TSG-RAN Meeting #22 **RP-030711**
Maui, Hawaii, USA, 9 - 12 December 2003

Title: **Independent Release 99 CR to TS 25.213 and shadow Release 4 & 5 CRs**

Source: **Nokia**

Agenda item: **7.2.3**

RP tdoc#	WG tdoc#	Spec	CR	R	Subject	Ph	Cat	Current	New	WI	Remarks
RP-030711	R1-031405	25.213	68		Restriction of DL secondary srambling codes per CCTrCH	Rel-4	F	3.8.0	3.9.0	TEI	
RP-030711	R1-031405	25.213	66	1	Restriction of DL secondary srambling codes per CCTrCH	Rel-4	A	4.3.0	4.4.0	TEI	
RP-030711	R1-031405	25.213	67	1	Restriction of DL secondary srambling codes per CCTrCH	Rel-5	A	5.4.0	5.5.0	TEI	

3GPP TSG-RAN WG1 Meeting #35 ***Tdoc R1-031405***
Lisbon, Portugal, 17-21 November, 2003

CR-Form-v7

CHANGE REQUEST

⌘ **TS25.213 CR 066** ⌘**rev** **1** ⌘ Current version: **4.3.0** ⌘

*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 [ ] Radio Access Network [X] Core Network [ ]

Title:	⌘	Restriction of DL secondary scrambling codes per CCTrCH
Source:	⌘	Nokia
Work item code:	⌘	TEI
Date:	⌘	10/11/2003
Category:	⌘	**A**
Release:	⌘	Rel-4

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:
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- *R97 (Release 1997)*
- *R98 (Release 1998)*
- *R99 (Release 1999)*
- *Rel-4 (Release 4)*
- *Rel-5 (Release 5)*
- *Rel-6 (Release 6)*

Reason for change: ⌘ Currently L1 specs as well as NBAP/RRC allow setting different scrambling codes for each DL DPCH in case of multicode transmission. This kind of combination is not in alignment with the assumptions on the use of multiple scrambling codes in RAN WG1.

Summary of change: ⌘ It is specified that no more than one secondary scrambling code for one CCTrCH is allowable in downlink.

Consequences if not approved: ⌘ Possible interpretation differences might cause incompatible equipment.

Unnecessary complexity for the UE if implemented functionality is not used.

Impact analysis:

The change has an isolated impact as
- o The scrambling codes employed are given to the UE by RRC signaling, so a network implementing the change also works with an earlier UE.

Clauses affected: ⌘ 5.2.2

Other specs affected: ⌘

Y	N		
	X	Other core specifications	⌘
	X	Test specifications	
	X	O&M Specifications	

Other comments: ⌘

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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.

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated in 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 code with smallest spreading factor used for the connection which is called PDSCH root channelisation code. This means that all the codes for this UE for the PDSCH connection can be generated according to the OVSF code generation principle from the PDSCH root channelisation code i.e. the code with smallest spreading factor 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 i.e. the multiple codes with smallest spreading factor can be considered as PDSCH root channelisation codes.

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 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, 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 no more than one secondary scrambling code for one CCTrCH is allowable. In compressed mode during compressed frames, these can be changed to the associated left or right scrambling codes as described above, i.e. in these frames, the total number of different scrambling codes may exceed two.

~~However, i~~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).

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

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

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

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

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

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

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

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

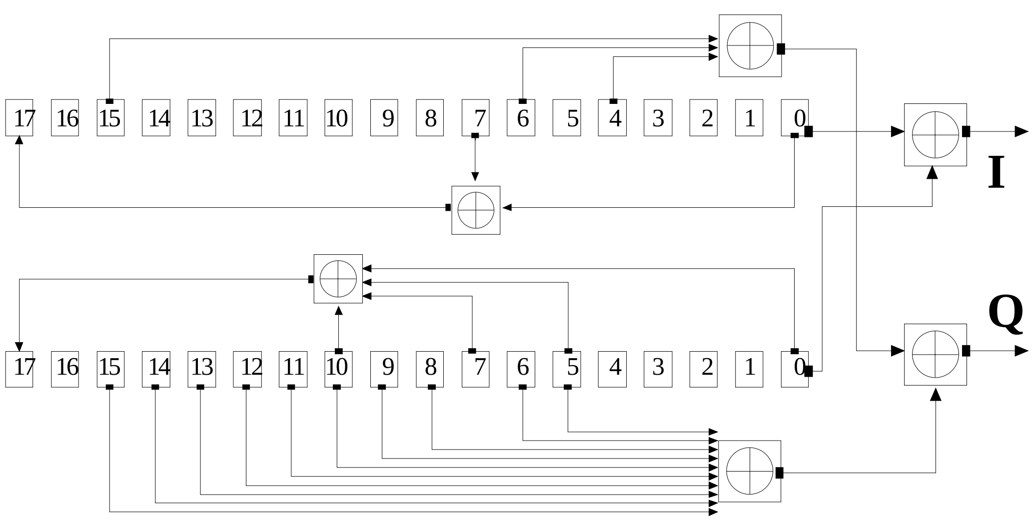

Figure 10: Configuration of downlink scrambling code generator

3GPP TSG-RAN WG1 Meeting #35
Lisbon, Portugal, 17-21 November, 2003

Tdoc R1-031405

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CHANGE REQUEST

⌘	**TS25.213**	**CR**	**067**	⌘ **rev**	**1**	⌘ Current version:	**5.4.0** ⌘

*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 [ ] Radio Access Network [X] Core Network [ ]

Title:	⌘	Restriction of DL secondary scrambling codes per CCTrCH
Source:	⌘	Nokia
Work item code:	⌘	TEI — ***Date:*** ⌘ 10/11/2003
Category:	⌘	**A** — ***Release:*** ⌘ Rel-5

Use one of the following categories:
- ***F*** *(correction)*
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Unnecessary complexity for the UE if implemented functionality is not used.

