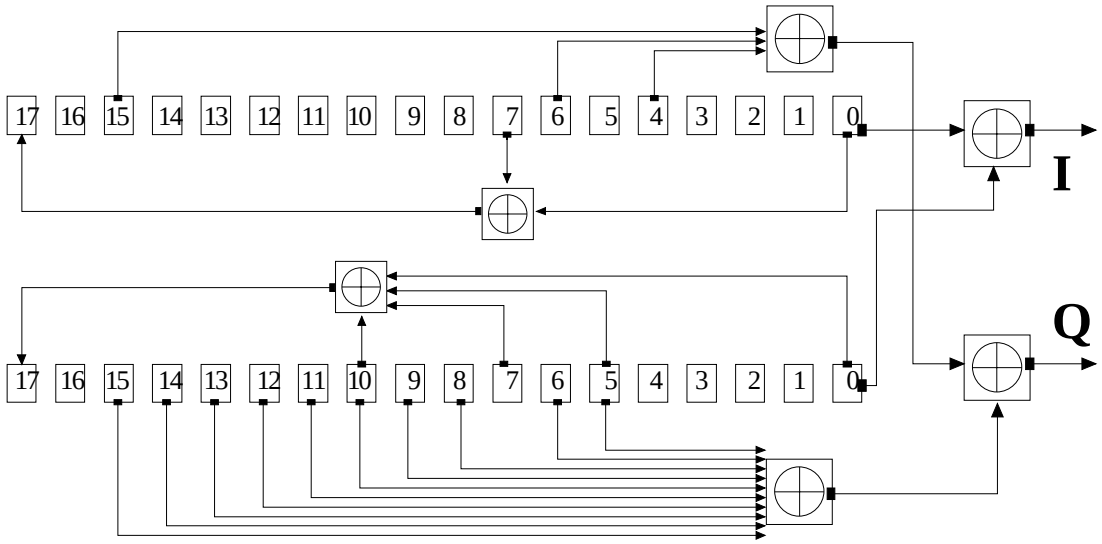

Figure 10: Configuration of downlink scrambling code generator

3GPP TSG-RAN2 Meeting #37
Budapest, Hungary, 25-29 August, 2003

Tdoc ⌘R2-032025

CR-Form-v7

CHANGE REQUEST

⌘ **25.331** **CR** **2065** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Scrambling code & phase reference combinations for HS-DSCH (solution 1)
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	August 25 2003
Category:	⌘	**C**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	Alignment with TS 25.213
Summary of change:	⌘	If the secondary CPICH is configured for the serving HS-DSCH radio link: - receive the HS-SCCH(s) according to the IE "HS-SCCH channelisation code" on the serving HS-DSCH radio link applying the scrambling code used by the secondary CPICH. else: - receive the HS-SCCH(s) according to the IE "HS-SCCH channelisation code" on the serving HS-DSCH radio link applying the primary scrambling code. The IE "DL Scrambling Code" included in the IE "HS-SCCH Info" is removed by the tabular and the ASN.1
Consequences if not approved:	⌘	Signalling specifications and physical layer specifications would not be aligned.

Clauses affected:	⌘	8.6.6.33, 10.3.6.36a, 11.3			
Other specs affected:	⌘	Y / N		⌘	
		X /	Other core specifications		TS 25.213 CR 063rev1
		/ X	Test specifications		
		/ X	O&M Specifications		
Other comments:	⌘				

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[…]

8.6.6.33 HS-SCCH Info

If the IE "HS-SCCH Info" is included, the UE shall:

1> store the received configuration.

When the variable HS_DSCH_RECEPTION is set to TRUE the UE shall:

1> in the case of FDD:

2> if the secondary CPICH is configured for the serving HS-DSCH radio link:

~~2~~3> receive the HS-SCCH(s) according to the IE "HS-SCCH channelisation code" on the serving HS-DSCH radio link applying the scrambling code ~~as received in the IE "DL Scrambling code"~~used by the secondary CPICH.

2> else:

3> receive the HS-SCCH(s) according to the IE "HS-SCCH channelisation code" on the serving HS-DSCH radio link applying the primary scrambling code.

1> in the case of TDD:

2> receive the HS-SCCH(s) according to the IEs "Timeslot" and "Channelisation Code" on the serving HS-DSCH radio link;

2> receive the HS-SICH according to the IEs "Timeslot" and "Channelisation Code" on the serving HS-DSCH radio link.

