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 **001rev3**   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
list expected approval meeting # here ↑		for information			non-strategic		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, LGIC	**Date:**	30.11.99

Subject: Correction of rate matching parameters for repetition after 1st Interleaving in 25.212

Work item:

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

				Release:		
F	Correction	X		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	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 Rate matching
4.2.7.1.2 Determination of parameters needed for calculating the rate matching pattern

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 25.222 as well.
Revision 2: Editorial revision due to new CR-form and official version 3.0.0
Revision 3: Update of definition of q and $S(n_i)$ in section 4.2.7

4.2.7 Rate matching

Rate matching means that bits on a transport channel are repeated or punctured. Higher layers assign a rate-matching attribute for each transport channel. 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 transport channel can vary between different transmission time intervals. In the downlink the transmission is interrupted if the number of bits is lower than maximum. When the number of bits between different transmission time intervals in uplink is changed, bits are repeated or punctured to ensure that the total bit rate after second multiplexing is identical to the total channel bit rate of the allocated dedicated physical channels.

Notation used in section 4.2.7 and subsections:

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

For downlink : An intermediate calculation variable (not a integer but a multiple of 1/8).

N_{il}^{TTI} : Number of bits in a transmission time interval before rate matching on TrCH i with transport format l. Used in downlink only.

ΔN_{ij} : For uplink: If positive - number of bits that should be repeated in each radio frame on TrCH i with transport format combination j.

If negative - number of bits that should be punctured in each radio frame on TrCH i with transport format combination j.

For downlink : An intermediate calculation variable (not integer but a multiple of 1/8).

ΔN_{il}^{TTI} : If positive - number of bits to be repeated in each transmission time interval on TrCH i with transport format j.

If negative - number of bits to be punctured in each transmission time interval on TrCH i with transport format j.

Used in downlink only.

RM_i: Semi-static rate matching attribute for transport channel i. Signalled from higher layers.

PL: Puncturing limit for uplink. This value limits the amount of puncturing that can be applied in order to avoid multicode or to enable the use of a higher spreading factor. Signalled from higher layers.

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

I: Number of TrCHs in the 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 ($0 \pounds n_i < F_i$).

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

$I_F(n_i)$: 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). Used in uplink only.

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

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

4.2.7.1.2 Determination of parameters needed for calculating the rate matching pattern

The number of bits to be repeated or punctured, ΔN_{ij}, within one radio frame for each TrCH i is calculated with equation 1 for all possible transport format combinations j and selected every radio frame. $N_{data,j}$ is given from section 4.2.7.1.1. In compressed mode $N_{data,j}$ is replaced by $N_{data,j}^{cm}$ in Equation 1. $N_{data,j}^{cm}$ is given from the following relation:

$N_{data,j}^{cm} = 2N_{data,j} - N_{TGL}$, where

$$N_{TGL} = \begin{cases} \dfrac{TGL}{15}2N_{data,j}, \text{ if } N_{first} + TGL \leq 15 \\[2em] \dfrac{15 - N_{first}}{15}2N_{data,j}, \text{ in first frame if } N_{first} + TGL > 15 \\[2em] \dfrac{TGL - (15 - N_{first})}{15}2N_{data,j}, \text{ in second frame if } N_{first} + TGL > 15 \end{cases}$$

N_{first} and TGL are defined in section 4.4.

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 4.2.7.4 does not need to be executed.

Otherwise, for determining e_{ini}, e_{plus}, e_{minus}, and N the following parameters are needed (regardless if the radio frame is compressed or not):

For convolutional codes,

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

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

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

else

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

endif

-- note: q is a signed quantity.

~~$q = \lfloor N_{ij} / (| \Delta N_{ij} |) \rfloor$~~

if q is even

    then q' = q $\pm$ gcd($\lfloor q \rfloor$, F$_i$)/F$_i$ -- where gcd ($\lfloor q \rfloor$, F$_i$) means greatest common divisor of $\lfloor q \rfloor$ 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$_F$ ($\lfloor$ x*q' $\rfloor$ mod F$_i$)) = ($\lfloor$ x*q' $\rfloor$ div F$_i$)

end for