RAN WG1 meeting #7bis **TSGR1#7bis(99) g01**

(revision of f31)

Place : **Korea**

Date : **4-5 October 1999**

Title : **Text proposal to TS 25.212 for Implementation of compressed mode in the IL & MUX chain**

Source : **Mitsubishi Electric (MCRD)**

Paper for : **Decision**

Introduction

Up to now the exact implementation of compressed mode was not defined in terms of multiplexing and interleaving. In this paper we propose an implementation for both UL and DL for the DPDCH.

References

[1] TS 25.212 V2.2.0 (1999-09) Multiplexing and channel coding (FDD)

[2] R1-(99)b99 Compressed mode function in multiplexing chain (source Mitsubishi Electric)

[3] R1#7bis-(99)e86 Compressed mode, source Ericsson

[4] R1#7bis-(99)e94 , Text proposal for 25.212 section 4.4 on compressed mode, source Mitsubishi Electric (ITE)

Abbreviations

CM Compressed Mode
DL Downlink
TGPF Transmission Gap Per Frame (number of idle slots per frame)
RM Rate Matching
UL Uplink

New notations in UL

Currently N_{SF} is the number of data bits offered by the physical channel(s) to the CCTrCH for one radio frame in normal mode for spreading factor SF

$$N_{SF} = 15 \cdot \frac{2560}{SF}$$

We denote now by $N_{SF}^{cm,\mathrm{TGPF}}$ the number of data bits offered by the physical channel(s) to the CCTrCH for one radio frame in compressed mode for the spreading factor *SF* and for the compressed mode with transmission gap per frame TGPF.

$$N_{SF}^{cm,\mathrm{TGPF}} = \frac{15 - \mathrm{TGPF}}{15} \cdot N_{SF}$$

<u>One frame compressed mode :</u>
For a one-frame compressed mode we have TGPF = TGL, so, as TGL ranges from 3 to 7 TGPF also ranges from 3 to 7 for a one-frame compressed mode.

<u>Double frame compressed mode :</u>
In the case of a double-frame compressed mode, we have $\mathrm{TGPF}_{\text{first frame}} + \mathrm{TGPF}_{\text{second frame}} = \mathrm{TGL}$.

Moreover, e.g. for TGL = 7, all the combinations 1+6, 2+5, 3+4, 4+3, 5+2 and 6+1 are allowed. So for the double frame compressed mode TGPF is ranging from 1 to 7.

Implementation for UL for DPDCH

In the UL direction, the RM is performed frame by frame. So it is possible to implement the CM with very little modification. Only the definition of SET0 is changed in section 0.

Instead of SET0 being the set of N_{data} for all SF and number of PhCH, SET0 is the set of for all SF and number of PhCH, and for a certain compressed mode format.

This is very similar to the proposal of Ericsson in [3], except that the change begin on SET0 and not on $N_{data,j}$, the SF is not always divided by 2. Also the contribution of Ericsson does not say exactly what happens when the SF is already 4.

In other words the combination of method A and method B is done by the already existing algorithm for selection of $N_{data,j}$ in SET0, only SET0 is changed.

Implementation for UL for DPCCH

This is not covered by this paper.

Implementation of method A for DL

In the DL, $N_{data,*}$ used for the RM parameter determination remains the value in use for normal mode, even if the method B is used. In other words, the RM parameters are still computed as in normal mode. We do so because, contrary to UL the RM is not executed frame by frame, but TTI per TTI. So it is not possible to use the RM function only for the compressed mode.

In consequence we propose the two following changes :

- The “flexible position DTX indication insertion” module is modify, in order to insert fewer DTX, when this is possible.
- A new module, called “compressed mode function” is inserted immediately after the 2nd IL

It is to be noted that, contrary to what is said in our contribution referred [2], we propose that the compressed mode function is immediately after the 2nd IL, and not immediately before. This is possible because we also slightly change the DTX insertion module.

The advantage of placing the compressed mode function immediately after the 2nd IL, is that when the compressed mode function makes a puncturing, it can make a very straight forward block puncturing. Thanks to the ILing effect, we expect that this will spread evenly the puncture bits at the input of the channel decoder. However, we had no time to run simulation, to check whether this works, so we propose this only as a W.A. in order to check by WG1#8 whether this is acceptable or not.

It is to be noted that in the scheme proposed, the fixed position/flexible position mode is not changed according to the compressed/normal mode. So if we are in fixed (resp. flexible) positions of TrCH in normal mode, we remain in fixed (resp. flexible) positions in compressed mode.

It is to be noted that, in case of fixed position TrCH, the compressed mode function acts in a predefined way, not depending on the current TF of TrCH. So BRD scheme is still possible.
However this solution is such that the DTX bits inserted by the “fixed position DTX indication insertion” module are handled as data bits.

method B for DL

The potential use of method B is taken into account by this paper, as the compressed mode function can also make repetition in order to reuse some available bits when the TGPF is shorter than what is made available by the method B alone.

Currently there is not selection criterion to select method B in DL. This is not covered by this document, but by another paper [4].

method A2

We propose to suppress method A2 from [1], and to insert it in the technical report of items for study in future releases.

Conclusion

We propose that the following text proposal be accepted for UL, and taken for W.A. for DL.

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~~1~~2 References

[1] 3GPP RAN TS 25.201: “Physical layer – General Description”

[2] 3GPP RAN TS 25.211: “Transport channels and physical channels (FDD)”

[3] 3GPP RAN TS 25.213: “Spreading and modulation (FDD)”

[4] 3GPP RAN TS 25.214: “Physical layer procedures (FDD)”

[5] 3GPP RAN TS 25.221: “Transport channels and physical channels (TDD)”

[6] 3GPP RAN TS 25.222: “Multiplexing and channel coding (TDD)”

[7] 3GPP RAN TS 25.223: “Spreading and modulation (TDD)”

[8] 3GPP RAN TS 25.224: “Physical layer procedures (TDD)”

[9] 3GPP RAN TS 25.2~~31~~15: “Measurements (FDD)”

[10] 3GPP RAN TS 25.225: “Measurements (TDD)”

~~1~~3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the [following] terms and definitions [given in ... and the following] apply.

<defined term>: <definition>.

example: text used to clarify abstract rules by applying them literally.

~~1.1~~3.2 Symbols

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

<symbol> <Explanation>

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*

Unless otherwise is explicitly stated when the symbol is used, the meaning of the following symbols is:
N_{first} Slot number of the first slot in a transmission gap, where slot are numbered from 0 to 14.

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P Number of PhCHs used for one CCTrCH.
PL Puncturing Limit for the uplink. Signalled from higher layers

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1.13.3 Abbreviations

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

<ACRONYM> <Explanation>

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SNR	Signal to Noise Ratio
TGL	Transmission Gap Length, number of slot in a transmission gap for compressed mode.
TGPF	Transmission Gap Per Frame, definition can be found in section **Error! Reference source not found.**
TF	Transport Format

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14 Multiplexing, channel coding and interleaving

4.1 General

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1.14.2 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:

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- Multiplexing of transport channels (see Section **Error! Reference source not found.**)
- Physical channel segmentation (see Section 4.2.10)
- Mapping to physical channels (see Section 4.2.12)
- Compressed mode function (see Section 4.2.12)

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

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Figure 1: Transport channel multiplexing structure for uplink

