3GPP TSG RAN WG1 (Radio) Meeting #8
New York, USA, 12-15 OCT 1999

***Document* R1-99f28**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

25.212 25.222	**CR**	**001**	Current Version: v3.0.0

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 use only)*
list expected approval meeting # here ↑		for information		non-strategic	

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Samsung and LGIC **Date:** 12 Oct 1999

Subject: Clarification of functionality

Work item: TS25.212 and TS25.222

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

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

Release:

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

Reason for change: The current description of TS25.212 and TS25.222 is not clear for treatment of the bits after rate matching. So, some additional description is required to avoid any misunderstanding and ambiguities.

Clauses affected: 4.2.7.3 of TS25.212 and 6.2.7.2 of TS25.222

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:

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

TSG-RAN Working Group1 Meeting #8 *TSGR1#8(99)f28*
New York, U.S.A., October 12-15, 1999

Agenda Item:
Source: SAMSUNG Electronics Co. and LGIC
Title: Text proposal for Turbo codes and rate matching in TS 25.212, TS 25.222
Document for: Decision

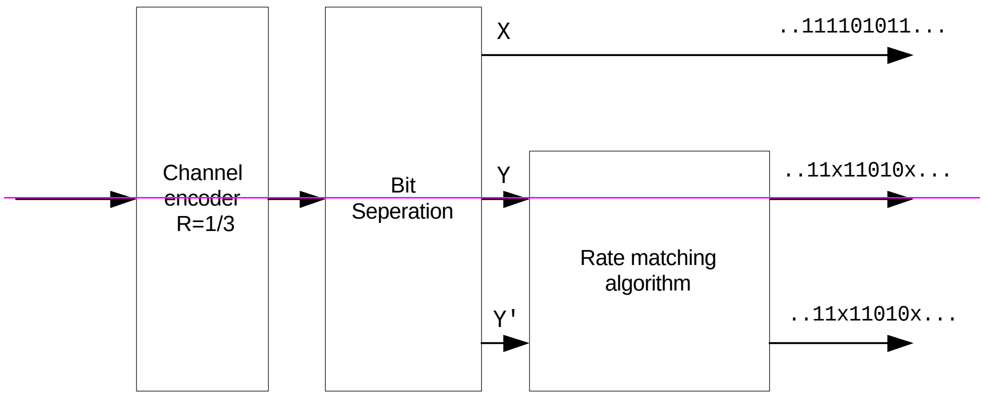
1. Introduction

During the discussion on the WG1 reflector it turned out that some clarification regarding treatment of the bits after rate matching puncturing for Turbo codes is required mainly in the section rate matching to avoid any misunderstanding and ambiguities. This text proposal deals with this item which is relevant for both of TS 25.212 (FDD) and TS 25.222 (TDD). Also, some additional editorial corrections were included.

2. Text proposal for TS 25.212

-------------------- Start text proposal -------------------

4.2.7.3. Bit separation and bit collection for rate matching



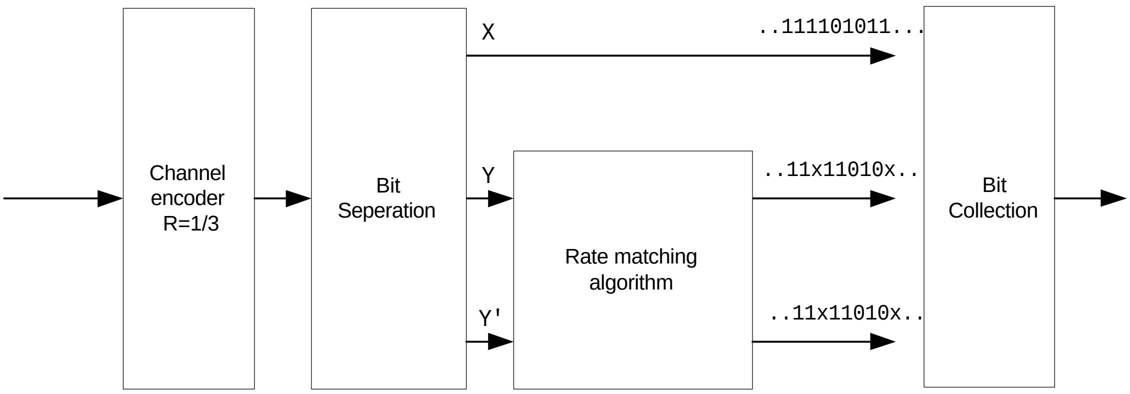


Figure 6: Overall rate matching block diagram before first interleaving where x denotes punctured bit.

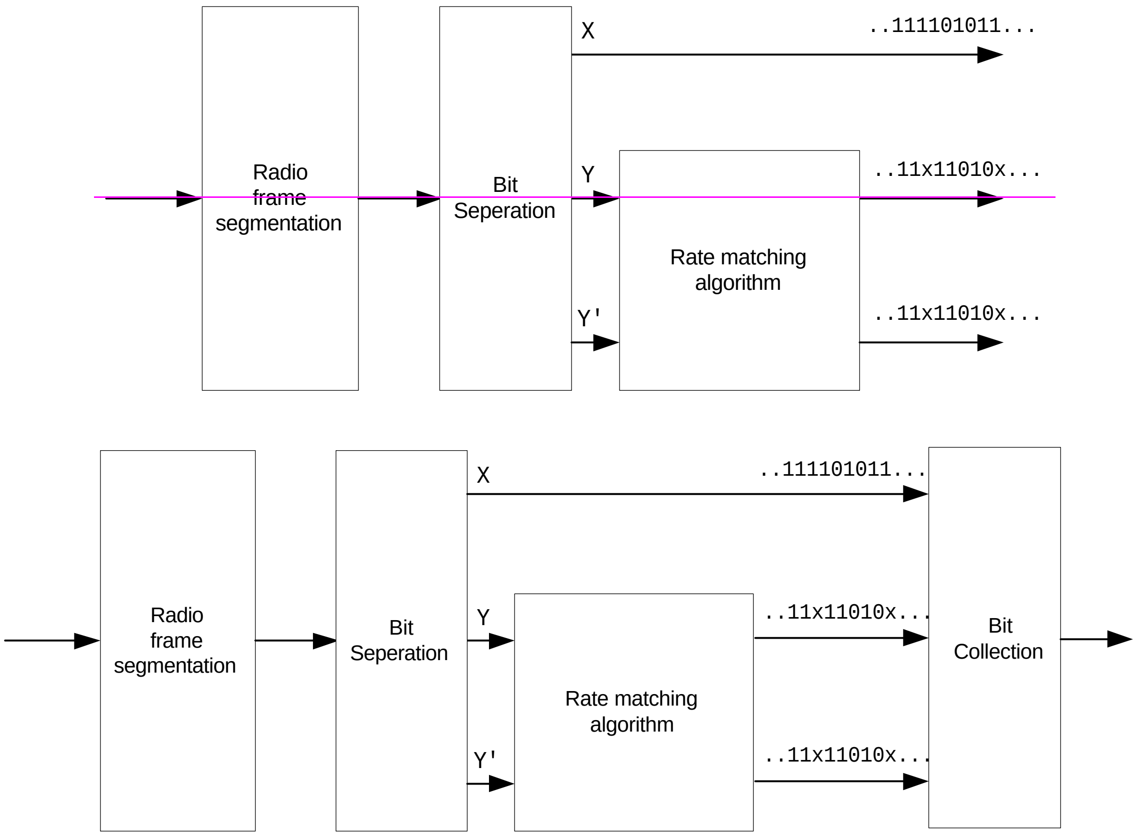


Figure 7: Overall rate matching block diagram after first interleaving where x denotes punctured bit.

Rate matching puncturing for Turbo codes in uplink is applied separately to *Y* and *Y'* sequences. No puncturing is applied to *X* sequence. Therefore, it is necessary to separate *X*, *Y*, and *Y'* sequences before rate matching is applied.

For uplink, there are two different alternation patterns in bit stream from Radio frame segmentation according to the TTI of a TrCH as shown in Table 4.