[…]

10.3.6.36a HS-SCCH Info

Information Element/Group name	Need	Multi	Type and reference	Semantics description	Version
CHOICE mode	MP				REL-5
>FDD					REL-5
~~>>DL Scrambling Code~~	~~MD~~		~~Secondary scrambling code 10.3.6.74~~	~~DL Scrambling code to be applied for HS-DSCH and HS-SCCH. Default is same scrambling code as for DPCH.~~	~~REL-5~~
>>HS-SCCH Channelisation Code Information	MP	<1 to maxHSSCCHcodes>			REL-5
>>>HS-SCCH Channelisation Code	MP		Integer (0..127)		REL-5
>TDD					REL-5
>>CHOICE *TDD option*	MP				REL-5
>>>3.84 Mcps					REL-5
>>>> Ack-Nack Power Offset	MP		Integer (-7..8 by step of 1)	dB	REL-5
>>>> HS-SICH Power Control Info	MP		HS-SICH Power Control Info 10.3.6.36b		REL-5
>>>>HS-SCCH Set Configuration	MP	1 to <maxHS-SCCHs>			REL-5
>>>>>Timeslot number	MP		Integer (0..14)		REL-5
>>>>>Channelisation code	MP		Enumerated ((16/1) ..(16/16))		REL-5
>>>>>Midamble Allocation mode	MP		Enumerated (Default midamble, Common midamble)	HS-SCCH always uses burst type 1.	REL-5
>>>>>Midamble configuration	MP		Integer (4, 8, 16)		REL-5
>>>>>BLER target	MP		Real (-3.15..0 by step of 0.05)	Signalled value is Log10(HS-SCCH BLER quality target)	REL-5
>>>>>HS-SICH configuration					REL-5
>>>>>>Timeslot number	MP		Integer (0..14)		REL-5
>>>>>>Channelisation code	MP		Enumerated ((16/1) ..(16/16))		REL-5
>>>>>>Midamble Allocation mode	MP		Enumerated (Default midamble, UE specific midamble)	HS-SICH always uses burst type 1.	REL-5
>>>>>>Midamble configuration	MP		Integer (4, 8, 16)		REL-5
>>>>>>Midamble Shift	CV-*UE*		Integer (0..15)		REL-5
>>>1.28 Mcps					REL-5

>>>>HS-SCCH Set Configuration	MP	1 to <maxHS-SCCHs>			REL-5
>>>>>Timeslot number	MP		Integer (0..6)		REL-5
>>>>>First Channelisation code	MP		Enumerated ((16/1) ..(16/16))		REL-5
>>>>>Second Channelisation code	MP		Enumerated ((16/1) ..(16/16))		REL-5
>>>>>Midamble Allocation mode	MP		Enumerated (Default midamble, Common midamble, UE specific midamble)		REL-5
>>>>> Midamble Shift	CV-UE		Integer (0..15)		REL-5
>>>>>Midamble configuration	MP		Integer (2, 4, 6, 8, 10, 12, 14, 16)		REL-5
>>>>>BLER target	MP		Real (-3.15..0 by step of 0.05)	Signalled value is Log10(HS-SCCH BLER quality target)	REL-5
>>>>>HS-SICH configuration					REL-5
>>>>>>Timeslot number	MP		Integer (0..6)		REL-5
>>>>>>Channelisation code	MP		Enumerated ((16/1) ..(16/16))		REL-5
>>>>>>Midamble Allocation mode	MP		Enumerated (Default midamble, UE specific midamble)		REL-5
>>>>>>Midamble configuration	MP		Integer (2, 4, 6, 8, 10, 12, 14, 16)		REL-5
>>>>>>Midamble Shift	CV-*UE*		Integer (0..15)		REL-5
>>>>>>Ack-Nack Power Offset	MP		Integer (-7..8 by step of 1)	dB.	REL-5
>>>>>>$PRX_{HS-SICH}$	MP		Integer (-120..-58 by step of 1)	dBm. Desired power level for HS-SICH.	REL-5
>>>>>>TPC step size	MP		Integer (1, 2, 3)	dB.	REL-5

Condition	Explanation
UE	This IE is mandatory present when the value of the IE "Midamble Allocation Mode" is "UE specific midamble" and not needed otherwise.

[…]

11.3 Information element definitions

[…]

```
HS-SCCH-Info ::=                    SEQUENCE {
```

```
    modeSpecificInfo                    CHOICE {
        fdd                                 SEQUENCE {
            hS-SCCHChannelisationCodeInfo       SEQUENCE (SIZE (1..maxHSSCCHs)) OF
                                                    HS-SCCH-Codes,
            dl-ScramblingCode                   SecondaryScramblingCode     OPTIONAL
        },
        tdd                                 CHOICE {
            tdd384                              SEQUENCE {
                nack-ack-power-offset               INTEGER (-7..8),
                hs-SICH-PowerControl-Info           HS-SICH-Power-Control-Info-TDD384,
                hS-SCCH-SetConfiguration            SEQUENCE (SIZE (1..maxHSSCCHs)) OF
                        HS-SCCH-TDD384
                },
            tdd128                              SEQUENCE (SIZE (1..maxHSSCCHs)) OF
                                                    HS-SCCH-TDD128
        }
    }
}
[...]
```