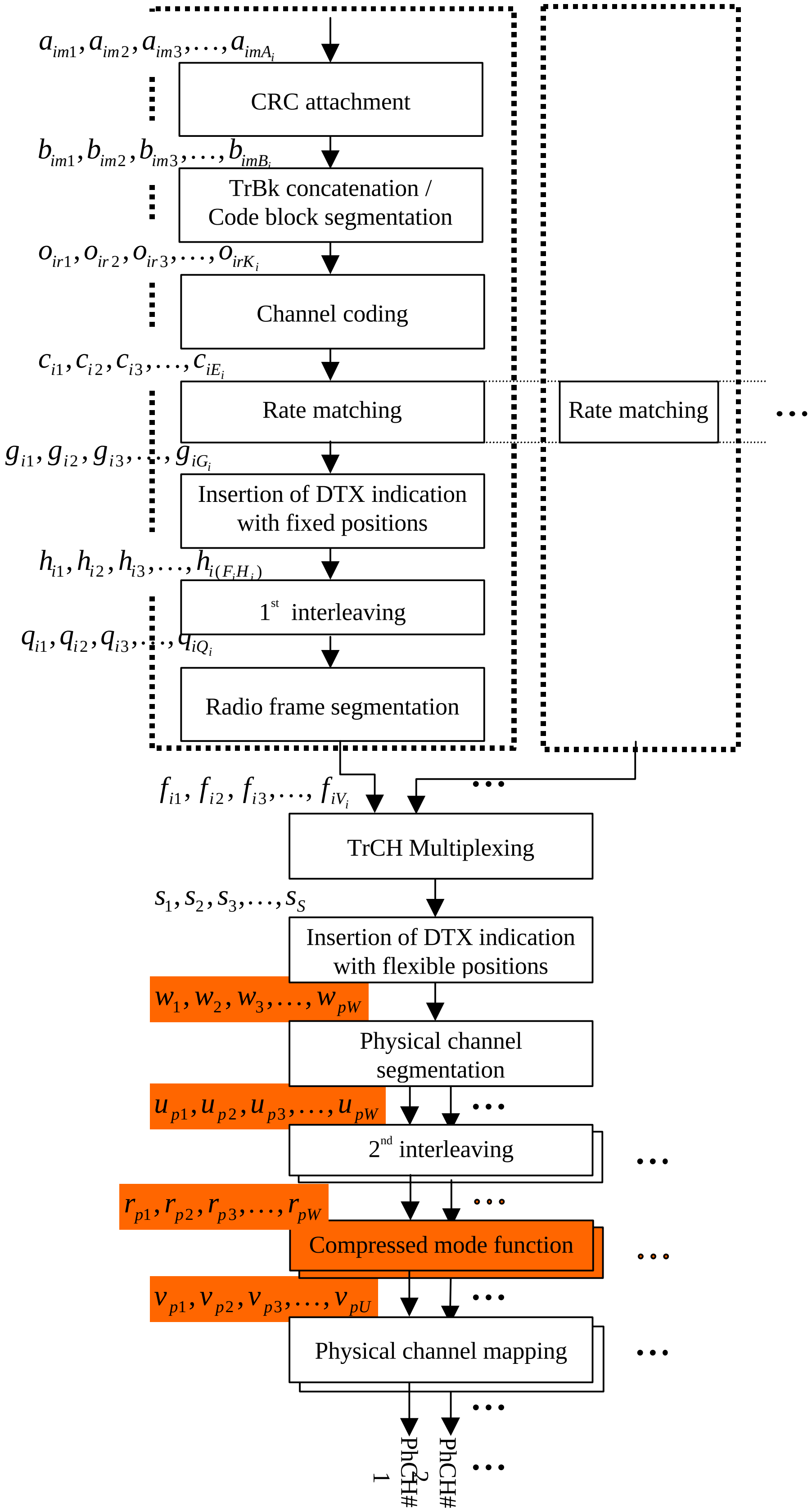

Figure 2: Transport channel multiplexing structure for downlink<Mitsubishi Note : the compressed mode function was added on the figure, I put the new stuff with red background, as the drawing cannot be revision marks, only the text. The change on *w*, *u* and *v* bits is that *U* is replaced by *W*>

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

4.2.1 Available PhCH(s) in uplink direction

For the uplink the number *P* of PhCH, and the number *U* of bits available to the CCTrCH per PhCH are variable from radio frame to radio frame. The selection rule is defined in the section 4.2.7.1 about UL rate matching parameter determination.

4.2.2 Available PhCH(s) in downlink direction

For the downlink the number *P* of PhCH, and the number *U* of bits available to the CCTrCH per PhCH have values that are informed in anticipation to the UE's L1 by the upper layers. These values are :

- two semi-static constants U^{nm} and P^{nm} in normal mode
- two semi-static constants $U^{cm,o}$ and $P^{cm,o}$ in compressed mode with compressed mode format *o*.

