TSG-RAN Meeting #15 Jeju-do, Korea, 5 - 8 March 2002

Title: Removal of channel coding option "no coding" for FDD

Source: Siemens

Agenda item: 7

RAN TDoc	Spec	CR	Rev	Phas	Subject	Cat	Version	Version-
RP-020231	25.201	009	2	R99	Removal of channel coding option "no coding" for FDD	F	3.2.0	3.3.0
RP-020231	25.201	010	1	Rel-4	Removal of channel coding option "no coding" for FDD	Α	4.1.0	4.2.0
RP-020231	25.212	127	2	R99	Removal of channel coding option "no coding" for FDD	F	3.8.0	3.9.0
RP-020231	25.212	128	2	Rel-4	Removal of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0
RP-020231	25.215	110	1	R99	Removal of channel coding option "no coding" for FDD	F	3.9.0	3.10.0
RP-020231	25.215	111	1	Rel-4	Removal of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0
RP-020231	25.302	120	2	R99	Removal of channel coding option "no coding" for FDD	С	3.11.0	3.12.0
RP-020231	25.302	121	1	Rel-4	Removal of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0
RP-020231	25.331	1295	2	R99	Removal of channel coding option "no coding" for FDD	С	3.9.0	3.10.0
RP-020231	25.331	1296	1	Rel-4	Removal of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0
RP-020231	25.423	585	2	R99	Removing of channel coding option "no coding" for FDD	F	3.8.0	3.9.0
RP-020231	25.423	586	2	Rel-4	Removing of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0
RP-020231	25.433	627	2	R99	Removing of channel coding option "no coding" for FDD	F	3.8.0	3.9.0
RP-020231	25.433	628	2	Rel-4	Removing of channel coding option "no coding" for FDD	Α	4.3.0	4.4.0



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4.2.2 Channel coding and interleaving

For the channel coding in UTRA three two options are supported for FDD and three options are supported for TDD:

- Convolutional coding.
- Turbo coding.
- No coding (TDD only)

Channel coding selection is indicated by higher layers. In order to randomise transmission errors, bit interleaving is performed further.

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1) Fill out the above form. The symbols above marked **%** contain pop-up help information about the field that they are closest to.

4.2.2 Transport block concatenation and code block segmentation

All transport blocks in a TTI are serially concatenated. If the number of bits in a TTI is larger than *Z*, the maximum size of a code block in question, then code block segmentation is performed after the concatenation of the transport blocks. The maximum size of the code blocks depends on whether convolutional coding or, turbo coding or no coding is used for the TrCH.

4.2.2.1 Concatenation of transport blocks

The bits input to the transport block concatenation are denoted by $b_{im1}, b_{im2}, b_{im3}, \dots, b_{imB_i}$ where i is the TrCH number, m is the transport block number, and B_i is the number of bits in each block (including CRC). The number of transport blocks on TrCH i is denoted by M_i . The bits after concatenation are denoted by $x_{i1}, x_{i2}, x_{i3}, \dots, x_{iX_i}$, where i is the TrCH number and $X_i = M_i B_i$. They are defined by the following relations:

$$x_{ik} = b_{i1k}$$
 $k = 1, 2, ..., B_i$
 $x_{ik} = b_{i,2,(k-B_i)}$ $k = B_i + 1, B_i + 2, ..., 2B_i$
 $x_{ik} = b_{i,3,(k-2B_i)}$ $k = 2B_i + 1, 2B_i + 2, ..., 3B_i$
...
$$x_{ik} = b_{i,M_i,(k-(M_i-1)B_i)}$$
 $k = (M_i - 1)B_i + 1, (M_i - 1)B_i + 2, ..., M_iB_i$

4.2.2.2 Code block segmentation

Segmentation of the bit sequence from transport block concatenation is performed if $X_i > Z$. The code blocks after segmentation are of the same size. The number of code blocks on TrCH i is denoted by C_i . If the number of bits input to the segmentation, X_i , is not a multiple of C_i , filler bits are added to the beginning of the first block. If turbo coding is selected and $X_i < 40$, filler bits are added to the beginning of the code block. The filler bits are transmitted and they are always set to 0. The maximum code block sizes are:

- convolutional coding: Z = 504;
- turbo coding: Z = 5114;
- no channel coding: Z = unlimited.

The bits output from code block segmentation, for $C_i \neq 0$, are denoted by $o_{ir1}, o_{ir2}, o_{ir3}, \dots, o_{irK_i}$, where *i* is the TrCH number, *r* is the code block number, and K_i is the number of bits per code block.

Number of code blocks:

$$\frac{1}{C_i} = \begin{cases}
X_i/Z \\
0 & \text{when } Z \neq unlimited \\
0 & \text{when } Z = unlimited \text{ and } X_i = 0 \\
1 & \text{when } Z = unlimited \text{ and } X_i \neq 0
\end{cases}$$

Number of bits in each code block (applicable for $C_i \neq 0$ only):

if $X_i < 40$ and Turbo coding is used, then

```
K_i = 40
    else
        K_i = \int X_i / C_i 
    end if
Number of filler bits: Y_i = C_i K_i - X_i
for k = 1 to Y_i
                                  -- Insertion of filler bits
    o_{i1k} = 0
end for
for k = Y_i + 1 to K_i
    o_{i1k} = x_{i,(k-Y_i)}
end for
r = 2
                                           -- Segmentation
while r \leq C_i
    for k = 1 to K_i
         o_{irk} = x_{i,(k+(r-1)\cdot K_i-Y_i)}
    end for
    r = r+1
end while
```

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 $y_{ir1}, y_{ir2}, y_{ir3}, \ldots, y_{irY_i}$, where Y_i is the number of encoded bits. The relation between o_{irk} and o_{irk} and between o_{irk} and between o_{irk} and o_{irk} and between o_{irk} and between o_{irk} and o_{irk} and o_{irk} and between o_{irk} and o_{irk} and o

The following channel coding schemes can be applied to TrCHs:

- convolutional coding;
- turbo coding;
- no coding.

Usage of coding scheme and coding rate for the different types of TrCH is shown in table 1.

The values of Y_i in connection with each coding scheme:

- convolutional coding with rate 1/2: $Y_i = 2*K_i + 16$; rate 1/3: $Y_i = 3*K_i + 24$;
- turbo coding with rate 1/3: $Y_i = 3*K_i + 12$;
- no coding: $Y_i = K_i$.

Table 1: Usage of channel coding scheme and coding rate

Type of TrCH	Coding scheme	Coding rate
BCH		
PCH	Convolutional coding	1/2
RACH	Convolutional coding	
		1/3, 1/2
CPCH, DCH, DSCH, FACH	Turbo coding	1/3
	No codi	

4.2.7.1.2 Determination of parameters needed for calculating the rate matching pattern

The number of bits to be repeated or punctured, $\Delta N_{i,j}$, 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 subclause 4.2.7.1.1.

In a compressed radio frame, $N_{data,j}$ is replaced by $N_{data,j}^{cm}$ in Equation 1. $N_{data,j}^{cm}$ is given as follows:

In a radio frame compressed by higher layer scheduling, $N_{data,j}^{cm}$ is obtained by executing the algorithm in subclause

4.2.7.1.1 but with the number of bits in one radio frame of one PhCH reduced to $\frac{N_{tr}}{15}$ of the value in normal mode.

 N_{tr} is the number of transmitted slots in a compressed radio frame and is defined by the following relation:

$$N_{tr} = \begin{cases} 15 - TGL \text{, if } N_{first} + TGL \leq 15 \\ N_{first} \text{, in first frame if } N_{first} + TGL > 15 \\ 30 - TGL - N_{first} \text{, in second frame if } N_{first} + TGL > 15 \end{cases}$$

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

In a radio frame compressed by spreading factor reduction, $N_{data,j}^{cm} = 2 \times (N_{data,j} - N_{TGL})$, where

$$N_{TGL} = \frac{15 - N_{tr}}{15} \times N_{data,j}$$

If $\Delta N_{i,j} = 0$ then the output data of the rate matching is the same as the input data and the rate matching algorithm of subclause 4.2.7.5 does not need to be executed.

If $\Delta N_{i,j} \neq 0$ the parameters listed in subclauses 4.2.7.1.2.1 and 4.2.7.1.2.2 shall be used for determining e_{ini} , e_{plus} , and e_{minus} (regardless if the radio frame is compressed or not).

4.2.7.1.2.1 Uncoded and cConvolutionally encoded TrCHs

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

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

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

else

$$q = \lceil N_{i,j} / (R - N_{i,j}) \rceil$$

endif

-- note: q is a signed quantity.

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 $F_i - 1$

$$S[| x \times q'| \mod F_i] = (| x \times q'| \dim F_i)$$

end for

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

$$a = 2$$

For each radio frame, the rate-matching pattern is calculated with the algorithm in subclause 4.2.7.5, where :

$$X_i = N_{i,j}$$
, and

$$e_{ini} = (a \times S[P1_{Fi}(n_i)] \times |\Delta N_i| + 1) \mod (a \cdot N_{ij}).$$

$$e_{\text{plus}} = a \times N_{i,j}$$

$$e_{\text{minus}} = \mathbf{a} \times |\Delta N_i|$$

puncturing for ΔN <0, repetition otherwise.

4.2.7.2.1.3 Determination of rate matching parameters for uncoded and convolutionally encoded TrCHs

$$\Delta N_i = \Delta N_{i,max}$$

For compressed mode by puncturing, ΔN_i is defined as: $\Delta N_i = \Delta N_{i,\text{max}}^{TTI,cm,m}$, instead of the previous relation.

