TSG-RAN Working Group 1 meeting #11
San Diego, CA, USA
February 29 – March 3, 2000

TSGR1#11(00)0413

Agenda item:

Source: GBT

Title: CR 25.213-030r1.0: Number of PRACH scrambling codes

Document for: Decision

This CR is a revision of Tdoc #399 which was submitted to Ad-Hoc 14.

This CR proposes a minor change to the formula for the number of uplink PRACH scrambling codes to facilitate the usage of a common formula for PRACH and PCPCH. A side benefit of this will be that PCPCH and PRACH can share their AP or CD preamble scrambling code if TRRAN chooses to do so.

3GPP TSG RAN WG1 Meeting #11
San Diego, USA, February 29 – March 3, 2000

Document R1000413
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	030r1.0	Current Version:	3.1.0

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

For submission to:	TSG-RAN #7	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:** 2000-02-22

Subject: Number of RACH scrambling codes

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: This CR proposes a minor change to the formula for the number of uplink PRACH scrambling codes to facilitate the usage of a common formula for PRACH and PCPCH. A side benefit of this will be that PCPCH and PRACH can share their AP or CD preamble scrambling code if TRRAN chooses to do so

Clauses affected: 4.3.2.5; 4.3.3.2

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:

4.3.2.5 PRACH message part scrambling code

The scrambling code used for the PRACH message part is 10 ms long, and there are 8192 different PRACH scrambling codes defined. ~~, cell-specific and has a one-to-one correspondence to the scrambling code used for the preamble part.~~

The *n*:th PRACH message part scrambling code, denoted $S_{r\text{-}msg,n}$, where $n = 80xm+k$ $\{k=0,1,2,\ldots 15, m=0,1,2,\ldots 511\}$, is based on the long scrambling sequence and is defined as

$S_{r\text{-}msg,n}(i) = C_{long,n}(i + 4096), \quad i = 0, 1, \ldots, 38399$

where the lowest index corresponds to the chip transmitted first in time and $C_{long,n}$ is defined in section 4.3.2.2.

The message part scrambling code has a one-to-one correspondence to the scrambling code used for the preamble part. For one PRACH, the same code number is used for both scrambling codes, i.e. if the PRACH preamble scrambling code used is $S_{r\text{-}pre,m}$ then the PRACH message part scrambling code is $S_{r\text{-}msg,m}$, where the number *m* is the same for both codes.

4.3.2.6 PCPCH message part scrambling code

The set of scrambling codes used for the PCPCH message part are 10 ms long, cell-specific and have a one-to-one correspondence to the signature sequences and the access sub-channels used by the access preamble part. Both long or short scrambling codes can be used to scramble the CPCH message part.

The *n*:th PCPCH message part scrambling code, denoted $S_{c\text{-}msg,n}$, is based on the scrambling sequence and is defined as

In the case when the long scrambling codes are used,

$S_{r\text{-}msg,n}(i) = C_{long,n}(i + 8192), \quad i = 0, 1, \ldots, 38399$

where the lowest index corresponds to the chip transmitted first in time and $C_{long,n}$ is defined in section 4.3.2.2.

In the case when the access resources are shared between the RACH and CPCH, then $S_{c\text{-}msg,n}$ is defined as

$S_{r\text{-}msg,n}(i) = C_{long,n}(i + 4096), \quad i = 0, 1, \ldots, 38399$

where the lowest index corresponds to the chip transmitted first in time and $C_{long,n}$ is defined in section 4.3.2.2.

In the case the short scrambling codes are used,

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

4.2.3.7 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 section 4.2.3.6 above. 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.

4.3.3 PRACH preamble codes

4.3.3.1 Preamble code construction

The random access preamble code $C_{pre,n,}$ is a complex valued sequence. It is built from a preamble scrambling code $S_{r\text{-}pre,n}$ and a preamble signature $C_{sig,s}$ as follows:

$$C_{pre,n,s}(k) = S_{r\text{-}pre,n}(k) \times C_{sig,s}(k) \times e^{j(\frac{\pi}{4}+\frac{\pi}{2}k)}, \quad k = 0, 1, 2, 3, \ldots, 4095,$$

where k=0 corresponds to the chip transmitted first in time and $S_{r\text{-}pre,n}$ and $C_{sig,s}$ are defined in 4.3.3.2 and 4.3.3.3 below respectively.

4.3.3.2 Preamble scrambling code

The scrambling code for the PRACH preamble part is constructed from the long scrambling sequences. There are 8192 PRACH preamble scrambling codes in total.

The *n*:th preamble scrambling code, , where *n =80xm+k {k=0,1,2,…15, m=0,1,2,…511}* , is defined as:

$S_{r\text{-}pre,n}(i) = c_{long,1,n}(i)$, $i = 0, 1, \ldots, 4095$,

where the sequence $c_{long,1,n}$ is defined in section 4.3.2.2.

The 8192 PRACH preamble scrambling codes are divided into 512 groups with 16 codes in each group. There is a one-to-one correspondence between the group of PRACH preamble scrambling codes in a cell and the primary scrambling code used in the downlink of the cell. The *k*:th PRACH preamble scrambling code within the cell with downlink primary scrambling code *m*, $k = 0, 1, 2, \ldots, 15$ and $m = 0, 1, 2, \ldots, 511$, is $S_{r\text{-}pre,n}$ as defined above with $n = 80 \times m + k$.

4.3.3.3 Preamble signature

The preamble signature corresponding to a signature s consists of 256 repetitions of a length 16 signature $P_s(n)$, n=0…15. This is defined as follows:

$C_{sig,s}(i) = P_s(i \text{ modulo } 16)$, $i = 0, 1, \ldots, 4095$.

The signature $P_s(n)$ is from the set of 16 Hadamard codes of length 16. These are listed in table 3.

Table 3: Preamble signatures

Preamble signature	Value of *n*															
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
$P_0(n)$	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
$P_1(n)$	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1
$P_2(n)$	1	1	-1	-1	1	1	-1	-1	1	1	-1	-1	1	1	-1	-1
$P_3(n)$	1	-1	-1	1	1	-1	-1	1	1	-1	-1	1	1	-1	-1	1
$P_4(n)$	1	1	1	1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1	-1
$P_5(n)$	1	-1	1	-1	-1	1	-1	1	1	-1	1	-1	-1	1	-1	1
$P_6(n)$	1	1	-1	-1	-1	-1	1	1	1	1	-1	-1	-1	-1	1	1
$P_7(n)$	1	-1	-1	1	-1	1	1	-1	1	-1	-1	1	-1	1	1	-1
$P_8(n)$	1	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1
$P_9(n)$	1	-1	1	-1	1	-1	1	-1	-1	1	-1	1	-1	1	-1	1
$P_{10}(n)$	1	1	-1	-1	1	1	-1	-1	-1	-1	1	1	-1	-1	1	1
$P_{11}(n)$	1	-1	-1	1	1	-1	-1	1	-1	1	1	-1	-1	1	1	-1
$P_{12}(n)$	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1
$P_{13}(n)$	1	-1	1	-1	-1	1	-1	1	-1	1	-1	1	1	-1	1	-1
$P_{14}(n)$	1	1	-1	-1	-1	-1	1	1	-1	-1	1	1	1	1	-1	-1
$P_{15}(n)$	1	-1	-1	1	-1	1	1	-1	-1	1	1	-1	1	-1	-1	1