3GPP TSG RAN WG1 Meeting #10
Beijing, China, January 18th-21st 2000

***Document* R1-000081**
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.

25.222 CR 018 Current Version: V3.1.0

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

Source: Siemens AG **Date:** 14.01.2000

Subject: Refinements of Physical Channel Mapping

Work item: TS 25.222

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

F	Correction	X
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: This CR does not change the technical content of the mapping scheme, which has been approved during RAN#6. However, the current mathematical notation using indices is replaced by a pseudo c-code, which allows a clearer and uniform representation of the algorithm used for mapping each CCTrCH onto the respective physical channels.

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:

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4.2.11 Physical channel mapping

The PhCH for both uplink and downlink is defined in [6]. The bits after physical channel mapping are denoted by $w_{p1}, w_{p2}, \ldots, w_{pU_p}$, where p is the PhCH number and U_p is the number of bits in one radio frame for the respective PhCH. The bits w_{pk} are mapped to the PhCHs so that the bits for each PhCH are transmitted over the air in ascending order with respect to k.

The mapping of the bits is performed like block interleaving, writing the bits into columns, but a PhCH with an odd number is filled in forward order, were as a PhCH with an even number is filled in reverse order.

The mapping scheme, as described in the following subsection, shall be applied individually for each timeslot t used in the current frame. Therefore, the bits are assigned to the bits of the physical channels in each timeslot.

In uplink there are at most two codes allocated (P≤2). If there is only one code, the same mapping as for downlink is applied. Denote SF1 and SF2 the spreading factors used for code 1 and 2, respectively. For the number of consecutive bits to assign per code bs_k the following rule is applied:

```
if
   SF1 >= SF2  then bs1 = 1  ; bs2 =  SF1/SF2 ;
else
   SF2 > SF1  then bs1 = SF2/SF1; bs2 = 1 ;
end if
```

In the downlink case bs_p is 1 for all physical channels.

4.2.11.1 Mapping scheme

Notation used in this section:

P_t: number of physical channels for timeslot t , P_t = 1..2 for uplink ; P_t = 1...16 for downlink

U_{tp}: capacity in bits for the physical channel p in timeslot t

U_t: total number of bits to be assigned for timeslot t

bs_p: number of consecutive bits to assign per code

for downlink all $bs_p = 1$

for uplink if SF1 >= SF2 then $bs_1 = 1$; $bs_2 = SF1/SF2$;

if SF2 > SF1 then $bs_1 = SF2/SF1$; $bs_2 = 1$;

fb_p: number of already written bits for each code

pos: intermediate calculation variable

```
for  p=1  to Pt                          --  reset number of already written bits for every physical channel
     fbp = 0
end for

p = 1                                    -- start with PhCH #1

for k=1  to Ut

    do while (fbp == Utp)                -- physical channel filled up already ?
        p = ((p + 1) mod (Pt +1))  + 1 ;
   end do

   if (p mod 2) == 0
```

```
    pos = U_tp - fb_p                  -- reverse order
  else
    pos = fb_p + 1                     -- forward order
  endif

  w_tp,pos = v_t,k                     -- assignment
  fb_p = fb_p + 1                      -- Increment number of already written bits

  if (fb_p mod bs_p) == 0              -- Conditional change to the next physical channel
     p = ((p + 1) mod (P_t +1))  + 1;
  end if

end for
```

The mapping scheme depends on the applied 2nd interleaving scheme.

4.2.11.1 Mapping scheme after frame related 2nd interleaving

4.2.11.1.1 Mapping scheme after frame related 2nd interleaving in uplink

In uplink there are at most two codes allocated (P≤2). If there is only one code, the same mapping as for downlink is applied, see section 6.2.11.1.2. Denote SF1 and SF2 the spreading factors used for code 1 and 2, respectively. Then denote the inverse relation of the spreading factors s1: s2 = SF2: SF1, where the smallest possible integers are used for s1 and s2.

The following mapping rule is applied:

Bits are mapped on the first PhCH (in forward order) if $(k\text{-}1)mod(s1+s2) = 0$, …, s1-1:

else bits are mapped on the second PhCH (in reverse order):

This formula is applied starting with k=1 and increasing k until one of the PhCH is completely filled. From then on, the remaining bits are mapped on the PhCH which has not been filled in the same order (forward or reverse depending on the PhCH) as used previously on that PhCH.

4.2.11.1.2 Mapping scheme after frame related 2nd interleaving in downlink

The mapping is equivalent to block interleaving, writing in colomns, but a PhCH with an odd number is filled in forward order, were as a PhCH with an even number is filled in reverse order.

The following mapping rule is applied:

Bits are mapped on an odd numbered PhCH (in forward order) according to the following rule, if (k mod P)+1 is odd:

Bits are mapped on an even numbered PhCH (in reverse order) according to the following rule, if (k mod P)+1 is even:

This formula is applied starting with k=1 and increasing k until all the PhCHs which carry TFCI are completely filled. From then on, the remaining bits are mapped on the remaining PhCHs in the same order (forward or reverse depending on the PhCH) as previously on these PhCHs.

4.2.11.2 Mapping scheme after timeslot related 2^{nd} interleaving

For each timeslot only those physical channels with $p = 1, 2, \ldots, P_t$ are considered respectively, which are transmitted in that timeslot, and the following mapping scheme is applied:

6.2.11.2.1 Mapping scheme after timeslot related 2nd interleaving in uplink

In uplink there are at most two codes allocated (P≤2). If there is only one code, the same mapping as for downlink is applied, see section 6.2.11.1.2. Denote SF1 and SF2 the spreading factors used for code 1 and 2, respectively. Then denote the inverse relation of the spreading factors s1: s2 = SF2: SF1, where the smallest possible integers are used for s1 and s2.

The following mapping rule is applied:

Bits are mapped on the first PhCH (in forward order) if $(k\text{-}1)mod(s1+s2) = 0, \ldots,$ s1-1:

else bits are mapped on the second PhCH (in reverse order):

This formula is applied starting with k=1 and increasing k until one of the PhCH is completely filled. From then on, the remaining bits are mapped on the PhCH which has not been filled in the same order (forward or reverse depending on the PhCH) as used previously on that PhCH.

6.2.11.2.2 Mapping scheme after timeslot related 2nd interleaving in downlink

The mapping is equivalent to block interleaving, writing in colomns, but a PhCH with an odd number is filled in forward order, were as a PhCH with an even number is filled in reverse order.

The following mapping rule is applied:

Bits are mapped on an odd numbered PhCH (in forward order) according to the following rule, if $(k \bmod P_t)+1$ is odd:

Bits are mapped on an even numbered PhCH (in reverse order) according to the following rule, if $(k \bmod P_t)+1$ is even:

This formula is applied starting with k=1 and increasing k until all the PhCHs which carry TFCI are completely filled. From then on, the remaining bits are mapped on the remaining PhCHs in the same order (forward or reverse depending on the PhCH) as previously on these PhCHs.