TSG-RAN Working Group 1 meeting #10 **TSGR1#10(00)0039**

Beijing, China
January 18 – 21, 2000

Agenda item:

Source: Ericsson

Title: CR 25.212-035: Clarification of DL compressed mode

Document for: Decision

In uplink compressed mode, new rate matching patterns are calculated to ensure that as many bits as possible are repeated (or as few as possible punctured). When calculating the rate matching pattern, the number of bits on the physical channel is different for normal and compressed mode. In normal mode the number of bits for TFC *j* is denoted by $N_{data,j}$ and in compressed mode it is denoted by $N^{cm}_{data,j}$.

The rate matching is not changed in downlink compressed mode, i.e. the downlink rate matching patterns are always derived using the number of bits on the physical channel in normal mode. In section 4.2.7 of 25.212, the total number of bits available to the CCTrCH in one radio frame is denoted by $N_{data,*}$.

In downlink, DTX is used when there are no bits to transmit. In downlink compressed mode more DTX compared to normal mode can be inserted. The number of available bits on one physical channel in compressed mode is needed when calculating the amount of DTX that should be inserted. In section 4.2.9.2 this number is denoted by N_{data}. Note that N_{data} is the number of bits on *one* physical channel. Further, the value of N_{data} in normal mode will differ from the one in compressed mode by spreading factor reduction and for compressed mode by higher layer scheduling with TFCI.

In short, in section 4.2.7, $N_{data,*}$ means the total number of bits on all physical channels in normal mode. In section 4.2.9.2, N_{data} means the number of bits on one physical channel in normal mode *or* compressed mode. In order to avoid misunderstandings the following is proposed:

- The notation $N^{cm}_{data,*}$ used in uplink is introduced in downlink as well.
- A sentence saying that the rate matching in downlink compressed mode is unchanged is added.
- It is clarified that the CCTrCH includes DTX since the current definition of $N_{data,j}$ (section 4.2.7) rely on the CCTrCH definition. (The definition of $N_{data,j}$ is "Total number of bits that are available for the CCTrCH in a radio frame with transport format combination *j*.")

3GPP TSG RAN WG1 Meeting #10
Beijing, China, January 18 – 21, 2000

Document ???99???
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 CR 035 Current Version: 3.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN #7	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 [X] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: Ericsson **Date:** 2000-01-13

Subject: Clarification of DL compressed mode

Work item:

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

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

Release:

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

Reason for change: Current description of downlink compressed mode can easily be misinterpreted and a clarification is therefore proposed.

Clauses affected: 3.2, 4.2, 4.2.7.2 and 4.2.9.2

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.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

éxù	round towards ¥, i.e. integer such that *x* £ *éxù* < *x*+1
ëxû	round towards -¥, i.e. integer such that *x*-1 < *ëxû* £ *x*
çxç	absolute value of *x*
N_{first}	The first slot in the *TG*.
N_{last}	The last slot in the *TG*. N_{last} is either a slot in the same radio frame as N_{first} or a slot in the radio frame immediately following the slot that contains N_{first}.

Unless otherwise is explicitly stated when the symbol is used, the meaning of the following symbols is:

i	TrCH number
j	TFC number
k	Bit number
l	TF number
m	Transport block number
n_i	Radio frame number of TrCH *i*.
p	PhCH number
r	Code block number
I	Number of TrCHs in a CCTrCH.
C_i	Number of code blocks in one TTI of TrCH *i*.
F_i	Number of radio frames in one TTI of TrCH *i*.
M_i	Number of transport blocks in one TTI of TrCH *i*.
$N_{data,j}$	Number of data bits that are available for the CCTrCH in a radio frame with TFC *j*. In downlink $N_{data,j}=P\times(15N_{data1}+15N_{data2})$ and in uplink $N_{data,j}=P\times15\cdot N_{data}$. N_{data1}, N_{data2}, and N_{data} are defined in [2].
$N^{cm}_{data,j}$	Number of data bits that are available for the CCTrCH in a compressed radio frame with TFC *j*.
P	Number of PhCHs used for one CCTrCH.
PL	Puncturing Limit for the uplink. Signalled from higher layers
RM_i	Rate Matching attribute for TrCH *i*. Signalled from higher layers.

Temporary variables, i.e. variables used in several (sub)sections with different meaning.

x, X
y, Y
z, Z

4.2 Transport-channel coding/multiplexing

Data arrives to the coding/multiplexing unit in form of transport block sets once every transmission time interval. The transmission time interval is transport-channel specific from the set {10 ms, 20 ms, 40 ms, 80 ms}.

The following coding/multiplexing steps can be identified:

- Add CRC to each transport block (see section 4.2.1)
- Transport block concatenation and code block segmentation (see section 4.2.2)
- Channel coding (see section 4.2.3)
- Rate matching (see section 4.2.7)
- Insertion of discontinuous transmission (DTX) indication bits (see section 4.2.9)
- Interleaving (two steps, see sections 4.2.4 and 4.2.11)
- Radio frame segmentation (see section 4.2.6)
- Multiplexing of transport channels (see section 4.2.8)
- Physical channel segmentation (see section 4.2.10)
- Mapping to physical channels (see section 4.2.12)

The coding/multiplexing steps for uplink and downlink are shown in figure 1 and figure 2 respectively.

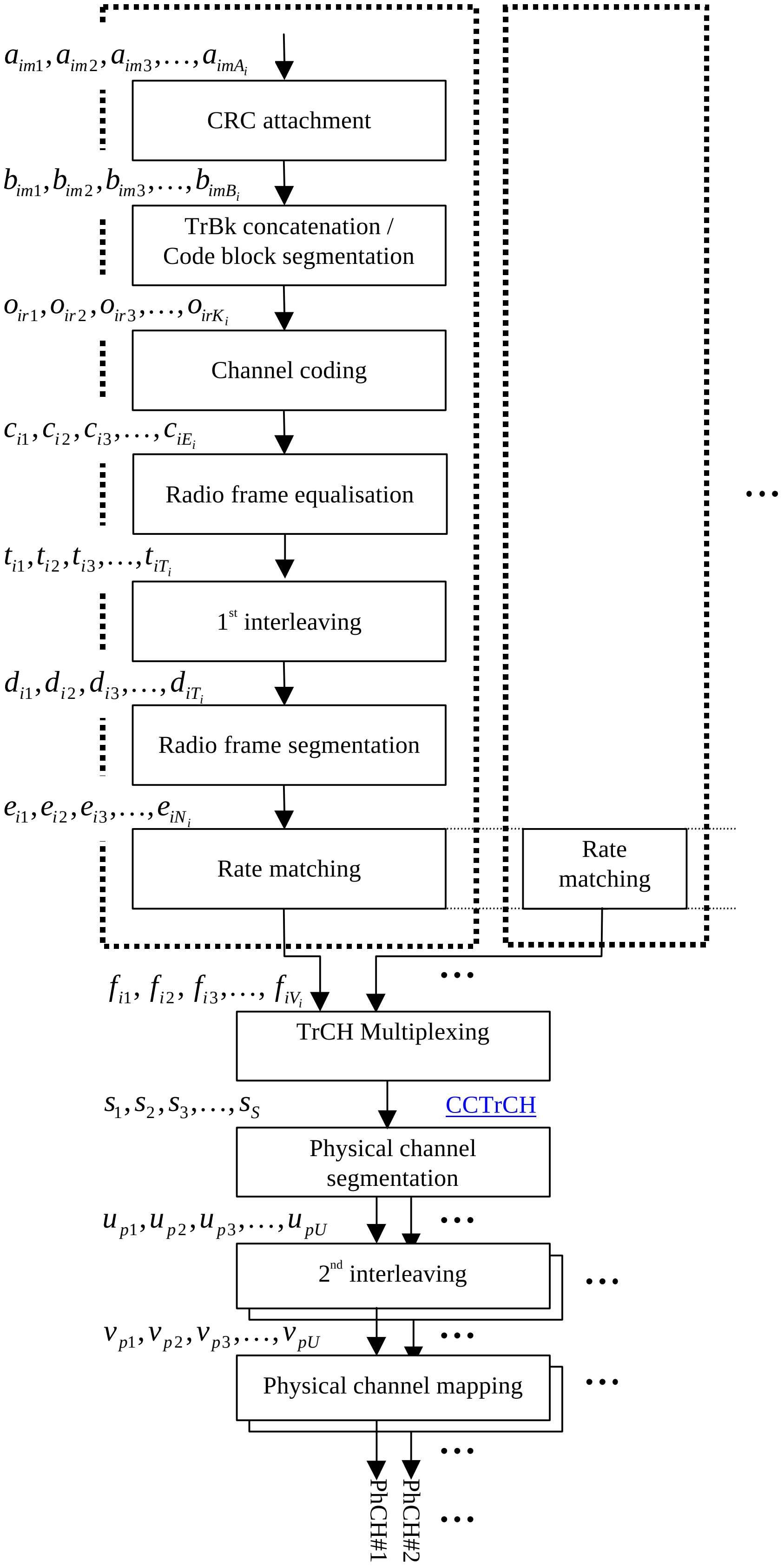

Figure 1: Transport channel multiplexing structure for uplink

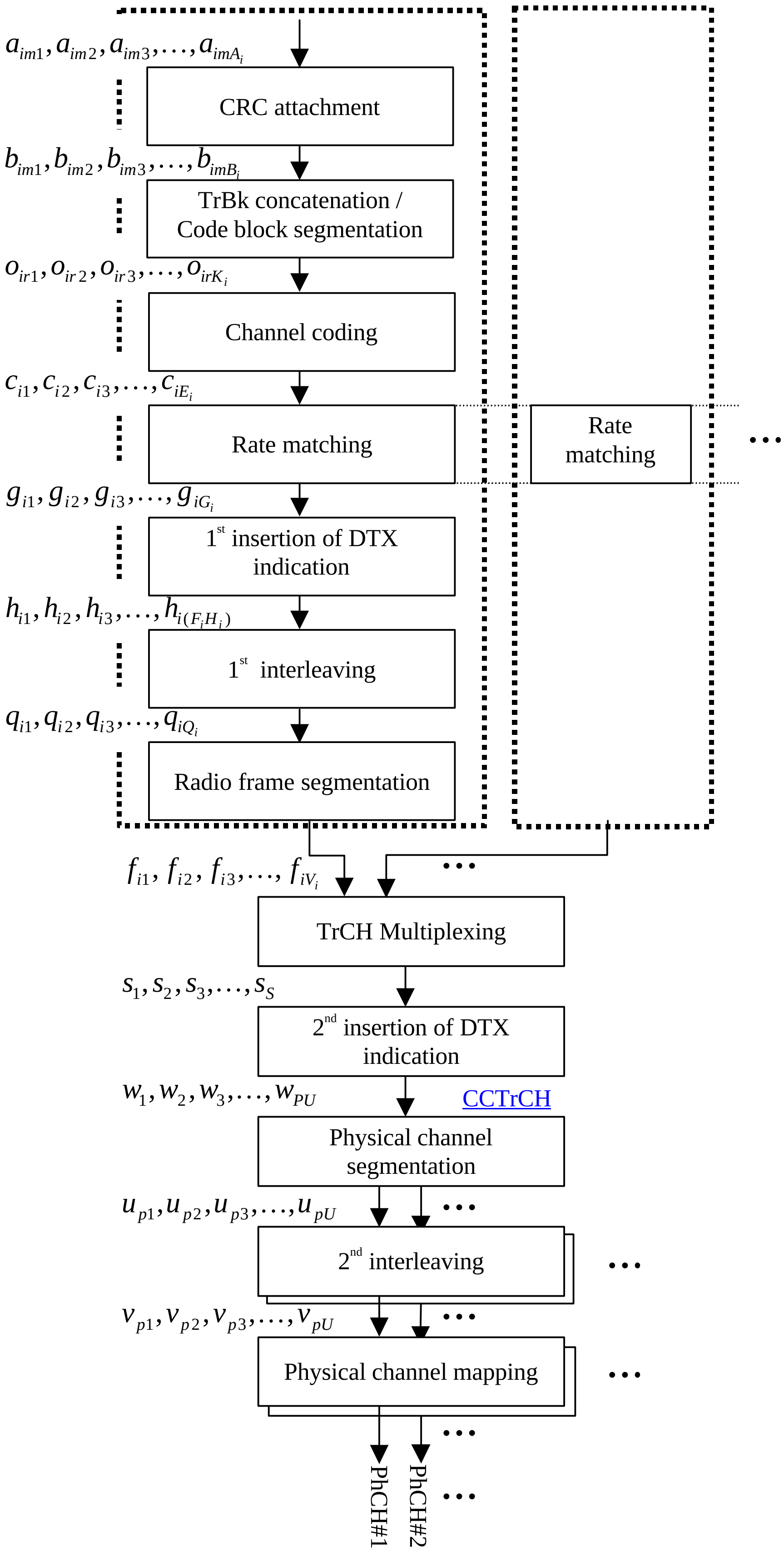

Figure 2: Transport channel multiplexing structure for downlink

The single output data stream from the TrCH multiplexing, including DTX indication bits in downlink, is denoted *Coded Composite Transport Channel (CCTrCH)*. A CCTrCH can be mapped to one or several physical channels.

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. Denote the number of physical channels used for the CCTrCH by P. $N_{data,*}$ is the number of bits available to the CCTrCH in one radio frame and defined as $N_{data,*}=P(15N_{data1}+15N_{data2})$, where N_{data1} and N_{data2} are defined in [2]. Note that contrary to the uplink, the same rate matching patterns are used in normal and compressed mode.

4.2.9.2 2nd insertion of DTX indication bits

The DTX indication bits inserted in this step shall be placed at the end of the radio frame. Note that the DTX will be distributed over all slots after 2nd interleaving.

The bits input to the DTX insertion block are denoted by $s_1, s_2, s_3, \ldots, s_S$,where *S* is the number of bits from TrCH multiplexing. The number of PhCHs is denoted by *P* and the number of bits in one radio frame, including DTX indication bits, for each PhCH by *U*. In normal mode $U = \frac{N_{data,*}}{P} = 15N_{data1} + 15N_{data2}$ The number of available bits on the PhCH is denoted by N_{data} and $N_{data}=15N_{data1}+15N_{data2}$, where N_{data1} and N_{data2} are defined in [25.211]. In normal mode $U=N_{data}$. In compressed mode, additional DTX shall be inserted if the transmission time reduction method does not exactly create a transmission gap of the desired TGL. The number of bits available to the CCTrCH in one radio frame in compressed mode is denoted by $N^{cm}_{data,*}$ and $U = \frac{N^{cm}_{data,*}}{P}$. N_{data} is changed from the value in normal node. The exact value of $N^{cm}_{data,*}$ N_{data} is dependent on the *TGL* and the transmission time reduction method, which are signalled from higher layers. It can be calculated as $N^{cm}_{data,*} = N'_{data,*} - N_{TGL}$, where $N'_{data,*} = P(15N'_{data1} + 15N'_{data2})$. N'_{data1} and N'_{data2} are the number of bits in the data fields of a slot for slot format A or B as defined in [2]. N_{TGL} is Tthe number of bits that are located within the transmission gap is denoted N_{TGL} and defined as:

$$N_{TGL} = \begin{cases} \frac{TGL}{15} N'_{data,*} \quad \frac{TGL}{15} N_{data}, & \text{if } N_{first} + TGL \le 15 \\ \frac{15 - N_{first}}{15} N'_{data,*} \quad \frac{15 - N_{first}}{15} N_{data}, & \text{in first frame if } N_{first} + TGL > 15 \\ \frac{TGL - (15 - N_{first})}{15} N'_{data,*} \quad \frac{TGL - (15 - N_{first})}{15} N_{data}, & \text{in second frame if } N_{first} + TGL > 15 \end{cases}$$

N_{first} and *TGL* are defined in Section 4.4.

In compressed mode $U=N_{data}-N_{TGL}$.

The bits output from the DTX insertion block are denoted by $w_1, w_2, w_3, \ldots, w_{(PU)}$. Note that these bits are threevalued. They are defined by the following relations:

$$w_k = s_k \quad k = 1, 2, 3, \ldots, S$$

$$w_k = d \quad k = S+1, S+2, S+3, \ldots, PU$$

where DTX indication bits are denoted by *d*. Here $s_k \in \{0,1\}$ and $d \notin \{0,1\}$.