The compressed mode format is determined by the :

- the transmission gap per frame in the radio frame in compressed mode,
- whether compressed mode formation method B is used or not,
- the frame format of the compressed mode radio frame, and/or
- the slot formats that are used in the radio frame in compressed mode

The compressed mode format *o* is informed to the UE's L1 by the upper layers in anticipation to the concerned radio frame.

When fixed position of TrCH are used we have $P^{nm} = P^{cm,o}$ whatever the compressed mode format *o*.

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4.2.7 Rate matching

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4.2.7.1 Determination of rate matching parameters in uplink

In uplink puncturing can be used to avoid multicode or to enable the use of a higher spreading factor when this is needed because the UE does not support SF down to 4. The rate matching is also used in the uplink in order to implement the uplink compressed mode. The maximum amount of puncturing that can be applied is signalled from higher layers and denoted by *PL*.

The number of available bits in the radio frames for all possible spreading factors is given ~~in [2]. D~~denoted ~~these values~~ by N_{256}, N_{128}, N_{64}, N_{32}, N_{16}, N_8, and N_4, where the index refers to the spreading factor.

The possible values of N_{data} then are therefore { N_{256}, N_{128}, N_{64}, N_{32}, N_{16}, N_8, N_4, $2N_4$, $3N_4$, $4N_4$, $5N_4$, $6N_4$} for the normal mode.

In compressed mode, we denote by $N_{SF}^{cm,\mathrm{TGPF}}$ the amount of available bits for the CCTrCH in a radio frame of spreading factor *SF* and with compressed mode transmission gap per frame TGPF. The definitions of TGPF, of N_{SF} and of $N_{SF}^{cm,\mathrm{TGPF}}$ in function of N_{SF} are given below :

N_{SF} can be derived straightforwardly from the spreading factor by the relation :

$$N_{SF} = 15 \cdot \frac{2560}{SF}$$

For compressed mode a new parameter TGPF is defined as the number of idle slot in the current radio frame.
We have TGPF defined as follows :

$$\mathrm{TGPF} = \begin{cases} \mathrm{TGL}, & \text{if } N_{first} + \mathrm{TGL} \le 15 \\ 15 - N_{first}, & \text{for the first frame, if } N_{first} + \mathrm{TGL} > 15 \\ \mathrm{TGL} - (15 - N_{first}), & \text{for the second frame, if } N_{first} + \mathrm{TGL} > 15 \end{cases}$$

In the uplink the compressed mode format of a radio frame is defined as the parameter TGPF, and we have the relation :

$$N_{SF}^{cm,\mathrm{TGPF}} = \frac{15 - \mathrm{TGPF}}{15} \cdot N_{SF}$$

The possible values of N_{data} then are therefore { $N_{256}^{cm,\mathrm{TGPF}}$, $N_{128}^{cm,\mathrm{TGPF}}$, $N_{64}^{cm,\mathrm{TGPF}}$, $N_{32}^{cm,\mathrm{TGPF}}$, $N_{16}^{cm,\mathrm{TGPF}}$, $N_{8}^{cm,\mathrm{TGPF}}$, $N_{4}^{cm,\mathrm{TGPF}}$, $2N_{4}^{cm,\mathrm{TGPF}}$, $3N_{4}^{cm,\mathrm{TGPF}}$, $4N_{4}^{cm,\mathrm{TGPF}}$, $5N_{4}^{cm,\mathrm{TGPF}}$, $6N_{4}^{cm,\mathrm{TGPF}}$ } for the compressed mode with transmission gap per frame.

