CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

3G25.212	**CR**	**023**	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:		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:	Mitsubishi Electric (MCRD)	**Date:**	30th November 99

Subject: Rate matching parameter determination for coding scheme = no coding

Work item:

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

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

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

Reason for change: In the current description RM parameter determination is not specified when the coding scheme is "no coding"

Clauses affected: 4.2.7.1.2 and 4.2.7.2

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:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

4.2.7.1.2 Determination of parameters needed for calculating the rate matching pattern

The number of bits to be repeated or punctured, $\boldsymbol{D}N_{ij}$, 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 $N_{data,j}^{cm}$ is replaced by $N_{data,j}^{cm}$ in Equation 1. $N_{data,j}^{cm}$ is given from the following relation:

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

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

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

If $\boldsymbol{D}N_{ij} = 0$ 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):

When the channel coding scheme is convolutional code or no coding,

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

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 ($\lceil$x*q'$\rceil$ mod F_i)) = ($\lceil$x*q'$\rceil$ div F_i)

end for

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

a = 2

For each radio frame, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4, where :

   N = $N_{i,j}$., and

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

$e_{plus} = a \cdot N$

$e_{minus} = a \cdot |\Delta N|$

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.

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

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

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

if($q \leq 2$)

    for *x*=0 to F_i-1

        if(Y sequence)

            $S[I_F[(3x+1) \bmod F_i]] = x \bmod 2;$

       if(Y' sequence)

            $S[I_F [(3x+2) \bmod F_i]] = x \bmod 2;$

    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

       $r = \lceil x*q' \rceil \bmod F_i;$

      if(Y sequence)

          $S[I_F[(3r+1) \bmod F_i]] = \lceil x*q' \rceil \text{ div } F_i;$

      if(Y' sequence)

          $S[I_F[(3r+2) \bmod F_i]] = \lceil x*q' \rceil \text{ div } F_i;$

    endfor

endif

For each radio frame, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4, where:

N is as above,

$e_{ini} = (a \times S(n_i) \times |DN| + N) \bmod a \times N$, *if* $e_{ini} = 0$ *then* $e_{ini} = a \times N$.

$e_{plus} = a \cdot N$

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

puncturing for $DN < 0$, repeating otherwise.

4.2.7.2   Determination of rate matching parameters in downlink

For downlink $N_{data,j}$ does not depend on the transport format combination j. $N_{data,*}$ is given by the channelization code(s) assigned by higher layers.

4.2.7.2.1   Determination of rate matching parameters for fixed positions of TrCHs

First an intermediate calculation variable $N_{i,*}$ is calculated for all transport channels i by the following formula:

$$N_{i,*} = \frac{1}{F_i} \cdot \max_{l \in TFS(i)} N_{i,l}^{TTI}$$

The computation of the $\Delta N_{i,l}^{TTI}$ parameters is then performed in for all TrCH i and all TF l by the following formula, where $\Delta N_{i,*}$ is derived from $N_{i,*}$ by the formula given at section 4.2.7:

$$\Delta N_{i,*}^{TTI} = F_i \cdot \Delta N_{i,*}$$

If $\Delta N_{i,*}^{TTI} = 0$ then, for TrCH i, 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:

When the channel coding scheme is convolutional code or no coding,

$$\Delta N = \Delta N_{i,*}^{TTI}$$

a=2

$$N_{max} = \max_{l \in TFS(i)} N_{il}^{TTI}$$

For each transmission time interval of TrCH i with TF l, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4. The following parameters are used as input:

$$N = N_{il}^{TTI}$$

$$e_{ini} = N_{max}$$

$$e_{plus} = a \cdot N_{max}$$

$$e_{minus} = a \cdot |\Delta N|$$

Puncturing if $\Delta N < 0$, repetition otherwise.

For turbo codes, if repetition is to be performed, such as $\Delta N_{i,*}^{TTI} > 0$, 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,

$a=1$ for *Y'* sequence.

The X bits shall not be punctured.

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

$$N_{max} = \max_{l \in TFS(i)} \left\lfloor N_{il}^{TTI} / 3 \right\rfloor$$

For each transmission time interval of TrCH *i* with TF *l*, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4. The following parameters are used as input:

$$N = \left\lfloor N_{il}^{TTI} / 3 \right\rfloor$$

$$e_{ini} = N_{max}$$

$$e_{plus} = a \cdot N_{max}$$

$$e_{min\,us} = a \cdot \left| \Delta N \right|$$

Puncturing if $\Delta N < 0$, repetition otherwise.

4.2.7.2.2 Determination of rate matching parameters for flexible positions of TrCHs

First an intermediate calculation variable N_{ij} is calculated for all transport channels *i* and all transport format combinations *j* by the following formula:

$$N_{i,j} = \frac{1}{F_i} \cdot N_{i,TF_i(j)}^{TTI}$$

Then rate matching ratios RF_i are calculated for each the transport channel *i* in order to minimise the number of DTX bits when the bit rate of the CCTrCH is maximum. The RF_i ratios are defined by the following formula:

$$RF_i = \frac{N_{data,*}}{\max_{j \in TFCS} \sum_{i=1}^{i=I} \left(RM_i \cdot N_{i,j} \right)} \cdot RM_i$$

The computation of $\Delta N_{i,l}^{TTI}$ parameters is then performed in two phases. In a first phase, tentative temporary values of $\Delta N_{i,l}^{TTI}$ are computed, and in the second phase they are checked and corrected. The first phase, by use of the RF_i ratios, ensures that the number of DTX indication bits inserted is minimum when the CCTrCH bit rate is maximum, but it does not ensure that the maximum CCTrCH bit rate is not greater than $N_{data,*}$ per 10ms. The latter condition is ensured through the checking and possible corrections carried out in the second phase.