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 subclause 4.2.7.5. The following parameters are used as input:

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

$$e_{ini} = 1$$

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

$$e_{\min us} = a \times |\Delta N_i|$$

Puncturing if $\Delta N_i < 0$, repetition otherwise. The values of $\Delta N_{i,l}^{TTI}$ may be computed by counting repetitions or puncturing when the algorithm of subclause 4.2.7.5 is run. The resulting values of $\Delta N_{i,l}^{TTI}$ can be represented with following expression.

$$\Delta N_{i,l}^{TTI} = \left[\frac{\left| \Delta N_i \right| \times X_i}{N_{max}} \right] \times \operatorname{sgn}(\Delta N_i)$$

For compressed mode by puncturing, the above formula produces $\Delta N_{i,l}^{TTI,m}$ instead of $\Delta N_{i,l}^{TTI}$.

4.2.7.2.1.4 Determination of rate matching parameters for Turbo encoded TrCHs

If repetition is to be performed on turbo encoded TrCHs, i.e. $\Delta N_{i,max} > 0$, the parameters in subclause 4.2.7.2.1.3 are used.

If puncturing is to be performed, the parameters below shall be used. Index b is used to indicate systematic (b=1), 1^{st} parity (b=2), and 2^{nd} parity bit (b=3).

$$a=2$$
 when $b=2$

$$a=1$$
 when $b=3$

The bits indicated by b=1 shall not be punctured.

$$\Delta N_i^b = \begin{cases} \left[\Delta N_{i,max} / 2 \right], & \text{for } b = 2\\ \left[\Delta N_{i,max} / 2 \right], & \text{for } b = 3 \end{cases}$$

In Compressed Mode by puncturing, the following relations are used instead of the previous ones:

$$\Delta N_i^b = \left[\Delta N_{i,\text{max}}^{TTI,cm,m} / 2 \right], \text{ for } b=2$$

$$\Delta N_{i}^{b}{}_{I} = \left[\Delta N_{i,\text{max}}^{TTI,cm,m} / 2 \right]$$
 , for $b=3$

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

For each transmission time interval of TrCH i with TF l, the rate-matching pattern is calculated with the algorithm in subcaluse 4.2.7.5. The following parameters are used as input:

$$X_i = N_{il}^{TTI} / 3$$

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

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

$$e_{\min us} = a \times |\Delta N_i^b|$$

The values of $\Delta N_{i,l}^{TTI}$ may be computed by counting puncturing when the algorithm of subclause 4.2.7.5 is run. The resulting values of $\Delta N_{i,l}^{TTI}$ can be represented with following expression.

$$\Delta N_{i,l}^{TTI} = -\left| \frac{\left| \Delta N_i^2 \right| \times X_i}{N_{max}} + 0.5 \right| - \left| \frac{\left| \Delta N_i^3 \right| \times X_i}{N_{max}} \right|$$

In the above equation, the first term of the right hand side represents the amount of puncturing for b=2 and the second term represents the amount of puncturing for b=3.

For compressed mode by puncturing, the above formula produces $\Delta N_{i,l}^{TTI,m}$ instead of $\Delta N_{i,l}^{TTI}$.

4.2.7.2.2.2

Determination of rate matching parameters for uncoded and convolutionally encoded TrCHs

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

$$a=2$$

For each transmission time interval of TrCH i with TF l, the rate-matching pattern is calculated with the algorithm in subclause 4.2.7.5. The following parameters are used as input:

$$X_{i} = N_{il}^{TTI}$$

$$e_{ini} = 1$$

$$e_{plus} = a \times N_{il}^{TTI}$$

$$e_{\min us} = a \times |\Delta N_i|$$

puncturing for $\Delta N_i < 0$, repetition otherwise.

4.2.7.3 Bit separation and collection in uplink

The systematic bits of turbo encoded TrCHs shall not be punctured, the other bits may be punctured. The systematic bits, first parity bits, and second parity bits in the bit sequence input to the rate matching block are therefore separated into three sequences.

The first sequence contains:

- All of the systematic bits that are from turbo encoded TrCHs.
- From 0 to 2 first and/or second parity bits that are from turbo encoded TrCHs. These bits come into the first sequence when the total number of bits in a block after radio frame segmentation is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second sequence contains:

- All of the first parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The third sequence contains:

- All of the second parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second and third sequences shall be of equal length, whereas the first sequence can contain from 0 to 2 more bits. Puncturing is applied only to the second and third sequences. The bit separation function is transparent for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition. The bit separation and bit collection are illustrated in figures 5 and 6.

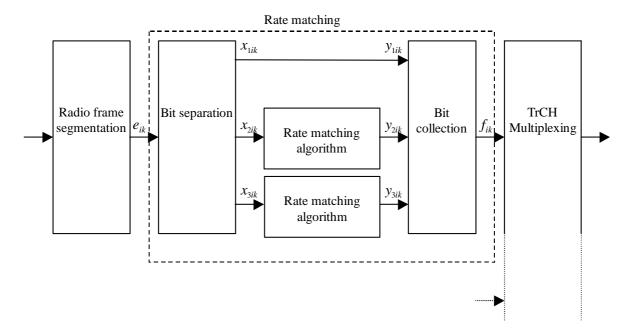


Figure 5: Puncturing of turbo encoded TrCHs in uplink

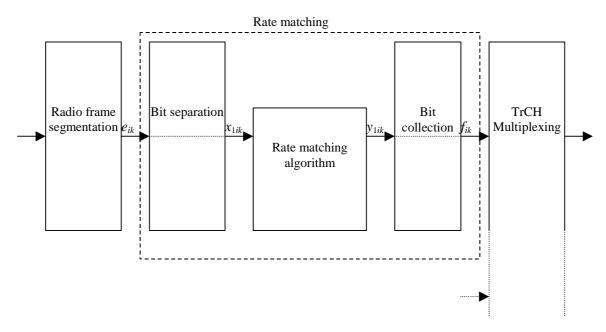


Figure 6: Rate matching for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition in uplink

The bit separation is dependent on the 1st interleaving and offsets are used to define the separation for different TTIs. b indicates the three sequences defined in this section, with b=1 indicating the first sequence, b = 2 the second one, and b = 3 the third one. The offsets α_b for these sequences are listed in table 5.

Table 5: TTI dependent offset needed for bit separation

TTI (ms)	α_1	α_2	α_3
10, 40	0	1	2
20, 80	0	2	1

The bit separation is different for different radio frames in the TTI. A second offset is therefore needed. The radio frame number for TrCH i is denoted by n_i and the offset by β_{n_i} .

Table 6: Radio frame dependent offset needed for bit separation

TTI (ms)	β_0	β_1	β_2	β_3	β_4	eta_5	eta_6	β_7
10	0	NA	NA	NA	NA	NA	NA	NA
20	0	1	NA	NA	NA	NA	NA	NA
40	0	1	2	0	NA	NA	NA	NA
80	0	1	2	0	1	2	0	1

4.2.7.3.1 Bit separation

The bits input to the rate matching are denoted by e_{i1} , e_{i2} , e_{i3} ,..., e_{iN_i} , where i is the TrCH number and N_i is the number of bits input to the rate matching block. Note that the transport format combination number j for simplicity has been left out in the bit numbering, i.e. $N_i = N_{ij}$. The bits after separation are denoted by x_{bi1} , x_{bi2} , x_{bi3} ,..., x_{biX_i} . For turbo encoded TrCHs with puncturing, b indicates the three sequences defined in section 4.2.7.3, with b=1 indicating the first sequence, and so forth. For all other cases b is defined to be 1. X_i is the number of bits in each separated bit sequence. The relation between e_{ik} and x_{bik} is given below.

For turbo encoded TrCHs with puncturing:

$$X_{1,i,k} = e_{i,3(k-1)+1+(\alpha_1+\beta_n) \bmod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i/3 \rfloor$

$$x_{1,i,\lfloor N_i/3 \rfloor + k} = e_{i,3\lfloor N_i/3 \rfloor + k}$$
 $k = 1, ..., N_i \mod 3$ Note: When $(N_i \mod 3) = 0$ this row is not needed.

$$x_{2,i,k} = e_{i,3(k-1)+1+(\alpha_2+\beta_{n_i}) \mod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i / 3 \rfloor$

$$x_{3,i,k} = e_{i,3(k-1)+1+(\alpha_3+\beta_{n_i}) \bmod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i / 3 \rfloor$

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$X_{1,i,k} = e_{i,k}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = N_i$

4.2.7.3.2 Bit collection

The bits x_{bik} are input to the rate matching algorithm described in subclause 4.2.7.5. The bits output from the rate matching algorithm are denoted $y_{bi1}, y_{bi2}, y_{bi3}, \dots, y_{biY_i}$.

Bit collection is the inverse function of the separation. The bits after collection are denoted by $z_{bi1}, z_{bi2}, z_{bi3}, \ldots, z_{biY_i}$. After bit collection, the bits indicated as punctured are removed and the bits are then denoted by $f_{i1}, f_{i2}, f_{i3}, \ldots, f_{iV_i}$, where i is the TrCH number and $V_i = N_{ij} + \Delta N_{ij}$. The relations between y_{bik} , z_{bik} , and f_{ik} are given below.

For turbo encoded TrCHs with puncturing $(Y_i=X_i)$:

$$z_{i,3(k-1)+1+(\alpha_1+\beta_n) \mod 3} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3|N_i/3|+k} = y_{1,i,N_i/3|+k}$$
 $k = 1, ..., N_i \mod 3$ Note: When $(N_i \mod 3) = 0$ this row is not needed.

$$z_{i,3(k-1)+1+(\alpha_2+\beta_{n_i}) \bmod 3} = y_{2,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3(k-1)+1+(\alpha_3+\beta_{n_i}) \bmod 3} = y_{3,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

After the bit collection, bits $z_{i,k}$ with value δ , where $\delta \not\in \{0, 1\}$, are removed from the bit sequence. Bit $f_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $f_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$z_{i,k} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

When repetition is used, $f_{i,k}=z_{i,k}$ and $Y_i=V_i$.

