

TSG-RAN Working Group1 meeting #12

TSGR1#12(00)540

Seoul, South Korea, April, 10 – April 13, 2000

**Agenda Item** : AH14  
**Source** : Nortel Networks  
**Title** : **Numbering of the PCPCH access preamble and collision detection preamble scrambling codes**  
**Document for** : **Decision**

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## 1. Introduction

This CR proposes a numbering scheme for the PCPCH access preamble and PCPCH collision detection preamble scrambling codes. This covers all cases, where the PCPCH access resource and RACH resource are shared or not. The proposed CR is editorial in its form since not changing the set of long codes to be used in each cell as a function of the primary downlink scrambling code. It is felt that this change is needed in order to clarify the sharing of resource issue and also to allow RAN 2 to have a consistent numbering with RAN1 in 25.331.

## 2. Current text in 25.213 and 25.331

The current text for the PCPCH access preamble scrambling codes references first the scrambling codes that are not shared with the PRACH. these scrambling codes represent 512 groups of 64 elements. Later the text refers to the possibility to share on scrambling code between the PRACH and the PCPCH, in which case the PCPCH scrambling code may be one of those allowed for the PRACH which correspond to 512 groups of 16 codes, that set not overlapping with the set of codes which are PCPCH specific. On a cell basis the PCPCH Access preamble may then be mapped onto  $64+16=80$  scrambling codes. The first 16 codes may be used only if shared with the PRACH, whereas the 64 last ones cannot be shared with the PRACH.

In the RAN2 25.331 version 3.2.0 specification the range for the PCPCH AP scrambling code is 0...255. There is no particular field indicating the sharing of codes between the PRACH and PCPCH. Neither is there a correspondence provides between this 8 bits field and a numbering of codes used in the RAN 1 specification.

The description above although intended for the CPCH-AP codes is equally valid for the CPCH-CD codes.

## 3. Proposed modification

In order to improve the readability of the specification and provide correspondence between RAN 1 and RAN 2 specification we believe that there should be a numbering of the PCPCH AP scrambling codes that covers both the PRACH scrambling code and the PCPCH specific scrambling codes. The same numbering should also be applied to the CPCH-CD codes.

In order to introduce such a numbering the following editorial modifications of 25.213 are proposed in the attached Change request :

- 1) An overall set of PCPCH access preamble codes comprising the PRACH codes and the PCPCH specific codes is introduced. That set has hence  $40960=8192+32768$ . This correspond to 512 set of 80 codes where 64 codes out of 80 are the PCPCH specific codes and 16 are the PRACH codes as defined in section xxx
- 2) The formula providing the number of the PCPCH codes  $n$  the whole system is retained but corrected and extended to cover also the codes shared with PRACH.
  - a) The range for  $k$ , where  $k$  is the  $k$ th codes in the set of codes allowed for PCPCH, is extended to covers 0,...79 to cover the PRACH range (0,...,15) and the PCPCH specific codes range (16,...,79).
  - b) The same formula as for the PRACH is hence used for  $k=0$  to 15 ( $n=64xm+k$ ) and for  $k=16$  to 79 (the PCPCH specific codes),  $n = 64 \times m + k + 8192$
- 3) The same modifications are propagated into the PCPCH CD preamble

The correspondence between the RAN 1 numbering and the numbering in 25.331 is not addressed in this contribution and change request to 25.213. This may be liaised to RAN2..

**3GPP/SMG Meeting #12**  
**Seoul, Korea, April 10-April 18 2000**

**Document R1-00540**

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 034**

Current Version: **3.2.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑

↑ CR number as allocated by MCC support team

For submission to: **WG1 # 12**

list expected approval meeting # here  
↑

for approval   
for information

strategic   
non-strategic  (for SMG use only)

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  UTRAN / Radio  Core Network   
(at least one should be marked with an X)

**Source:** Nortel Networks **Date:**

**Subject:** Numbering of the PCPCH access preamble and collision detection preamble scrambling codes

**Work item:** TS 25.213

**Category:** 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  Release 98   
D Editorial modification  Release 99   
Release 00

(only one category shall be marked with an X)

**Reason for change:**

**Clauses affected:**

**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:**



help.doc

<----- double-click here for help and instructions on how to create a CR.

## 4.3.4 PCPCH preamble codes

### 4.3.4.1 Access preamble

#### 4.3.4.1.1 Access preamble code construction

Similar to PRACH access preamble codes, the PCPCH access preamble codes  $C_{c\text{-acc},n,s}$ , are complex valued sequences. The PCPCH access preamble codes are built from the preamble scrambling codes  $S_{c\text{-acc},n}$  and a preamble signature  $C_{\text{sig},s}$  as follows:

- $C_{c\text{-acc},n,s}(k) = S_{c\text{-acc},n}(k) \times C_{\text{sig},s}(k) \times e^{j(\frac{\pi}{4} + \frac{\pi}{2}k)}$ ,  $k = 0, 1, 2, 3, \dots, 4095$ ;
- where  $S_{c\text{-acc},n}$  and  $C_{\text{sig},s}$  are defined in section 4.3.4.1.2 and 4.3.4.1.3 below respectively.

