3GPP TSG RAN WG1#9
Dresden, Germany 30 Nov - 03 Dec 1999

Document R1-99i20
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**	**001rv2**	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	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: Siemens, LGIC **Date:** 20.11.99

Subject: Correction of rate matching parameters for repetition after 1st Interleaving in 25.222

Work item:

Category:				**Release:**		
	F	Correction	X		Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: For rate matching after first interleaving the formula was erroneous for high repetition rates.

Clauses affected: 4.2.7.1 Determination of rate matching parameters

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: Identical change should be introduced in 25.212 as well.
Revision 2: Editorial revision due to new CR-form and official version 3.0.0

4.2.7.1 Determination of rate matching parameters

The following relations are used when calculating the rate matching pattern:

$$Z_{0,j} = 0$$

$$Z_{ij} = \left\lfloor \frac{\sum_{m=1}^{i} RM_m \cdot N_{mj}}{\sum_{m=1}^{I} RM_m \cdot N_{mj}} \cdot N_{data,j} \right\rfloor \quad \text{for all i = 1 .. I}$$

$$\Delta N_{ij} = Z_{ij} - Z_{i-1,j} - N_{ij} \quad \text{for all i = 1 .. I}$$

Puncturing can be used to minimise the required transmission capacity. The maximum amount of puncturing that can be applied is signalled from higher layers and denoted by PL. The possible values for N_{data} in depend on the number of dedicated physical channels and on their characteristics (spreading factor, length of midamble and TFCI, usage of TPC and multiframe structure), respectively. The supported set of N_{data} , denoted SET0, depends on the UE capabilities.

$N_{data,j}$ for the transport format combination j is determined by executing the following algorithm:

SET1 = { N_{data} in SET0 such that $N_{data} - PL \cdot \sum_{x=1}^{I} \frac{RM_x}{\min_{1 \le y \le I}\{RM_y\}} \cdot N_{x,j}$ is non negative }

$N_{data,j}$ = min SET1

The number of bits to be repeated or punctured, ΔN_{ij}, within one radio frame for each TrCH i is calculated with the relations given at the beginning of this section for all possible transport format combinations j and selected every radio frame.

If $\Delta N_{ij} = 0$ then the output data of the rate matching is the same as the input data and the rate matching algorithm of section 4.2.7.3 does not need to be executed.

Otherwise, the rate matching pattern is calculated with the algorithm described in section 4.2.7.3. For this algorithm the parameters e_{ini}, e_{plus}, e_{minus}, and N are needed, which are calculated according to the following equations:

For convolutional codes,

a = 2

$\Delta N = \Delta N_{i,j}$

$N = N_{i,j}$

R = ΔN_{ij} mod N_{ij} -- note: in this context ΔN_{ij} mod N_{ij} is in the range of 0 to N_{ij}-1 i.e. -1 mod 10 = 9.

if $R \neq 0$ and $2R \le N_{ij}$

then $q = \lceil N_{ij} / R \rceil$

else

$q = \lceil N_{ij} / (R - N_{ij}) \rceil$

endif

-- note: q is a signed quantity.

~~$q = \lfloor N / (|\Delta N|) \rfloor$~~

If q is even

then q' = q ±– gcd(⌊q⌋, F_i)/F_i -- where gcd (⌊q⌋, F_i) means greatest common divisor of ⌊q⌋ and F_i

-- note that q' is not an integer, but a multiple of 1/8

else

q' = q

endif

for x = 0 to F_i-1

S(I_F (⌈⌊⌊x*q'⌋⌋⌉ mod F_i)) = (⌈⌊⌊x*q'⌋⌋⌉ div F_i)–

eEnd for

e_{ini} = (a·S(n_i)·|ΔN| + N) mod a·N, if e_{ini} =0 then e_{ini} = a·N.

e_{plus} = a·N

$e_{minus} = a \times |DN|$

puncturing for DN<0, repeating otherwise.

For turbo codes, if repetition is to be performed, such as $DN_{i,j}$ >0, parameters for turbo codes are the same as parameter for convolutional codes. If puncturing is to be performed, parameters are as follows.

a = 2 for Y sequence, and

a = 1 for Y' sequence.

$$\Delta N = \begin{cases} \lfloor DN_{i,j} / 2 \rfloor \text{for Y sequence} \\ \lceil DN_{i,j} / 2 \rceil \text{for Y' sequence} \end{cases}$$

N = $\lfloor N_{i,j}/3 \rfloor$,

q = $\lfloor N/|\Delta N| \rfloor$

if(q ≤ 2)

for x=0 to F_i-1

if(Y sequence)

S[I_F[(3x+1) mod F_i]] = x mod 2;

if(Y' sequence)

S[I_F [(3x+2) mod F_i]] = x mod 2;

end for

else

if q is even

then $q' = q – gcd(q, F_i)/ F_i$ -- where $gcd (q, F_i)$ means greatest common divisor of q and F_i

-- note that q' is not an integer, but a multiple of 1/8

else $q' = q$

endif

for x=0 to F_i –1