When puncturing is used, $Y_i=X_i$ and bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $f_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $f_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

4.2.7.4 Bit separation and collection in downlink

The systematic bits of turbo encoded TrCHs shall not be punctured, the other bits may be punctured.

The systematic bits, first parity bits and second parity bits in the bit sequence input to the rate matching block are therefore separated into three sequences of equal lengths.

The first sequence contains:

- All of the systematic bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second sequence contains:

- All of the first parity bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The third sequence contains:

- All of the second parity bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

Puncturing is applied only to the second and third sequences.

The bit separation function is transparent for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition. The bit separation and bit collection are illustrated in figures 7 and 8.

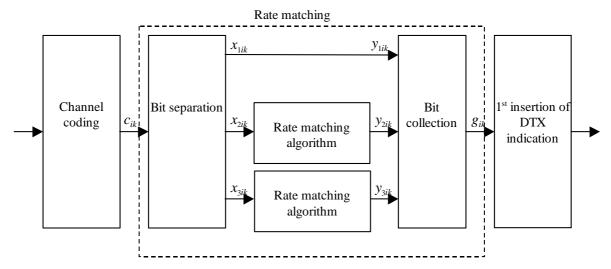


Figure 7: Puncturing of turbo encoded TrCHs in downlink

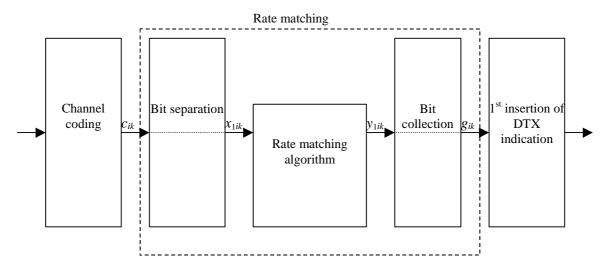


Figure 8: Rate matching for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition in downlink

4.2.7.4.1 Bit separation

The bits input to the rate matching are denoted by $c_{i1}, c_{i2}, c_{i3}, \ldots, c_{iE_i}$, where i is the TrCH number and E_i is the number of bits input to the rate matching block. Note that E_i is a multiple of 3 for turbo encoded TrCHs and that the transport format l for simplicity has been left out in the bit numbering, i.e. $E_i = N_{il}^{TTI}$. The bits after separation are

denoted by $X_{bi1}, X_{bi2}, X_{bi3}, \dots, X_{biX_i}$. For turbo encoded TrCHs with puncturing, b indicates the three sequences defined in section 4.2.7.4, with b=1 indicating the first sequence, and so forth. For all other cases b is defined to be 1. X_i is the number of bits in each separated bit sequence. The relation between c_{ik} and x_{bik} is given below.

For turbo encoded TrCHs with puncturing:

$$X_{1,i,k} = C_{i,3(k-1)+1}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$

$$x_{2,i,k} = c_{i,3(k-1)+2}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$

$$X_{3,i,k} = C_{i,3(k-1)+3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$X_{1,i,k} = C_{i,k}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i$

4.2.7.4.2 Bit collection

The bits x_{bik} are input to the rate matching algorithm described in subclause 4.2.7.5. The bits output from the rate matching algorithm are denoted $y_{bi1}, y_{bi2}, y_{bi3}, \dots, y_{biY_i}$.

Bit collection is the inverse function of the separation. The bits after collection are denoted by $z_{bi1}, z_{bi2}, z_{bi3}, \ldots, z_{biY_i}$. After bit collection, the bits indicated as punctured are removed and the bits are then denoted by $g_{i1}, g_{i2}, g_{i3}, \ldots, g_{iG_i}$, where i is the TrCH number and $G_i = N_{il}^{TTI} + \Delta N_{il}^{TTI}$. The relations between y_{bik} , z_{bik} , and g_{ik} are given below.

For turbo encoded TrCHs with puncturing $(Y_i=X_i)$:

$$z_{i,3(k-1)+1} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3(k-1)+2} = y_{2,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3(k-1)+3} = y_{3,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

After the bit collection, bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $g_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $g_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$z_{i,k} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

When repetition is used, $g_{i,k}=z_{i,k}$ and $Y_i=G_i$.

When puncturing is used, $Y_i=X_i$ and bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $g_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $g_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

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How to create CRs using this form: Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked # contain pop-up help information about the field that they are closest to.

4.2.2 Transport block concatenation and code block segmentation

All transport blocks in a TTI are serially concatenated. If the number of bits in a TTI is larger than *Z*, the maximum size of a code block in question, then code block segmentation is performed after the concatenation of the transport blocks. The maximum size of the code blocks depends on whether convolutional coding or, turbo coding or no coding is used for the TrCH.

4.2.2.1 Concatenation of transport blocks

The bits input to the transport block concatenation are denoted by $b_{im1}, b_{im2}, b_{im3}, \dots, b_{imB_i}$ where i is the TrCH number, m is the transport block number, and B_i is the number of bits in each block (including CRC). The number of transport blocks on TrCH i is denoted by M_i . The bits after concatenation are denoted by $x_{i1}, x_{i2}, x_{i3}, \dots, x_{iX_i}$, where i is the TrCH number and $X_i = M_i B_i$. They are defined by the following relations:

$$x_{ik} = b_{i1k} k = 1, 2, ..., B_i$$

$$x_{ik} = b_{i,2,(k-B_i)} k = B_i + 1, B_i + 2, ..., 2B_i$$

$$x_{ik} = b_{i,3,(k-2B_i)} k = 2B_i + 1, 2B_i + 2, ..., 3B_i$$
...
$$x_{ik} = b_{i,M_{i,i}(k-(M_i-1)B_i)} k = (M_i - 1)B_i + 1, (M_i - 1)B_i + 2, ..., M_iB_i$$

4.2.2.2 Code block segmentation

Segmentation of the bit sequence from transport block concatenation is performed if $X_i > Z$. The code blocks after segmentation are of the same size. The number of code blocks on TrCH i is denoted by C_i . If the number of bits input to the segmentation, X_i , is not a multiple of C_i , filler bits are added to the beginning of the first block. If turbo coding is selected and $X_i < 40$, filler bits are added to the beginning of the code block. The filler bits are transmitted and they are always set to 0. The maximum code block sizes are:

- convolutional coding: Z = 504;
- turbo coding: Z = 5114;
- no channel coding: Z = unlimited.

The bits output from code block segmentation, for $C_i \neq 0$, are denoted by $o_{ir1}, o_{ir2}, o_{ir3}, \dots, o_{irK_i}$, where i is the TrCH number, r is the code block number, and K_i is the number of bits per code block.

Number of code blocks:

$$\frac{1}{C_{i}} = \begin{bmatrix} X_{i}/Z \end{bmatrix} \quad \text{when } Z \neq unlimited$$

$$C_{i} = \begin{cases} X_{i}/Z \end{bmatrix} \quad \text{when } Z = unlimited \text{ and } X_{i} = 0$$

$$1 \quad \text{when } Z = unlimited \text{ and } X_{i} \neq 0$$

Number of bits in each code block (applicable for $C_i \neq 0$ only):

if X_i < 40 and Turbo coding is used, then

$$K_i = 40$$

else

```
K_i = \int X_i / C_i
    end if
Number of filler bits: Y_i = C_i K_i - X_i
for k = 1 to Y_i
                                   -- Insertion of filler bits
    o_{i1k} = 0
end for
for k = Y_i + 1 to K_i
    o_{i1k} = x_{i,(k-Y_i)}
end for
r = 2
                                            -- Segmentation
while r \leq C_i
    for k = 1 to K_i
         o_{irk} = x_{i,(k+(r-1)\cdot K_i - Y_i)}
    end for
    r = r+1
```

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 $y_{ir1}, y_{ir2}, y_{ir3}, \ldots, y_{irY_i}$, where Y_i is the number of encoded bits. The relation between o_{irk} and o_{irk} and between o_{irk} and between o_{irk} and o_{irk} and between o_{irk} and between o_{irk} and o_{irk} and o_{irk} and o_{irk} and between o_{irk} and o_{irk} and o

The following channel coding schemes can be applied to TrCHs:

- convolutional coding;
- turbo coding;

end while

- no coding.

Usage of coding scheme and coding rate for the different types of TrCH is shown in table 1.

The values of Y_i in connection with each coding scheme:

- convolutional coding with rate 1/2: $Y_i = 2*K_i + 16$; rate 1/3: $Y_i = 3*K_i + 24$;
- turbo coding with rate 1/3: $Y_i = 3*K_i + 12$;
- no coding: $Y_i = K_i$.

Table 1: Usage of channel coding scheme and coding rate

Type of TrCH	Coding scheme	Coding rate
BCH		
PCH	Convolutional coding	1/2
RACH	Convolutional coding	
		1/3, 1/2
CPCH, DCH, DSCH, FACH	Turbo coding	1/3
	No codi	

4.2.7.1.2 Determination of parameters needed for calculating the rate matching pattern

The number of bits to be repeated or punctured, $\Delta N_{i,j}$, 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 subclause 4.2.7.1.1.

In a compressed radio frame, $N_{data,j}$ is replaced by $N_{data,j}^{cm}$ in Equation 1. $N_{data,j}^{cm}$ is given as follows:

In a radio frame compressed by higher layer scheduling, $N_{data,j}^{cm}$ is obtained by executing the algorithm in subclause

4.2.7.1.1 but with the number of bits in one radio frame of one PhCH reduced to $\frac{N_{tr}}{15}$ of the value in normal mode.