#### 4.3.4.1.2 Access preamble scrambling code

~~The access preamble scrambling code generation is done in a way similar to that of PRACH. There are 32768 PCPCH scrambling codes in total.~~

The scrambling code for the PCPCH preamble part is constructed from the long scrambling sequences. There are 40960 PCPCH access preamble scrambling codes in total.

The  $n$ :th PCPCH access preamble scrambling code, where  $n = \underline{0, \dots, 8192, 8193, \dots, 40959}$  is defined as:

- $S_{c\text{-acc},n}(i) = c_{\text{long},1,n}(i)$ ,  $i = 0, 1, \dots, 4095$ ;

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

~~In the case when the access resources are shared between the PRACH and PCPCH, the scrambling codes used in the PRACH preamble are used for the PCPCH preamble as well.~~

The ~~40 960~~32768 PCPCH access preamble scrambling codes are divided into 512 groups with ~~8064~~ codes in each group. There is a one-to-one correspondence between the group of PCPCH access preamble scrambling codes in a cell and the primary scrambling code used in the downlink of the cell. The  $k$ :th PCPCH scrambling code within the cell with downlink primary scrambling code  $m$ , for  $k = 0, \dots, 16, 17, \dots, 79$  and  $m = 0, 1, 2, \dots, 511$ , is  $S_{c\text{-acc},n}$  as defined above with  $n = 64 \times m + k$  for  $k = 0, \dots, 15$  and  $n = 64 \times m + (k - 16) + 819276$  for  $k = 16, \dots, 79$ .

The index  $k = 0, \dots, 15$  may only be used as a PCPCH access preamble part scrambling code if the same code is also used for a PRACH.

The index  $k = 16, \dots, 79$  correspond to PCPCH access preamble scrambling codes which are not shared together with a PRACH. This leads to 32 768 PCPCH specific preamble scrambling codes divided into 512 groups with 64 elements. In case scrambling code resource is shared between PCPCH and PRACH, the index  $k$  is less than 16 and the corresponding PRACH formulae shall be used. Otherwise, if the index  $k$  is greater than or equal to 16, the formula in this section shall be used.

#### 4.3.4.1.3 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 CD preamble

##### 4.3.4.2.1 CD preamble code construction

Similar to PRACH access preamble codes, the PCPCH CD preamble codes  $C_{c-d,n,s}$  are complex valued sequences. The PCPCH CD preamble codes are built from the preamble scrambling codes  $S_{c-d,n}$  and a preamble signature  $C_{sig,s}$  as follows:

$$C_{c-d,n,s}(k) = S_{c-d,n}(k) \times C_{sig,s}(k) \times e^{j\left(\frac{\pi}{4} + \frac{\pi}{2}k\right)}, k = 0, 1, 2, 3, \dots, 4095;$$

where  $S_{c-d,n}$  and  $C_{sig,s}$  are defined in sections 4.3.4.2.2 and 4.3.4.2.3 below respectively.

##### 4.3.4.2.2 CD preamble scrambling code

~~The PCPCH CD preamble scrambling code is derived from the same scrambling code used in the CPCH access preamble. There are 40960 PCPCH-CD preamble scrambling codes in total.~~

~~There are 32768 PCPCH scrambling codes in total.~~

The  $n$ :th PCPCH CD access preamble scrambling code, where  $n = 0, \dots, 8192, 8193, \dots, 40959$ , is defined as:

$$S_{c-d,n}(i) = c_{long,1,n}(i), i = 0, 1, \dots, 4095;$$

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

~~In the case when the access resources are shared between the RACH and CPCH, the scrambling codes used in the RACH preamble will be used for the CPCH CD preamble as well.~~

The 3276840960 PCPCH scrambling codes are divided into 512 groups with 8064 codes in each group. There is a one-to-one correspondence between the group of PCPCH CD preamble scrambling codes in a cell and the primary scrambling code used in the downlink of the cell. The  $k$ :th PCPCH scrambling code within the cell with downlink primary scrambling code  $m$ ,  $k = 0, 1, 4, 17, \dots, 79$  and  $m = 0, 1, 2, \dots, 511$ , is  $S_{c-d,n}$  as defined above with  $n = 64 \times m + k$  for  $k = 0, \dots, 15$  and  $n = 64 \times m + (k - 16) + 819276$  for  $k = 16, \dots, 79$ .

~~In case scrambling code resource is shared between PCPCH and PRACH, the index  $k$  is less than 16 and the corresponding PRACH formulae shall be used. Otherwise, if the index  $k$  is greater than or equal to 16, the formula in this section shall be used.~~

~~The index  $k = 0, \dots, 15$  may only be used as a PCPCH CD preamble part scrambling code if the same code is also used for a PRACH.~~

~~The index  $k = 16, \dots, 79$  correspond to PCPCH CD preamble scrambling codes which are not shared together with a PRACH. This leads to 32 768 PCPCH specific preamble scrambling codes divided into 512 groups with 64 elements.~~

##### 4.3.4.2.3 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.

## 4.4 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 7 below: