3GPP TSG RAN WG1 Meeting #12
Seoul, Korea, April 10th-14th 2000

Document R1-00???
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	035	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:	TSG-RAN #8	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: Panasonic **Date:** 2000-04-07

Subject: TDD Editorial correction to the calculation of Rate Matching parameters

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			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: In RAN1#11 CR25.212-059r1 was approved. Same type of modifications need for TDD.

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:

4.2.7 Rate matching

Rate matching means that bits on a TrCH are repeated or punctured. Higher layers assign a rate-matching attribute for each TrCH. This attribute is semi-static and can only be changed through higher layer signalling. The rate-matching attribute is used when the number of bits to be repeated or punctured is calculated.

The number of bits on a TrCH can vary between different transmission time intervals. When the number of bits between different transmission time intervals is changed, bits are repeated to ensure that the total bit rate after TrCH multiplexing is identical to the total channel bit rate of the allocated physical channels.

If no bits are input to the rate matching for all TrCHs within a CCTrCH, the rate matching shall output no bits for all TrCHs within the CCTrCH.

Notation used in subclause 4.2.7 and subclauses:

N_{ij}: Number of bits in a radio frame before rate matching on TrCH *i* with transport format combination *j*.

ΔN_{ij}: If positive – number of bits to be repeated in each radio frame on TrCH *i* with transport format

If negative – number of bits to be punctured in each radio frame on TrCH *i* with transport format combination *j*.

RM_i: Semi-static rate matching attribute for TrCH *i*. Signalled from higher layers.

PL: Puncturing limit. This value limits the amount of puncturing that can be applied in order to minimise the number of physical channels. Signalled from higher layers.

$N_{data,j}$: Total number of bits that are available for a CCTrCH in a radio frame with transport format combination j.

P: number of physical channels used in the current frame.

P_{max}: maximum number of physical channels allocated for a CCTrCH.

U_p: Number of data bits in the physical channel p with p = 1...P.

I: Number of TrCHs in a CCTrCH.

Z_{ij}: Intermediate calculation variable.

F_i: Number of radio frames in the transmission time interval of TrCH *i*.

n_i: Radio frame number in the transmission time interval of TrCH *i* ($0 \leq n_i < F_i$).

q: Average puncturing or repetition distance(normalised to only show the remaining rate matching on top of an integer number of repetitions).

$I_F(n_i)$: The inverse interleaving function of the 1st interleaver (note that the inverse interleaving function is identical to the interleaving function itself for the 1st interleaver).

$S(n_i)$: The shift of the puncturing or repetition pattern for radio frame n_i.

$TF_i(j)$: Transport format of TrCH i for the transport format combination j.

TFS(i): The set of transport format indexes *l* for TrCH i.

e_{ini}: Initial value of variable e in the rate matching pattern determination algorithm of subclause 4.2.7.3.

e_{plus} Increment of variable *e* in the rate matching pattern determination algorithm of subclause 4.2.7.3.

e_{minus} Decrement of variable *e* in the rate matching pattern determination algorithm of subclause 4.2.7.3.

b: Indicates systematic and parity bits.

b=1: Systematic bit. *X(t)* in subclause 4.2.3.2.1.

b=2: 1st parity bit (from the upper Turbo constituent encoder). *Y(t)* in subclause 4.2.3.2.1.

b=3: 2nd parity bit (from the lower Turbo constituent encoder). *Y'(t)* in subclause 4.2.3.2.1.

4.2.7.1 Determination of rate matching parameters

The following relations, defined for all TFC *j*, are used when calculating the rate matching pattern:

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

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

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

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

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} depend on the number of physical channels P_{max}, allocated to the respective CCTrCH, and on their characteristics (spreading factor, length of midamble and TFCI, usage of TPC and multiframe structure), which is given in [7].

Denote the number of data bits in each physical channel by $U_{p,Sp}$, where *p* refers to the sequence number *1£ p£ P_{max}* of this physical channel in the allocation message, and the second index *Sp* indicates the spreading factor with the possible values {*16, 8, 4, 2, 1*}, respectively. For each physical channel an individual minimum spreading factor Sp_{min} is transmitted by means of the higher layer. Then, for N_{data} one of the following values in ascending order can be chosen:

$$\left\{ U_{1,16},...,U_{1,S1_{\min}}, U_{1,S1_{\min}} + U_{2,16},...,U_{1,S1_{\min}} + U_{2,S2_{\min}},...,U_{1,S1_{\min}} + U_{2,S2_{\min}} + ... + U_{P_{\max},16},...,U_{1,S1_{\min}} + U_{2,S2_{\min}} + ... + U_{P_{\max},(SP_{\max})_{\min}} \right\}$$

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

~~SET1 = { N_{data} 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 }~~

SET1 = { N_{data} such that $\min_{1 \le y \le I} \{RM_y\} \cdot N_{data} - PL \cdot \sum_{x=1}^{I} RMx \cdot N_{x,j}$ 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 subclause 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 subclause 4.2.7.3 does not need to be executed.

Otherwise, the rate matching pattern is calculated with the algorithm described in subclause 4.2.7.3. For this algorithm the parameters e_{ini}, e_{plus}, e_{minus}, and X_i are needed, which are calculated according to the equations in subclauses 4.2.7.1.1 and 4.2.7.1.2.