 N_{tr} is the number of transmitted slots in a compressed radio frame and is defined by the following relation:

$$N_{tr} = \begin{cases} 15 - TGL \text{, if } N_{\textit{first}} + TGL \leq 15 \\ N_{\textit{first}} \text{, in first frame if } N_{\textit{first}} + TGL > 15 \\ 30 - TGL - N_{\textit{first}} \text{, in second frame if } N_{\textit{first}} + TGL > 15 \end{cases}$$

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

In a radio frame compressed by spreading factor reduction, $N_{data,j}^{cm} = 2 \times (N_{data,j} - N_{TGL})$, where

$$N_{TGL} = \frac{15 - N_{tr}}{15} \times N_{data,j}$$

If $\Delta N_{i,j} = 0$ then the output data of the rate matching is the same as the input data and the rate matching algorithm of subclause 4.2.7.5 does not need to be executed.

If $\Delta N_{i,j} \neq 0$ the parameters listed in subclauses 4.2.7.1.2.1 and 4.2.7.1.2.2 shall be used for determining e_{ini} , e_{plus} , and e_{minus} (regardless if the radio frame is compressed or not).

4.2.7.1.2.1 Uncoded and cConvolutionally encoded TrCHs

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

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

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

else

$$q = \lceil N_{i,j} / (R - N_{i,j}) \rceil$$

endit

-- note: q is a signed quantity.

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 $F_i - 1$

$$S[| x \times q'| \mod F_i] = (| x \times q'| \dim F_i)$$

end for

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

$$a = 2$$

For each radio frame, the rate-matching pattern is calculated with the algorithm in subclause 4.2.7.5, where :

$$X_i = N_{i,j}$$
, and

$$e_{ini} = (a \times S[P1_{Fi}(n_i)] \times |\Delta N_i| + 1) \mod (a \cdot N_{ij}).$$

$$e_{\text{plus}} = a \times N_{i,j}$$

$$e_{\text{minus}} = \mathbf{a} \times |\Delta N_i|$$

puncturing for ΔN <0, repetition otherwise.

4.2.7.2.1.3 Determination of rate matching parameters for uncoded and convolutionally encoded TrCHs

$$\Delta N_i = \Delta N_{i,max}$$

For compressed mode by puncturing, ΔN_i is defined as: $\Delta N_i = \Delta N_{i,\text{max}}^{TTI,cm,m}$, instead of the previous relation.

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 subclause 4.2.7.5. The following parameters are used as input:

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

$$e_{ini} = 1$$

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

$$e_{\min us} = a \times |\Delta N_i|$$

Puncturing if $\Delta N_i < 0$, repetition otherwise. The values of $\Delta N_{i,l}^{TTI}$ may be computed by counting repetitions or puncturing when the algorithm of subclause 4.2.7.5 is run. The resulting values of $\Delta N_{i,l}^{TTI}$ can be represented with following expression.

$$\Delta N_{i,l}^{TTI} = \left[\frac{|\Delta N_i| \times X_i}{N_{max}} \right] \times \operatorname{sgn}(\Delta N_i)$$

For compressed mode by puncturing, the above formula produces $\Delta N_{i,l}^{TTI,m}$ instead of $\Delta N_{i,l}^{TTI}$.

4.2.7.2.2.2

Determination of rate matching parameters for uncoded and convolutionally encoded TrCHs

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

$$a=2$$

For each transmission time interval of TrCH i with TF l, the rate-matching pattern is calculated with the algorithm in subclause 4.2.7.5. The following parameters are used as input:

$$X_{i} = N_{il}^{TTI}$$

$$e_{ini} = 1$$

$$e_{plus} = a \times N_{il}^{TTI}$$

$$e_{\min us} = a \times |\Delta N_i|$$

puncturing for $\Delta N_i < 0$, repetition otherwise.

4.2.7.3 Bit separation and collection in uplink

The systematic bits of turbo encoded TrCHs shall not be punctured, the other bits may be punctured. The systematic bits, first parity bits, and second parity bits in the bit sequence input to the rate matching block are therefore separated into three sequences.

The first sequence contains:

- All of the systematic bits that are from turbo encoded TrCHs.
- From 0 to 2 first and/or second parity bits that are from turbo encoded TrCHs. These bits come into the first sequence when the total number of bits in a block after radio frame segmentation is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second sequence contains:

- All of the first parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The third sequence contains:

- All of the second parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second and third sequences shall be of equal length, whereas the first sequence can contain from 0 to 2 more bits. Puncturing is applied only to the second and third sequences. The bit separation function is transparent for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition. The bit separation and bit collection are illustrated in figures 5 and 6.

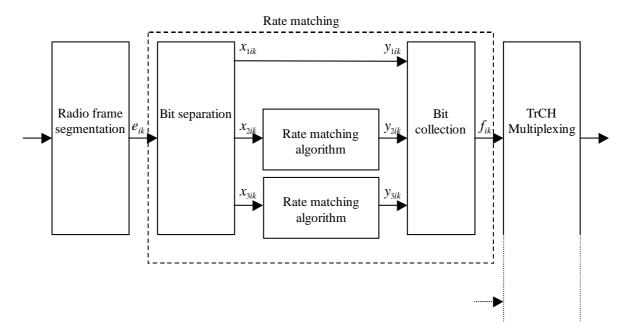


Figure 5: Puncturing of turbo encoded TrCHs in uplink

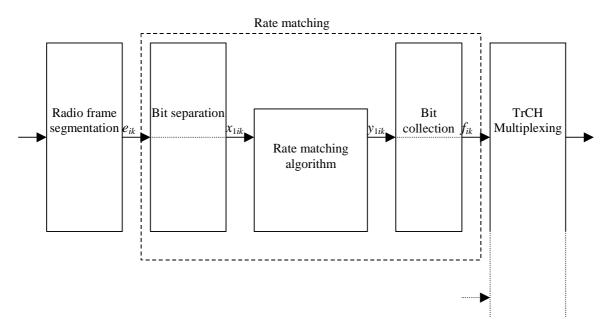


Figure 6: Rate matching for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition in uplink

The bit separation is dependent on the 1st interleaving and offsets are used to define the separation for different TTIs. b indicates the three sequences defined in this section, with b=1 indicating the first sequence, b = 2 the second one, and b = 3 the third one. The offsets α_b for these sequences are listed in table 5.

Table 5: TTI dependent offset needed for bit separation

TTI (ms)	α_1	α_2	α_3
10, 40	0	1	2
20, 80	0	2	1

The bit separation is different for different radio frames in the TTI. A second offset is therefore needed. The radio frame number for TrCH i is denoted by n_i and the offset by β_{n_i} .

Table 6: Radio frame dependent offset needed for bit separation

TTI (ms)	$eta_{f 0}$	eta_1	eta_{2}	eta_{3}	β_4	β_5	eta_6	β_7
10	0	NA	NA	NA	NA	NA	NA	NA
20	0	1	NA	NA	NA	NA	NA	NA
40	0	1	2	0	NA	NA	NA	NA
80	0	1	2	0	1	2	0	1

4.2.7.3.1 Bit separation

The bits input to the rate matching are denoted by e_{i1} , e_{i2} , e_{i3} ,..., e_{iN_i} , where i is the TrCH number and N_i is the number of bits input to the rate matching block. Note that the transport format combination number j for simplicity has been left out in the bit numbering, i.e. $N_i = N_{ij}$. The bits after separation are denoted by x_{bi1} , x_{bi2} , x_{bi3} ,..., x_{biX_i} . For turbo encoded TrCHs with puncturing, b indicates the three sequences defined in section 4.2.7.3, with b=1 indicating the first sequence, and so forth. For all other cases b is defined to be 1. X_i is the number of bits in each separated bit sequence. The relation between e_{ik} and x_{bik} is given below.

For turbo encoded TrCHs with puncturing:

$$X_{1,i,k} = e_{i,3(k-1)+1+(\alpha_1+\beta_n) \bmod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i/3 \rfloor$

$$x_{1,i,\lfloor N_i/3 \rfloor + k} = e_{i,3\lfloor N_i/3 \rfloor + k}$$
 $k = 1, ..., N_i \mod 3$ Note: When $(N_i \mod 3) = 0$ this row is not needed.

$$x_{2,i,k} = e_{i,3(k-1)+1+(\alpha_2+\beta_{n_i}) \mod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i / 3 \rfloor$

$$x_{3,i,k} = e_{i,3(k-1)+1+(\alpha_3+\beta_{n_i}) \bmod 3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = \lfloor N_i / 3 \rfloor$

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$X_{1,i,k} = e_{i,k}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = N_i$

4.2.7.3.2 Bit collection

The bits x_{bik} are input to the rate matching algorithm described in subclause 4.2.7.5. The bits output from the rate matching algorithm are denoted $y_{bi1}, y_{bi2}, y_{bi3}, \dots, y_{biY_i}$.

Bit collection is the inverse function of the separation. The bits after collection are denoted by $z_{bi1}, z_{bi2}, z_{bi3}, \ldots, z_{biY_i}$. After bit collection, the bits indicated as punctured are removed and the bits are then denoted by $f_{i1}, f_{i2}, f_{i3}, \ldots, f_{iV_i}$, where i is the TrCH number and $V_i = N_{ij} + \Delta N_{ij}$. The relations between y_{bik} , z_{bik} , and f_{ik} are given below.

