3GPP TSG RAN WG1#9
Dresden, Germany Nov. 30th - Dec. 3rd, 1999

Document R1-99j79
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.

25.212 CR 022 Current Version: 3.0.0

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

For submission to: RAN #6
list expected approval meeting # here ↑

for approval	X	strategic		*(for SMG use only)*
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	UTRAN / Radio	Core Network
	X	X	

Source: Siemens **Date:** 26.11.1999

Subject: Introduction of end puncturing to 25.212

Work item:

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

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	X
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:
Tdoc R1-99J08 has shown advantages of end puncturing. In particular there is an improved performance in terms of required Eb/N0, most pronounced for short block sizes which are expected for UEP. Additionally the overhead due to padding for radio frame equalisation will be avoided.
End puncturing should therefore be introduced in the section dealing with convolutional coding.

Clauses affected: 4.2.3 and 4.1.3.1.1 (which should be numbered 4.2.3.1.1)

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:
A similar change should be introduced in 25.222 as well. The changes differ slightly from 25.222 CR 011, because in FDD there also exist fixed bit positions and radio frame equalisation will only be applied in uplink.
This CR is a revised version of the text proposal in R1-99J08, in particular a typo in the definition of the rate 1/2 pattern is corrected.

4.2.3 Channel coding

Code blocks are delivered to the channel coding block. They are denoted by $o_{ir1}, o_{ir2}, o_{ir3}, \ldots, o_{irK_i}$, where i is the TrCH number, r is the code block number, and K_i is the number of bits in each code block. The number of code blocks on TrCH i is denoted by C_i. After encoding the bits are denoted by $y_{ir1}, y_{ir2}, y_{ir3}, \ldots, y_{irY_i}$. The encoded blocks are serially multiplexed so that the block with lowest index r is output first from the channel coding block. The bits output are denoted by $c_{i1}, c_{i2}, c_{i3}, \ldots, c_{iE_i}$, where i is the TrCH number and $E_i = C_iY_i$. The output bits are defined by the following relations:

$$c_{ik} = y_{i1k} \quad k = 1, 2, \ldots, Y_i$$

$$c_{ik} = y_{i,2,(k-Y_i)} \quad k = Y_i + 1, Y_i + 2, \ldots, 2Y_i$$

$$c_{ik} = y_{i,3,(k-2Y_i)} \quad k = 2Y_i + 1, 2Y_i + 2, \ldots, 3Y_i$$

$$\ldots$$

$$c_{ik} = y_{i,C_i,(k-(C_i-1)Y_i)} \quad k = (C_i - 1)Y_i + 1, (C_i - 1)Y_i + 2, \ldots, C_iY_i$$

The relation between o_{irk} and y_{irk} and between K_i and Y_i is dependent on the channel coding scheme.

The following channel coding schemes can be applied to TrCHs:

- Convolutional coding
- Turbo coding
- No channel coding

The values of Y_i in connection with each coding scheme:

- Convolutional coding, ½ rate: $Y_i = 2*K_i + 16 - N_{EPi}$; 1/3 rate: $Y_i = 3*K_i + 24 - N_{EPi}$
  N_{EPi} is defined in section 4.2.3.1.1.
- Turbo coding, 1/3 rate: $Y_i = 3*K_i + 12$
- No channel coding, $Y_i = K_i$

Table 1: Error Correction Coding Parameters

Transport channel type	Coding scheme	Coding rate
BCH	Convolutional code	1/2
PCH		
FACH		
RACH		
CPCH		1/3, 1/2 or no coding
DCH		
CPCH	Turbo Code	1/3 or no coding
DCH		

4.~~1~~2.3.1 Convolutional coding

4.~~1~~2.3.1.1 Convolutional coder

- Constraint length K=9. Coding rate 1/3 and ½.
- The configuration of the convolutional coder is presented in figure 3.
- The output from the convolutional coder shall be done in the order output0, output1, output2, output0, output1, …,output2. (When coding rate is 1/2, output is done up to output 1).
- K-1 tail bits (value 0) shall be added to the end of the code block before encoding.
- The initial value of the shift register of the coder shall be "all 0".
- If end puncturing is applied, the number of bits to be punctured (NEPi) is calculated as indicated in table 2:
- The NEPi bits on the first NEPi positions listed in table 3 (counting from 0 for the first bit from output0) of the resulting outputstream after coding are punctured.

Table 2: Number of Bits N_{EPi} to be puncturd from End Puncturing Patterns

		Uplink	Downlink
Rate 1/2	Fixed positions of the TrCHs	Not applicable	4
	Flexible positions of the TrCHs	$(2*K_i + 15) \bmod F_i + 9 - F_i$	8
Rate 1/3	Fixed positions of the TrCHs	Not applicable	8
	Flexible positions of the TrCHs and $K_i > 3$	$(3*K_i + 23) \bmod F_i + 17 - F_i$	16
	Flexible positions of the TrCHs and $K_i < 4$	$(3*K_i + 19) \bmod F_i + 13 - F_i$	12

Table 3: End Puncturing Patterns

Rate 1/2	Fixed positions of the TrCHs	2, 4, 8, 9,
	Flexible positions of the TrCHs	2, $2*K_i$ +14, 4, $2*K_i$ +11, 8, $2*K_i$ +10, 9, $2*K_i$ + 8
Rate 1/3	Fixed positions of the TrCHs	0, 1, 3, 5, 7, 10, 13, 16
	Flexible positions of the TrCHs	0, $3*K_i$ +23, 1, $3*K_i$ +22, 3, $3*K_i$ +20, 5, $3*K_i$ +18, 7, $3*K_i$ +16, 10, $3*K_i$ +13, 13, $3*K_i$ +10, 16, $3*K_i$ + 7