Table 4: Alternation patterns of bits from radio frame segmentation in uplink

TTI (msec)	Alternation patterns
10, 40	… *X,Y,Y'*,…
20, 80	… *X,Y',Y*,…

In addition, each radio frame of a TrCH starts with different initial parity type. Table 5 shows the initial parity type of each radio frame of a TrCH with TTI = {10, 20, 40, 80} msec.

Table 5: Initial parity type of radio frames of TrCH in uplink

TTI (msec)	Radio frame indexes (n_i)							
	0	1	2	3	4	5	6	7
10	*X*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
20	*X*	*Y*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
40	*X*	*Y'*	*Y*	*X*	*NA*	*NA*	*NA*	*NA*
80	*X*	*Y*	*Y'*	*X*	*Y*	*Y'*	*X*	*Y*

Table 4 and 5 defines a complete output bit pattern from Radio frame segmentation.

Ex. 1. TTI = 40 msec, $n_i = 2$
Radio frame pattern: *Y, Y', X, Y, Y', X, Y, Y', X, …*
Ex. 2 TTI = 40 msec, $n_i = 3$
Radio frame pattern: *X, Y, Y', X, Y, Y', X, Y, Y', X, …*

Therefore, bit separation is achieved with the alternative selection of bits with the initial parity type and alternation pattern specified in Table 4 and 5 according to the TTI and n_i of a TrCH.

Rate matching puncturing for Turbo codes in downlink is applied separately to Y and Y's sequences. No puncturing is applied to X sequence. Therefore, it is necessary to separate X, Y, and Y' sequences before rate matching is applied.

For downlink, output bit sequence pattern from Turbo encoder is always X, Y, Y', X, Y, Y', …. Therefore, bit separation is achieved with the alternative selection of bits from Turbo encoder.

After rate matching puncturing for Turbo codes, the separated sequences X, Y, and Y' are collected and delivered. For uplink, only not punctured bits in each radio frame of TrCH shall be delivered sequentially according to the order in Table 4 and Table 5 for each TTI of a TrCH.

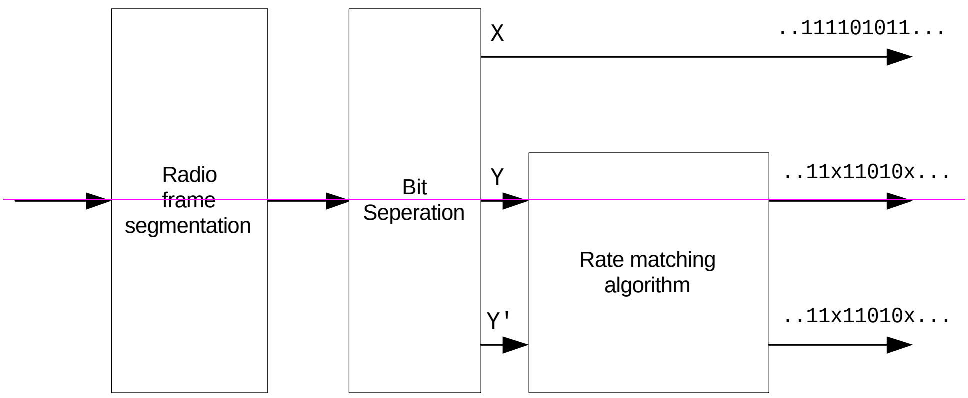
Ex. 1. TTI=40msec, $n_i = 2$
If radio frame pattern: *Y, ~~Y'~~, X, Y, Y', X, ~~Y~~, Y', X, … where ~~Y'~~ and ~~Y~~ mean punctured bits.*
Then delivered bits: *Y, X, Y, Y', X, Y', X, ….*

For downlink, only not punctured bits in a TTI of a TrCH shall be delivered sequentially in order of *X, Y, Y', X, Y, Y',…etc.*

3. Text proposal for TS 25.222

-------------------- Start text proposal --------------------

6.2.7.2. Bit separation and bit collection for rate matching



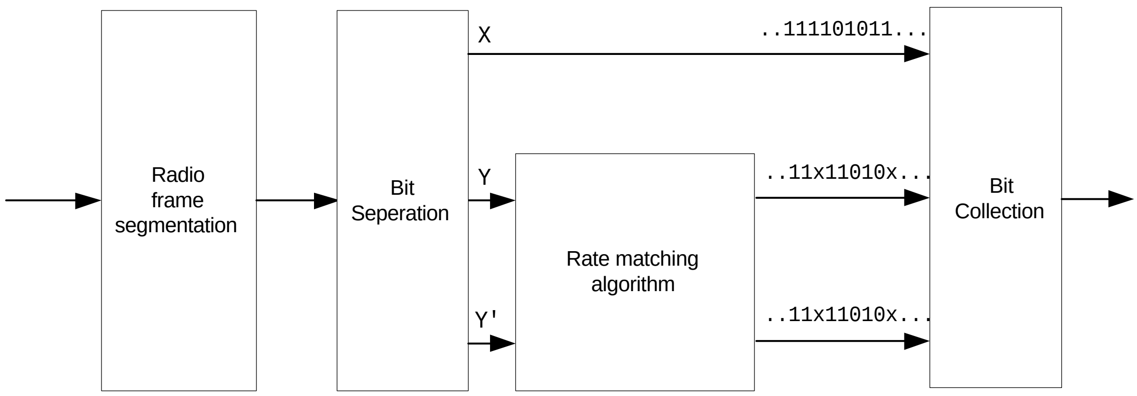


Figure 6-5. Overall rate matching block diagram after first interleaving where x denotes punctured bit.

Rate matching puncturing for Turbo codes is applied separately to *Y* and *Y'* sequences. No puncturing is applied to *X* sequence. Therefore, it is necessary to separate *X*, *Y*, and *Y'* sequences before rate matching is applied.

There are two different alternation patterns in bit stream from Radio frame segmentation according to the TTI of a TrCH as shown in Table 6.2.7-1.

Table 6.2.7-1 Alternation patterns of bits from radio frame segmentation

TTI (msec)	Alternation patterns
10, 40	… *X,Y,Y'*,…
20, 80	… *X,Y',Y*,…

In addition, each radio frame of a TrCH starts with different initial parity type. Table 6.2.7-2 shows the initial parity type of each radio frame of a TrCH with TTI = {10, 20, 40, 80} msec.

Table 6.2.7-2 Initial parity type of radio frames of TrCH

TTI (msec)	Radio frame indexes (n_i)							
	0	1	2	3	4	5	6	7
10	*X*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
20	*X*	*Y*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
40	*X*	*Y'*	*Y*	*X*	*NA*	*NA*	*NA*	*NA*
80	*X*	*Y*	*Y'*	*X*	*Y*	*Y'*	*X*	*Y*

Table 6.2.7-1 and 6.2.7-2 defines a complete output bit pattern from Radio frame segmentation.

Ex. 1. TTI = 40 msec, n_i = 2
Radio frame pattern: *Y*, *Y'*, *X*, *Y*, *Y'*, *X*, *Y*, *Y'*, *X*, …
Ex. 2 TTI = 40 msec, n_i = 3
Radio frame pattern: *X*, *Y*, *Y'*, *X*, *Y*, *Y'*, *X*, *Y*, *Y'*, *X*, …

Therefore, bit separation is achieved with the alternative selection of bits with the initial parity type and alternation pattern specified in Table 6.2.7-1 and 6.2.7-2 according to the TTI and n_i of a TrCH.

After rate matching puncturing for Turbo codes, the separated sequences X, Y, and Y' are collected and delivered. The only not punctured bits in each radio frame of TrCH shall be delivered sequentially according to the order in Table 6.2.7-1 and Table 6.2.7-2 for each TTI of a TrCH.

Ex. 1. TTI=40msec, n_i = 2
If radio frame pattern: *Y*, ~~*Y'*~~, *X*, *Y*, *Y'*, *X*, ~~*Y*~~, *Y'*, *X*, … *where* ~~*Y'*~~ *and* ~~*Y*~~ *mean punctured bits.*

Then delivered bits: *Y, X, Y, Y', X, Y', X, ….*

4. References

[1] TS 25.212 (V3.0.0): "Multiplexing and channel coding (FDD)"
[2] TS 25.222 (V3.0.0): "Multiplexing and channel coding (TDD)"