For turbo encoded TrCHs with puncturing $(Y_i=X_i)$:

$$z_{i,3(k-1)+1+(\alpha_1+\beta_{n-1}) \mod 3} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3|N_i/3|+k} = y_{1,i,N_i/3|+k}$$
 $k = 1, ..., N_i \mod 3$ Note: When $(N_i \mod 3) = 0$ this row is not needed.

$$z_{i,3(k-1)+1+(\alpha_2+\beta_{n_i}) \bmod 3} = y_{2,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

$$z_{i,3(k-1)+1+(\alpha_3+\beta_{n_i}) \bmod 3} = y_{3,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

After the bit collection, bits $z_{i,k}$ with value δ , where $\delta \not\in \{0, 1\}$, are removed from the bit sequence. Bit $f_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $f_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$z_{i,k} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

When repetition is used, $f_{i,k}=z_{i,k}$ and $Y_i=V_i$.

When puncturing is used, $Y_i=X_i$ and bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $f_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $f_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

4.2.7.4 Bit separation and collection in downlink

The systematic bits of turbo encoded TrCHs shall not be punctured, the other bits may be punctured.

The systematic bits, first parity bits and second parity bits in the bit sequence input to the rate matching block are therefore separated into three sequences of equal lengths.

The first sequence contains:

- All of the systematic bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second sequence contains:

- All of the first parity bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The third sequence contains:

- All of the second parity bits that are from turbo encoded TrCHs.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

Puncturing is applied only to the second and third sequences.

The bit separation function is transparent for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition. The bit separation and bit collection are illustrated in figures 7 and 8.

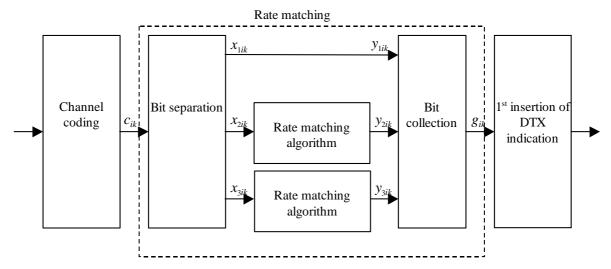


Figure 7: Puncturing of turbo encoded TrCHs in downlink

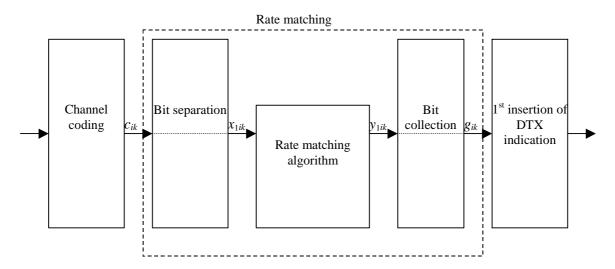


Figure 8: Rate matching for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition in downlink

4.2.7.4.1 Bit separation

The bits input to the rate matching are denoted by $C_{i1}, C_{i2}, C_{i3}, \dots, C_{iE_i}$, where i is the TrCH number and E_i is the number of bits input to the rate matching block. Note that E_i is a multiple of 3 for turbo encoded TrCHs and that the transport format l for simplicity has been left out in the bit numbering, i.e. $E_i = N_{il}^{TTI}$. The bits after separation are

denoted by $X_{bi1}, X_{bi2}, X_{bi3}, \dots, X_{biX_i}$. For turbo encoded TrCHs with puncturing, b indicates the three sequences defined in section 4.2.7.4, with b=1 indicating the first sequence, and so forth. For all other cases b is defined to be 1. X_i is the number of bits in each separated bit sequence. The relation between c_{ik} and x_{bik} is given below.

For turbo encoded TrCHs with puncturing:

$$x_{1,i,k} = c_{i,3(k-1)+1}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$ $x_{2,i,k} = c_{i,3(k-1)+2}$ $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$

$$x_{3,i,k} = c_{i,3(k-1)+3}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i/3$

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$X_{1,i,k} = C_{i,k}$$
 $k = 1, 2, 3, ..., X_i$ $X_i = E_i$

4.2.7.4.2 Bit collection

The bits x_{bik} are input to the rate matching algorithm described in subclause 4.2.7.5. The bits output from the rate matching algorithm are denoted $y_{bi1}, y_{bi2}, y_{bi3}, \dots, y_{biY_i}$.

Bit collection is the inverse function of the separation. The bits after collection are denoted by $z_{bi1}, z_{bi2}, z_{bi3}, \ldots, z_{biY_i}$. After bit collection, the bits indicated as punctured are removed and the bits are then denoted by $g_{i1}, g_{i2}, g_{i3}, \ldots, g_{iG_i}$, where i is the TrCH number and $G_i = N_{il}^{TTI} + \Delta N_{il}^{TTI}$. The relations between y_{bik} , z_{bik} , and g_{ik} are given below.

For turbo encoded TrCHs with puncturing $(Y_i=X_i)$:

$$\begin{split} z_{i,3(k-1)+1} &= y_{1,i,k} & k = 1, 2, 3, ..., Y_i \\ \\ z_{i,3(k-1)+2} &= y_{2,i,k} & k = 1, 2, 3, ..., Y_i \\ \\ z_{i,3(k-1)+3} &= y_{3,i,k} & k = 1, 2, 3, ..., Y_i \end{split}$$

After the bit collection, bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $g_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $g_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

For uncoded TrCHs, convolutionally encoded TrCHs, and turbo encoded TrCHs with repetition:

$$z_{i,k} = y_{1,i,k}$$
 $k = 1, 2, 3, ..., Y_i$

When repetition is used, $g_{i,k}=z_{i,k}$ and $Y_i=G_i$.

When puncturing is used, $Y_i=X_i$ and bits $z_{i,k}$ with value δ , where $\delta \notin \{0, 1\}$, are removed from the bit sequence. Bit $g_{i,1}$ corresponds to the bit $z_{i,k}$ with smallest index k after puncturing, bit $g_{i,2}$ corresponds to the bit $z_{i,k}$ with second smallest index k after puncturing, and so on.

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1) Fill out the above form. The symbols above marked # contain pop-up help information about the field that they are closest to.

5.2.6 Transport channel BER

Definition	The transport channel BER is an estimation of the average bit error rate (BER) of the DPDCH
	data of a Radio Link Set. The transport channel (TrCH) BER is measured from the data
	considering only non-punctured bits at the input of the channel decoder in Node B. It shall be
	possible to report an estimate of the transport channel BER for a TrCH after the end of each TTI
	of the TrCH. The reported TrCH BER shall be an estimate of the BER during the latest TTI for
	that TrCH. Transport channel BER is only required to be reported for TrCHs that are channel
	coded.

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1) Fill out the above form. The symbols above marked # contain pop-up help information about the field that they are closest to.

5.2.6 Transport channel BER

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- 1) Fill out the above form. The symbols above marked **%** contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

7.1.6 Transport Format

This is defined as a format offered by L1 to MAC (and vice versa) for the delivery of a Transport Block Set during a Transmission Time Interval on a Transport Channel. The Transport Format constitutes of two parts – one *dynamic* part and one *semi-static* part.

Attributes of the dynamic part are:

- Transport Block Size;
- Transport Block Set Size;
- Transmission Time Interval (optional dynamic attribute for TDD only);

Attributes of the semi-static part are:

- Transmission Time Interval (mandatory for FDD, optional for the dynamic part of TDD NRT bearers);
- error protection scheme to apply:
 - type of error protection, turbo code, convolutional code or no channel coding (TDD only);
 - coding rate;
 - static rate matching parameter;
- size of CRC.

Table A.1: Characterisation of Transport Format

		Attribute values	ВСН	PCH	FACH	RACH
Dynamic part	Transport Block Size	0 to 5 000 1 bit granularity	246	1 to 5000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity
	Transport Block Set Size	0 to 200 000 1 bit granularity	246	1 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity
	Transmission Time Interval (option for TDD only)	10, 20 ms, 40 and 80 ms				
Semi-static part	Transmission Time Interval (FDD, option for TDD NRT bearers)	10, 20 ms, 40 and 80 ms	20 ms	10ms for FDD, 20ms for TDD	10, 20 ms, 40 and 80 ms	10 ms and 20 ms for FDD, 10 ms for TDD
	Type of channel coding	No Coding (TDD only) Turbo coding Convolutional coding	Convolutiona I coding	Convolutional coding	No coding (TDD only) Turbo coding Convolutional coding	Convolutiona I coding
	code rates	1/2, 1/3	1/2	1/2	1/2, 1/3	1/2
	CRC size	0, 8, 12, 16, 24	16	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24
	Resulting ratio after static rate matching	0,5 to 4				

		Attribute values	СРСН	DCH	DSCH	USCH
Dynamic part	Transport Block Size	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity
	Transport Block Set Size	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity
	Transmission Time Interval (option for TDD only)	10, 20 ms, 40 and 80 ms		10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms
Semi-static part	Transmission Time Interval (FDD, option for TDD NRT bearers)	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms
	Type of channel coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutiona I coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutiona I coding
	code rates (in case of convolutional coding)	1/2, 1/3	1/2, 1/3	1/2, 1/3	1/2, 1/3	1/2, 1/3
	CRC size	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24
	Resulting ratio after static rate matching	0,5 to 4				

Table B.1

	Attribute		Value				
		Class A	Class B	Class C			
Dynamic part	Transport Block Size	81	103	60			
		65	99	40			
		75	84	0			
		61	87	0			
		58	76	0			
		55	63	0			
		49	54	0			
		42	53	0			
		39	0	0			
	Transport Block Set Size	Same as	the transport	block sizes			
Semi-static part	Transmission Time Interval		20 ms				
	Type of channel coding	Convolutional coding					
	code rates	1/2, 1/3	None	None (TDD			
		+ class-	(TDD	<u>only)</u> , 1/2 ,			
		specific only), 1/2,					
		rate 1/3 +					
		matching	specific rate				
			specific	matching			
			rate				
	CRC size	0	0				
	Resulting ratio after static rate	0.5 to 4(with no codir	ng the rate			
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Summary of chang	<i>је:</i> ж	THE	cnanne	el coding	option	n no co	oair	ig n	ias t	been	remo	vec	i ior i	-טט.		
		Isola	ted Imp	oact Ana	alysis											
		This	change	affects	the cha	annel c	odir	ng ty	ре.							
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								CR1					v3.9			
								CR1					v4.3			
								CR1					v3.1			
								CR1					v3.9			
								CR1: CR 5					v4.3.			
								CR 5					v4.3			
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How to create CRs using this form:

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- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

7.1.6 Transport Format

This is defined as a format offered by L1 to MAC (and vice versa) for the delivery of a Transport Block Set during a Transmission Time Interval on a Transport Channel. The Transport Format constitutes of two parts – one *dynamic* part and one *semi-static* part.