Impact analysis:

The change has an isolated impact as
- o The scrambling codes employed are given to the UE by RRC signaling, so a network implementing the change also works with an earlier UE.

Clauses affected: ⌘ 5.2.2

Other specs affected: ⌘

Y	N		
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$C_{ch,16,O}$ … $C_{ch,16,\ O+P-1}$

The number of multicodes and the corresponding offset for HS-PDSCHs mapped from a given HS-DSCH is signalled by HS-SCCH.

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.

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

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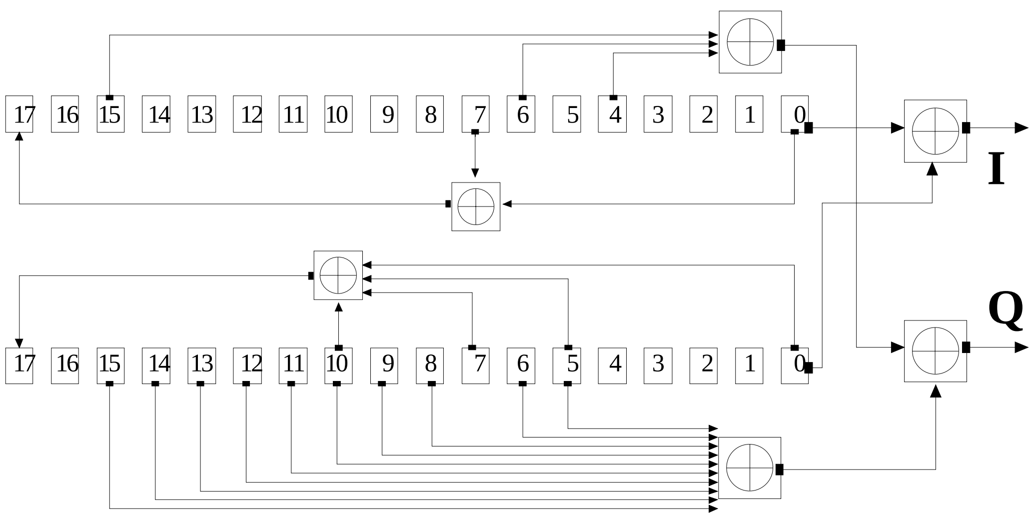

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3GPP TSG-RAN WG1 Meeting #35
Lisbon, Portugal, 17-21 November, 2003

Tdoc R1-031405

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CHANGE REQUEST

⌘	TS25.213	CR	068	⌘ rev	-	⌘	Current version:	3.8.0	⌘

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Work item code:	⌘	TEI
Date:	⌘	10/11/2003
Category:	⌘	F
Release:	⌘	R99

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

Initial conditions:

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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) modulo (2^{18} - 1)) + y(i) 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:

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

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

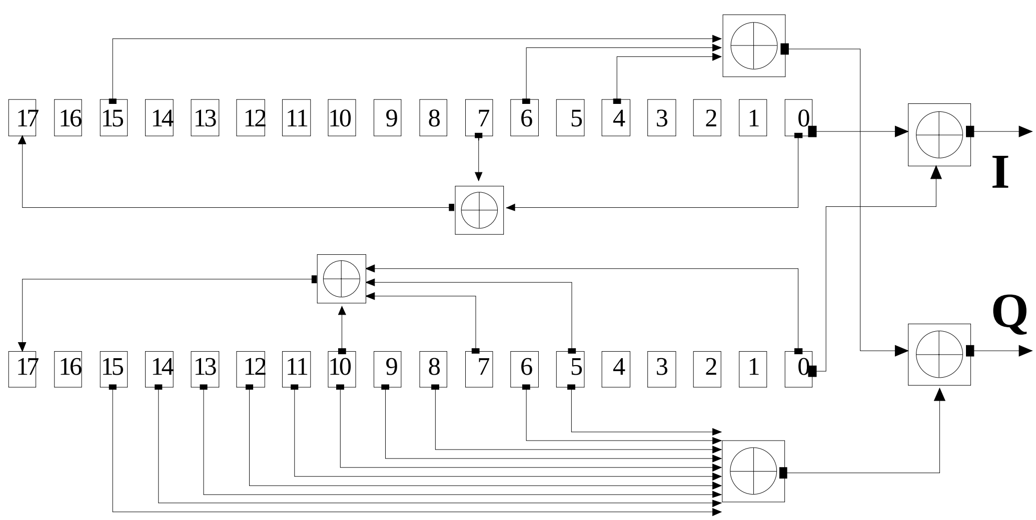

Figure 10: Configuration of downlink scrambling code generator