At the end of the second phase, the latest value of $\Delta N_{i,l}^{TTI}$ is the definitive value.

The first phase defines the tentative temporary $\Delta N_{i,l}^{TTI}$ for all transport channel *i* and any of its transport format *l* by use of the following formula:

$$\Delta N_{i,l}^{TTI} = F_i \cdot \left\lceil \frac{RF_i \cdot N_{i,l}^{TTI}}{F_i} \right\rceil - N_{i,l}^{TTI}$$

The second phase is defined by the following algorithm:

for all j in *TFCS* do   -- for all TFC

$$D = \sum_{i=1}^{i=I} \frac{N_{i,TF_i}^{TTI}(j) + \Delta N_{i,TF_i}^{TTI}(j)}{F_i} \qquad \text{-- CCTrCH bit rate (bits per 10ms) for TFC } l$$

    if $D > N_{data,*}$ then

        for $i = 1$ to I do   -- for all TrCH

            $\Delta N = F_i \cdot \Delta N_{i,j}$ -- $\Delta N_{i,j}$ is derived from $N_{i,j}$ by the formula given at section 4.2.7.

            if $\Delta N_{i,TF_i(j)}^{TTI} > \Delta N$ then

                $\Delta N_{i,TF_i(j)}^{TTI} = \Delta N$

            end-if

        end-for

    end-if

end-for

    NOTE: The order in which the transport format combinations are checked does not change the final result.

If $\Delta N_{i,l}^{TTI} = 0$ then, for TrCH i at TF l, 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:

When the channel coding scheme is convolutional code or no coding,

$$\Delta N = \Delta N_{il}^{TTI}$$

a=2

For each transmission time interval of TrCH i with TF l, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4. The following parameters are used as input:

$$N = N_{il}^{TTI}$$

$$e_{ini} = N$$

$$e_{plus} = a \cdot N$$

$$e_{min\,us} = a \cdot |\Delta N|$$

puncturing for $\Delta N < 0$, repeating otherwise.

For turbo codes, if repetition is to be performed, such as $\Delta N_{il}^{TTI} > 0$, 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,

$a=1$ for *Y'* sequence.

X bits shall not be punctured.

$$\Delta N = \begin{cases} \left\lfloor DN_{il}^{TTI} / 2 \right\rfloor & \text{for Y sequence} \\ \left\lceil DN_{il}^{TTI} / 2 \right\rceil & \text{for Y' sequence} \end{cases}$$

For each transmission time interval of TrCH *i* with TF *l*, the rate-matching pattern is calculated with the algorithm in section 4.2.7.4. The following parameters are used as input:

$$N = \left\lfloor N_{il}^{TTI} / 3 \right\rfloor,$$

$$e_{ini} = N,$$

$$e_{plus} = a \cdot N$$

$$e_{minus} = a \cdot |\Delta N|$$

puncturing for $\Delta N < 0$, repeating otherwise.

CHANGE REQUEST

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3G25.222	CR	023	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:

list expected approval meeting # here ↑

for approval [X]
for information [ ]

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:	Mitsubishi Electric (MCRD)	**Date:**	30th November 99

Subject:	Rate matching parameter determination for coding scheme = no coding

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:	In the current description RM parameter determination is not specified when the coding scheme is "no coding"

Clauses affected:	4.2.7.1

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:	

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:

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

$N_{data,j} = \min \text{SET1}$

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:

When the channel coding scheme is convolutional code or no coding,

$a = 2$

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

$N = N_{i,j}$

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

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

$\quad$ $S(I_F (\lceil x*q' \rceil \bmod F_i)) = (\lceil x*q' \rceil \operatorname{div} F_i)-$

End for

$e_{ini} = (a \cdot S(n_i) \cdot |\Delta N| + N) \bmod a \cdot N$, if $e_{ini} = 0$ then $e_{ini} = a \cdot N$.

$e_{plus} = a \cdot N$

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

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.

$\quad$ a = 2 for Y sequence, and

$\quad$ 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($q \le 2$)

$\quad$ for $x=0$ to F_i-1

$\quad\quad$ if(Y sequence)

$\quad\quad\quad$ $S[I_F[(3x+1) \bmod F_i]] = x \bmod 2$;

$\quad\quad$ if(Y' sequence)

$\quad\quad\quad$ $S[I_F [(3x+2) \bmod F_i]] = x \bmod 2$;

$\quad$ end for

else

$\quad$ if q is even

$\quad\quad$ then $q' = q - gcd(q, F_i)/ F_i$ $\quad$ -- 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

$\quad$ else $\quad q' = q$

$\quad$ endif

$\quad$ for $x=0$ to $F_i - 1$

$\quad\quad$ $r = \lceil x*q' \rceil \bmod F_i$;

$\quad\quad$ if(Y sequence)

$\quad\quad\quad$ $S[I_F[(3r+1) \bmod F_i]] = \lceil x*q' \rceil \operatorname{div} F_i$;

$\quad\quad$ if(Y' sequence)

$S[I_F[(3r+2) \bmod F_i]] = \lceil x*q' \rceil \text{ div } F_i;$

endfor

endif

For each radio frame, the rate-matching pattern is calculated with the algorithm in section 4.2.7.3, where:

N is as above,

$e_{ini} = (a \cdot S(n_i) \cdot |\Delta N| + N) \bmod a \cdot N$, if $e_{ini} = 0$ then $e_{ini} = a \cdot N$.

$e_{plus} = a \cdot N$

$e_{minus} = a \cdot |\Delta N|$

puncturing for *DN*<0, repeating otherwise.