Attributes of the dynamic part are:

- Transport Block Size;
- Transport Block Set Size;
- Transmission Time Interval (optional dynamic attribute for TDD only);

Attributes of the semi-static part are:

- Transmission Time Interval (mandatory for FDD, optional for the dynamic part of TDD NRT bearers);
- error protection scheme to apply:
 - type of error protection, turbo code, convolutional code or no channel coding (TDD only);
 - coding rate;
 - static rate matching parameter;
- size of CRC.

Table A.1: Characterisation of Transport Format

		Attribute values	BCH	PCH	FACH	RACH
Dynamic part	Transport Block Size	0 to 5 000 1 bit granularity	246	1 to 5000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity
	Transport Block Set Size	0 to 200 000 1 bit granularity	246	1 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity
	Transmission Time Interval (option for TDD only)	10, 20 ms, 40 and 80 ms				
Semi-static part	Transmission Time Interval (FDD, option for TDD NRT bearers)	10, 20 ms, 40 and 80 ms	20 ms	10ms for FDD, 20ms for TDD	10, 20 ms, 40 and 80 ms	10 ms and 20 ms for FDD, 10 ms for TDD
	Type of channel coding	No Coding (TDD only) Turbo coding Convolutional coding	Convolutiona I coding	Convolutional coding	No coding (TDD only) Turbo coding Convolutional coding	Convolutiona I coding
	code rates	1/2, 1/3	1/2	1/2	1/2, 1/3	1/2
	CRC size	0, 8, 12, 16, 24	16	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24
	Resulting ratio after static rate matching	0,5 to 4				

		Attribute values	СРСН	DCH	DSCH	USCH
Dynamic part	Transport Block Size	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity	0 to 5 000 1 bit granularity
	Transport Block Set Size	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity	0 to 200 000 1 bit granularity
	Transmission Time Interval (option for TDD only)	10, 20 ms, 40 and 80 ms		10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms
Semi-static part	Transmission Time Interval (FDD, option for TDD NRT bearers)	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms	10, 20 ms, 40 and 80 ms
	Type of channel coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutiona I coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutional coding	No coding (TDD only) Turbo coding Convolutiona I coding
	code rates (in case of convolutional coding)	1/2, 1/3	1/2, 1/3	1/2, 1/3	1/2, 1/3	1/2, 1/3
	CRC size	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24	0, 8, 12, 16, 24
	Resulting ratio after static rate matching	0,5 to 4				

Table B.1

	Attribute		Value				
		Class A	Class B	Class C			
Dynamic part	Transport Block Size	81	103	60			
		65	99	40			
		75	84	0			
		61	87	0			
		58	76	0			
		55	63	0			
		49	54	0			
		42	53	0			
		39	0	0			
	Transport Block Set Size	Same as	the transport	block sizes			
Semi-static part	Transmission Time Interval		20 ms				
	Type of channel coding	Convolutional coding					
	code rates	1/2, 1/3	None	None (TDD			
		+ class-	(TDD	<u>only)</u> , 1/2 ,			
		specific only), 1/2,					
		rate 1/3 +					
		matching	specific rate				
			specific	matching			
			rate				
	CRC size	0	0				
	Resulting ratio after static rate	0.5 to 4(with no codir	ng the rate			
	matching	matchin	g ratio needs	s to be >1)			

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For <u>HELP</u> on t	ısing	this fo	rm, see	bottom	of this	page o	r look	at th	e pop-up te	xt ove	r the 🕱 sy	mbols.
Proposed change	affec	ts: #	(U)	SIM	ME	/UE X	Rad	dio Ad	ccess Netwo	ork X	Core No	etwork
Title:	Re	moval	of char	nnel cod	ing op	tion "no	codir	g" fo	r FDD			
Source: #	Sie	mens										
Work item code: ₩	TE	l							Date:	₩ <mark>M</mark> a	arch 2002	
Category: अ	<i>Use</i> Deta	F (cor A (cor B (add C (fur D (edi iiled ex	rection) respond dition of actional i itorial me	owing cated as to a confeature), modification in softhe TR 21.900	rrection ion of fe n) above	n in an ea			2	of the f (GS) (Rel (Rel (Rel (Rel	ollowing rel M Phase 2) Lease 1996) Lease 1997) Lease 1998) Lease 1999) Lease 4)	
Reason for change: In the RAN#15 meeting it has been agreed to remove the channel coding option "no coding" for FDD. For TDD this option is still valid.												
		110 (coding	וטו רטט	. FOI	וווט נחופ	opu	י פו ווכ	siii vaiiu.			
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									indicated in nality otherw		t, it would a	arrect
Consequences if not approved:	ж	"no (coding"	option is	s poss	ible						
Clauses affected:	¥	10.3	.5.11									
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Other specs	***************************************			re speci		าร ส	CR CR CR CR CR CR CR CR CR	1009r2 1127r2 1128r2 1110r 1111r2 1120r2 121r3 1296 585r 586r 622r	1 25.20 2 25.21 2 25.21 1 25.21 1 25.21 2 25.30 1 25.33 1 25.33 2 25.42 2 25.42	11 v3.2 11 v4.1 2 v3.8 2 v4.3 5 v3.9 5 v4.3 12 v4.3 11 v4.3 13 v3.8 13 v4.3 13 v4.3	.0 3.0 3.0 3.0 3.0 1.0 3.0 3.0 3.0	
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How to create CRs using this form:

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- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

10.3.5.11 Semi-static Transport Format Information

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Transmission time interval	MP		Integer(10, 20, 40, 80, dynamic)	In ms. The value dynamic is only used in TDD mode
Type of channel coding	MP		Enumerated(No coding, Convolutiona I, Turbo)	The option "No coding" is only valid for TDD.
Coding Rate	CV-Coding		Enumerated(1/2, 1/3)	
Rate matching attribute	MP		Integer(1hi RM)	
CRC size	MP		Integer(0, 8, 12, 16, 24)	in bits

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Proposed change	e affe	ects: 3	€ (U)	SIM	ME/	UE X	Rac	dio Ad	ccess Netw	ork X	Core No	etwork
Title:	₩ R	emova	l of char	nnel codi	ing opt	ion "no	codin	g" fo	r FDD			
Source:	₩ S	iemens	3									
Work item code:	¥ T	El							Date:	ж <mark>Ма</mark>	arch 2002	
Category:	# A								Release:	₩ RI	EL-4	
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			orrection) orrespond	ds to a co	rrection	in an ea	arlier r	eleas	e) R96		M Phase 2) lease 1996)	
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	be	found i	n 3GPP]	TR 21.900	<u>)</u> .				REL-5	(Rel	ease 5)	
Reason for chang	Reason for change: # In the RAN#15 meeting it has been agreed to remove the channel coding option "no coding" for FDD. For TDD this option is still valid.											
Summary of char	na-9	₩ The	channe	al codina	ontion	"no co	dina"	hae l	been remov	ed for	FDD	
Summary or char	ige.					110 000	anig	iias i	ocen remov	eu ioi	100.	
		Isola	ated Imp	oact Ana	alysis							
		This	change	affects t	he cha	nnel co	ding	type.				
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									nality otherw		c, it would a	arrect
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Consequences if	9	₩ "no	codina"	option is	s possi	ble						
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Clauses affected:		光 10.	3.5.11									
Other specs	9	₩ (Other co	re specif	fication	s a	€ CR	009r	2 25.20)1 v3.2	2.0	
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								121r)2 v4.3		
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How to create CRs using this form:

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10.3.5.11 Semi-static Transport Format Information

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Transmission time interval	MP		Integer(10, 20, 40, 80, dynamic)	In ms. The value dynamic is only used in TDD mode
Type of channel coding	MP		Enumerated(No coding, Convolutiona I, Turbo)	The option "No coding" is only valid for TDD.
Coding Rate	CV-Coding		Enumerated(1/2, 1/3)	
Rate matching attribute	MP		Integer(1hi RM)	
CRC size	MP		Integer(0, 8, 12, 16, 24)	in bits

```
ChannelCodingType ::= CHOICE {
    -- the option 'noCoding' is only used for TDD in this version of the specification, otherwise it should be ignored noCoding NULL, convolutional CodingRate, turbo NULL
}
```

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Proposed change	e affec	ts: X	(U)	SIM	ME	/UE		Radi	io Ac	cess I	Networ	rk X	Cor	e Netv	vork
Title:	₭ Re	movin	g of ch	annel co	ding o	ption "	no (codir	ng" fo	r FD[)				
Source:	≋ Sie	mens	AG												
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Summary of char	ıge: ૠ			channe							d in the	e tabu	lar for	mat a	nd in
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		Rev TDE		Accordi	ing to ⅂	rsg r	AN	agre	eeme	nt to r	etain "	no co	ding"	for 3.8	84Mcps
		Isola	ted im	pact ana	alysis:										
		Impa relea		ssment t	toward	s the p	orev	rious	vers	ion of	the sp	ecific	ation	(same	
				no impa ause the											
Consequences if not approved:	ж	"no	coding'	option v	would	still be	pos	ssible	e for	FDD.					
Clauses affected:	* **	9.2.	1.64, 9.	3.4											
Other specs	¥	X C	other co	ore speci	fication	าร		CR0 CR1 CR1 CR1 CR1 CR1	009r2 010r1 127r2 128r2 110r1 111r1 120r2 121r1		25.201 25.201 25.212 25.212 25.215 25.215 25.302 25.302 25.331	v4.1 2 v3.8 2 v4.3 5 v3.9 5 v4.3 2 v3.1 2 v4.3	.0 .0 .0 .0 .0 .0 1.0		

affected:	Test specifications O&M Specifications	CR1296r1 CR 586r2 CR 627r2 CR 628r2	25.331 v4.3.0 25.423 v4.3.0 25.433 v3.8.0 25.433 v4.3.0	
Other comments:	x			

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9.2.1.64 Transport Format Set

The Transport Format Set is defined as the set of Transport Formats associated to a Transport Channel, e.g. DCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dynamic Transport Format Information		1 <maxtfcount></maxtfcount>		The first instance of the parameter corresponds to TFI zero, the second to 1 and so on.
>Number of Transport Blocks	М		INTEGER (0512)	
>Transport Block Size	C - Blocks		INTEGER (05000)	Bits
>CHOICE Mode >>TDD	М			
>>>Transmission Time Interval Information	C- TTIdynamic	1 <maxttlcount></maxttlcount>		
>>>Transmission Time Interval	М		ENUMERAT ED(10, 20, 40, 80,)	msec
Semi-static Transport Format Information		1		
>Transmission Time Interval	M		ENUMERAT ED (10, 20, 40, 80, dynamic,)	msec Value "dynamic" for TDD only
>Type of Channel Coding	М		ENUMERAT ED (No codingTDD, Convolutiona I, Turbo,)	[FDD - The value 'No codingTDD' shall be treated as logical error if received]
>Coding Rate	C – Coding		ENUMERAT ED (1/2, 1/3,)	
>Rate Matching Attribute	М		INTEGER (1maxRM)	
>CRC size	M		ENUMERAT ED (0, 8, 12, 16, 24,)	
>CHOICE Mode	М			
>>TDD				
>>>2 nd Interleaving Mode	М		ENUMERAT ED(Frame related, Timeslot related,)	

Condition	Explanation
Blocks	The IE shall be present if the Number of Transport Blocks IE is set
	to a value greater than 0.
Coding	The IE shall be present if the Type of Channel Coding IE is set to
	"Convolutional" or "Turbo".
TTIdynamic	The IE shall be present if the Transmission Time Interval IE of the
	Semi-static Transport Format Information IE is set to "dynamic".

Range bound	Explanation
MaxTFcount	The maximum number of different transport formats that can be
	included in the Transport format set for one transport channel.
MaxRM	The maximum number that could be set as rate matching attribute
	for a transport channel.
MaxTTlcount	The amount of different TTI that are possible for that transport
	format is.

9.3.4 Information Element Definitions

TEXT OMITTED

					CR-Form-v5
	CHANG	SE REQ	UEST		CK-FUIIII-V3
¥ 25	.423 CR 586	≋ rev	2 % C	Current version:	4.3.0 **
For HELP on using	this form, see bottom of	this page or I	look at the p	oop-up text over	the X symbols.
Proposed change affect	ets: 第 (U)SIM	ME/UE	Radio Acce	ess Network X	Core Network
Title:	moving of channel codin	g option "no	coding" for	FDD	
Source: # Sie	emens AG				
Work item code:	il			Date:	rch 2002
Category: # A			E	Release: # RE	
<i>Use</i>	one of the following categor F (correction) A (corresponds to a correction) B (addition of feature), C (functional modification) D (editorial modification) ailed explanations of the abound in 3GPP TR 21.900.	ction in an ear	lier release)	Use <u>one</u> of the for 2 (GSM R96 (Rele R97 (Rele R98 (Rele R99 (Rele REL-4 (Rele	M Phase 2) Pase 1996) Pase 1997) Pase 1998) Pase 1999) Pase 1999) Pase 5)
Reason for change: #	In the TSG RAN plena	ry meeting (N	March 5 th -8 th	h 2002) it has he	en agreed to
Reason for change.	remove the channel co	oding option '	'no coding"	for FDD from Re	el.99 & REL-4
Summary of change: ₩	The type of channel co				lar format and in
	Revision 1: CR cover	page and ser	nantic desc	ription modified.	
	Revision 2: According TDD	to TSG RAN	agreement	to retain "no co	ding" for 3.84Mcps
	Isolated impact analys	sis:			
	Impact assessment tow release):	ards the prev	vious versio	n of the specific	ation (same
	This CR has no impact release) because the re				
Consequences if # mot approved:	"no coding" option wou	uld still be po	ssible for FI	DD.	
Clauses affected: #	9.2.1.64, 9.3.4				
Other specs #	X Other core specifica	ations 4º	CR009r2	25.201 v3.2	0
ouiei specs — #	Other core specifica	ation 6	CR00912 CR010r1 CR127r2 CR128r2 CR110r1	25.201 v3.2 25.201 v4.1 25.212 v3.8 25.212 v4.3 25.215 v3.9	.0 .0 .0

		CR111r1	25.215 v4.3.0	
		CR120r2	25.302 v3.11.0	
		CR121r1	25.302 v4.3.0	
		CR1295r2	25.331 v3.9.0	
		CR1296r1	25.331 v4.3.0	
		CR 585r2	25.423 v3.8.0	
		CR 627r2	25.433 v3.8.0	
		CR 628r2	25.433 v4.3.0	
affected:	Test specifications			
	O&M Specifications			
Other comments:	X			

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The Transport Format Set is defined as the set of Transport Formats associated to a Transport Channel, e.g. DCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dynamic Transport Format Information		1 <maxtfcount></maxtfcount>		The first instance of the parameter corresponds to TFI zero, the second to 1 and so on.
>Number of Transport Blocks	М		INTEGER (0512)	
>Transport Block Size	C - Blocks		INTEGER (05000)	Bits
>CHOICE Mode	М		(3113333)	
>>TDD				
>>>Transmission Time Interval Information	C- TTldynamic	1 <maxttlcount></maxttlcount>		
>>>Transmission Time Interval	M		ENUMERAT ED(10, 20, 40, 80,)	msec
Semi-static Transport Format Information		1		
>Transmission Time Interval	М		ENUMERAT ED (10, 20, 40, 80, dynamic,)	msec Value "dynamic" for TDD only
>Type of Channel Coding	М		ENUMERAT ED (No codingTDD, Convolutiona I, Turbo,)	[FDD - The value 'No codingTDD' shall be treated as logical error if received]
>Coding Rate	C – Coding		ENUMERAT ED (1/2, 1/3,)	
>Rate Matching Attribute	М		INTEGER (1maxRM)	
>CRC size	M		ENUMERAT ED (0, 8, 12, 16, 24,)	
>CHOICE Mode	М		, ,	
>>TDD				
>>>2 nd Interleaving Mode	М		ENUMERAT ED(Frame related, Timeslot related,)	

Condition	Explanation
Blocks	The IE shall be present if the Number of Transport Blocks IE is set
	to a value greater than 0.
Coding	Th IE present if Transmission Time Interval IE is set to
	"Convolutional" or "Turbo".
TTIdynamic	The IE shall be present if the Transmission Time Interval IE in the
-	Semi-static Transport Format Information IE is set to "dynamic".

Range bound	Explanation
MaxTFcount	The maximum number of different transport formats that can be
	included in the Transport format set for one transport channel.
MaxRM	The maximum number that could be set as rate matching attribute
	for a transport channel.
MaxTTlcount	The amount of different TTI that are possible for that transport
	format is.

9.3.4 Information Element Definitions

TEXT OMITTED

		•													
	CHANGE REQUEST														
*	2	5.43	3 CR	627		жre	ev.	2	ж	Curre	ent vers	sion:	3.8.	0	¥
For HELP o	n using	this	form, se	ee bottor	n of this	s page	or l	ook i	at the	е рор-	up text	t over	the #	sym	bols.
Proposed change affects: (U)SIM ME/UE Radio Access Network X Core Network															
Title:	₩ R	emov	ving of c	hannel c	oding o	ption	"no	codir	ng" fo	r FDE)				
Source:	₩ <mark>S</mark>	eme	ns AG												
Work item code	:# T	ΞΙ								D	ate: ೫	Ma	rch 20	02	
Category: # F Use one of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900. Release: # R99 Use one of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) REL-4 (Release 4) REL-5 (Release 5)							ases:								
Reason for char	nae. a	e In	the TS	G RAN p	lenary i	meetir	na (N	/larcl	h 5th.	-8th 2	002) it	has h	neen ac	ree	d to
neason for char	ige. •	re	move th	ne chann feature	el codir	ng opt	ion "	no c	oding	g" for F	FDD fro	om R	el.99 &	REL	4
Summary of cha	ange: 3			of chann I code a							d in the	tabu	lar forn	nat a	nd in
		R	evision	1: CR co	ver pag	e and	l sen	nanti	c des	scription	on mod	dified			
			evision : DD	2: Accord	ding to	TSG F	RAN	agre	eeme	nt to r	etain "	no co	ding" fo	or 3.	84Mcps
		Iso	lated in	npact ar	nalysis:										
			oact ass ease):	essmen	t toward	ls the	prev	rious	vers	ion of	the sp	ecific	ation (s	same	Э
				as no impecause the											
Consequences not approved:	if 3	l "n	o codin	g" option	would	still be	e pos	ssible	e for	FDD					
Clauses affected	d: }	ß 9.	2.1.59,	9.3.4											
Other specs	9	g X	Other o	core spe	cification	ns	¥	CRC)09r2		25.201	v3 2	0		
Caror speed	•		Jaioi (Jord Spel	omoano	.10		CRO CR1 CR1 CR1 CR1 CR1)10r1 27r2 28r2 10r1 11r1 20r2 21r1		25.201 25.212 25.212 25.215 25.215 25.302 25.302 25.331	v4.1 v3.8 v4.3 v3.9 v4.3 v4.3 v4.3	.0 .0 .0 .0 .0 .0		

affected:	Test specificati	CR1296r1 CR 585r2 CR 586r2 CR 628r2	25.331 v4.3.0 25.423 v3.8.0 25.423 v4.3.0 25.433 v4.3.0	
anected.	O&M Specification			
Other comments:	*			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

- 1) Fill out the above form. The symbols above marked **%** contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.1.59 Transport Format Set

The Transport Format Set is defined as the set of Transport Formats associated to a Transport Channel, e.g. DCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dynamic Transport Format Information		1 to <maxtfcount></maxtfcount>		The first instance of the parameter corresponds to TFI zero, the second to 1 and so on.
>Number of Transport blocks	М		INTEGER (0512)	
>Transport Block Size	C - Blocks		INTEGER (05000)	Bits
>CHOICE Mode	M		,	
>>TDD				
>>>Transmission	C-	1 to		
Time interval	TTIdynami	<maxttlcount></maxttlcount>		
Information	С			
>>>>Transmission time interval	М		Enumerated(10, 20, 40, 80,)	ms
Semi-static Transport Format Information		1		
>Transmission time interval	М		ENUMERATED (10, 20, 40, 80, dynamic,)	ms Value "dynamic" for TDD only
>Type of channel coding	M		ENUMERATED (No codingTDD, Convolutional, Turbo,)	[FDD - The value 'No codingTDD' shall be treated as logical error if received]
>Coding Rate	C – Coding		ENUMERATED (1/2, 1/3,)	
>Rate matching attribute	М		INTEGER (1maxRM)	
>CRC size	M		ENUMERATED (0, 8, 12, 16, 24,)	
>CHOICE Mode	M			
>>TDD				
>>>2 nd interleaving mode	M		Enumerated(Fra me related, Timeslot related,)	

Condition	Explanation
Blocks	The IE shall be present if the Number of Transport Blocks IE is set to
	a value greater than 0.
Coding	The IE shall be present if the Type of channel coding IE is set to
	"Convolutional" or "Turbo".
TTIdynamic	The IE shall be present if the Transmission Time Interval IE in the
•	Semi-static Transport Format Information IE is set to "dynamic".

Range bound	Explanation
MaxTFcount	Maximum number of different transport formats that can be included
	in the Transport format set for one transport channel.
MaxRM	Maximum number that could be set as rate matching attribute for a
	transport channel.
MaxTTlcount	The amount of different TTI that are possible for that transport format.

9.3.4 Information Elements Definitions

```
-- Information Element Definitions
TEXT OMITTED
TransportFormatSet-Semi-staticPart ::= SEQUENCE {
  TransportFormatSet-TransmissionTimeIntervalSemiStatic,
   -- This IE shall be present if the Type of channel coding IE is set to 'convolutional' or
'turbo'
   rateMatcingAttribute
                           TransportFormatSet-RateMatchingAttribute,
   cRC-Size
                           TransportFormatSet-CRC-Size,
  mode
                          TransportFormatSet-ModeSSP
   iE-Extensions
                           ProtocolExtensionContainer { { TransportFormatSet-Semi-
staticPart-ExtIEs} } OPTIONAL,
}
TransportFormatSet-Semi-staticPart-ExtIEs NBAP-PROTOCOL-EXTENSION ::= {
TransportFormatSet-ChannelCodingType ::= ENUMERATED {
  no-codingTDD,
  convolutional-coding,
  turbo-coding,
TransportFormatSet-CodingRate ::= ENUMERATED {
  half.
  third,
TransportFormatSet-CRC-Size ::= ENUMERATED {
   ν0,
   v8.
  v12.
  v16,
  v24,
   . . .
```

TEXT OMITTED

	CHANGE REQUEST														
*	2	5.43	3 CR	628		жre	V	2	¥	Curr	ent ver	sion:	4.3	.0	¥
For <u>HELP</u> or	n usin	g this	form, se	e bottom	of this	s page	or l	ook	at the	э рор	-up tex	t ove	r the 🕊	sym	nbols.
Proposed change affects: (U)SIM ME/UE Radio Access Network Core Network															
Title:	₩ R	emov	ring of ch	nannel co	ding o	ption '	"no d	codir	ng" fo	or FD	D				
Source:	Siemens AG Siemens AG														
Work item code:	°₩ T	El								ı	Date:	Ma Ma	arch 20	02	
Category:	Category: # A Use one of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900. REL-4 REL-4 Use one of the following releases: Use one of the following releases: R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) REL-4 (Release 4) REL-5 (Release 5)							ases:							
Reason for chan	ge: 8	⊮ In	the TSG	RAN ple	enary r	neetir	ng (N	/larc	h 5 th -	·8 th 20	002) it l	nas b	een agi	reed	to
				e channe feature w											
Summary of cha	nge:			of channe code and								e tabu	ılar forr	nat a	and in
				: CR cov						-					
			evision 2 DD	:: Accordi	ing to 1	TSG F	RAN	agre	eeme	ent to	retain '	'no co	oding" f	or 3.	84Mcps
		Iso	lated im	pact ana	alysis:										
			oact asse ease):	essment t	toward	ls the	prev	ious	vers	sion o	f the sp	ecific	cation (sam	e
				s no impa cause the)
Consequences in not approved:	f 8	₩ "n	o coding	" option v	would	still be	pos	ssibl	e for	FDD					
Clauses affected	1 : 8	£ 9.	2.1.59, 9	0.3.4											
Other specs	\$	K X	Other c	ore speci	fication	ns		CRO CR1 CR1 CR1 CR1 CR1	009r2 010r1 127r2 128r2 110r1 111r1 120r2 121r1	22	25.20° 25.21° 25.21° 25.21° 25.21° 25.30° 25.30° 25.33°	v4.1 v3.8 v4.3 v4.3 v4.3 v4.3 v4.3 v4.3	.0 3.0 3.0 3.0 3.0 3.0 1.0		

affected:	Test specifications O&M Specifications	CR1296r1 CR 585r2 CR 586r2 CR 627r2	25.331 v4.3.0 25.423 v3.8.0 25.423 v4.3.0 25.433 v3.8.0	
Other comments:	x			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

- 1) Fill out the above form. The symbols above marked **%** contain pop-up help information about the field that they are closest to.
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- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.1.59 Transport Format Set

The Transport Format Set is defined as the set of Transport Formats associated to a Transport Channel, e.g. DCH.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Dynamic Transport Format Information		1 to <maxtfcount></maxtfcount>		The first instance of the parameter corresponds to TFI zero, the second to 1 and so on.
>Number of Transport blocks	М		INTEGER (0512)	
>Transport Block Size	C - Blocks		INTEGER (05000)	Bits
>CHOICE Mode	M			
>>TDD				
>>>Transmission Time interval Information	C- TTIdynami c	1 to <maxttlcount></maxttlcount>		
>>>Transmission time interval	M		Enumerated(10, 20, 40, 80,)	ms
Semi-static Transport Format Information		1		
>Transmission time interval	M		ENUMERATED (10, 20, 40, 80, dynamic,,5)	ms; Value "dynamic" for TDD only; Value "5" for LCR TDD only
>Type of channel coding	M		ENUMERATED (No codingTDD, Convolutional, Turbo,)	[FDD - The value 'No codingTDD' shall be treated as logical error if received]
>Coding Rate	C – Coding		ENUMERATED (1/2, 1/3,)	
>Rate matching attribute	М		INTEGER (1maxRM)	
>CRC size	М		ENUMERATED (0, 8, 12, 16, 24,)	
>CHOICE Mode	М			
>>TDD				
>>>2 nd interleaving mode	M		Enumerated(Fra me related, Timeslot related,)	

Condition	Explanation
Blocks	The IE shall be present if the Number of Transport Blocks IE is set to
	a value greater than 0.
Coding	The IE shall be present if the Type of channel coding IE is set to
	"Convolutional" or "Turbo".
TTIdynamic	The IE shall be present if the Transmission Time Interval IE in the
	Semi-static Transport Format Information IE is set to "dynamic".

Range bound	Explanation
MaxTFcount	Maximum number of different transport formats that can be included
	in the Transport format set for one transport channel.
MaxRM	Maximum number that could be set as rate matching attribute for a
	transport channel.
MaxTTlcount	The amount of different TTI that are possible for that transport format.

third,

v0, v8, v12, v16, v24,

}

TransportFormatSet-CRC-Size ::= ENUMERATED {

9.3.4 Information Elements Definitions

```
-- Information Element Definitions
TEXT OMITTED
TransportFormatSet-Semi-staticPart ::= SEQUENCE {
  TransportFormatSet-TransmissionTimeIntervalSemiStatic,
                                                       OPTIONAL,
  -- This IE shall be present if the Type of channel coding IE is set to 'convolutional' or
'turbo'
  rateMatcingAttribute
                         TransportFormatSet-RateMatchingAttribute,
mode TransportFormatSet-CRC-Size,

iE-Extensions ProtocolExtensionContainer { TransportFormatSet-Semi-
staticPart-ExtIEs} }

OPTIONAL,
}
TransportFormatSet-ChannelCodingType ::= ENUMERATED {
  no-codingTDD,
  convolutional-coding,
  turbo-coding,
TransportFormatSet-CodingRate ::= ENUMERATED {
  half,
```

TEXT OMITTED