Depending on the UE capabilities, the supported set of N_{data} , denoted SET0, can be a subset of { N_{256}, N_{128}, N_{64}, N_{32}, N_{16}, N_8, N_4, N_2, $N_{4/3}$, N_1, $N_{4/5}$, $N_{4/6}$} in normal mode. In compressed mode with compressed mode frame format *o*, SET0 is a subset of { $N_{256}^{cm,\mathrm{TGPF}}$, $N_{128}^{cm,\mathrm{TGPF}}$, $N_{64}^{cm,\mathrm{TGPF}}$, $N_{32}^{cm,\mathrm{TGPF}}$, $N_{16}^{cm,\mathrm{TGPF}}$, $N_{8}^{cm,\mathrm{TGPF}}$, $N_{4}^{cm,\mathrm{TGPF}}$, $2N_{4}^{cm,\mathrm{TGPF}}$, $3N_{4}^{cm,\mathrm{TGPF}}$, $4N_{4}^{cm,\mathrm{TGPF}}$, $5N_{4}^{cm,\mathrm{TGPF}}$, $6N_{4}^{cm,\mathrm{TGPF}}$ }~~{ N_{256}, N_{128}, N_{64}, N_{32}, N_{16}, N_8, N_4, $2N_4$, $3N_4$, $4N_4$, $5N_4$, $6N_4$}.~~ .

$N_{data,j}$ for the transport format combination *j* is determined by executing the following algorithm:

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

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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.

The rate matching parameters are determined with the $N_{data,*}$ value of normal mode. In compressed mode, even if the value of $N_{data,*}$ is changed, the rate matching parameters are the same as in normal mode.

4.2.7.2.1 Determination of rate matching parameters for fixed positions of TrCHs

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

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

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4.2.9 Insertion of discontinuous transmission (DTX) indication bits

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4.2.9.1 Insertion of DTX indication bits with fixed positions

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4.2.9.2 Insertion of DTX indication bits with flexible positions

Note: Below, it is assumed that all physical channels belonging to the same CCTrCH use the same SF. Hence, for all physical channel *p* we have U_p=U=~~constant.~~

Note : the value of *P* and *U* in downlink are known in advance to be either P^{nm} and U^{nm} in normal mode, or $P^{cm,o}$ and $U^{cm,o}$ in compressed mode with compressed mode format *o*. Refer to section 4.2.2 for more details.

This step of inserting DTX indication bits is used only if the positions of the TrCHs in the radio frame are flexible. The DTX indication bits shall be placed at the end of the radio frame. Note that the DTX will be distributed over all slots after 2nd interleaving.

In the following, $N_{data,*}$ is the number of bits made available by the physical channels to the CCTrCH in normal mode, like in section 4.2.7.2, and this is a semi-static constant for the CCTrCH. *P* is the number of PhCHs, and is also a semi-static constant in DL.

Normal mode ;
In normal mode, we have by definition $P^{nm} \cdot U^{nm} = P^{nm} \cdot W = N_{data,*}$. Moreover we have $S \le N_{data,*}$, so $N_{data,*} - S$ DTX indication bits are to be inserted.

Compressed mode :
$P^{cm,o} \cdot \left\lceil \frac{S}{P^{cm,o}} \right\rceil - S$ DTX indication bits are inserted, so $W = \left\lceil \frac{S}{P^{cm,o}} \right\rceil$. In other words, in compressed mode the flexible position DTX indication insertion equates to a size equalisation.

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

$w_k = s_k$ k = 1, 2, 3, …, S

$w_k = d$ k = S+1, S+2, S+3, …, ~~PU~~$P \times W$

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

Note : the relation above holds even when the TrCH are in fixed positions, because in this case we have $P^{nm} = P^{cm,o} = P$ and $S = P \cdot W = N_{data,*}$,and therefore the above relation equates to no DTX indication bit insertion.

4.2.10 Physical channel segmentation

Note: Below, it is assumed that all physical channels belonging to the same CCTrCH use the same SF. Hence, U_p=U=constant.

When more than one PhCH is used, physical channel segmentation divides the bits among the different PhCHs. The bits input to the physical channel segmentation are denoted by $x_1, x_2, x_3, \ldots, x_X$ $x_1, x_2, x_3, \ldots, x_Y$, where Y X is the number of bits inputted to the physical channel segmentation block. The number of PhCHs is denoted by P. The output bits of the physical channel segmentation are denoted $y_1, y_2, y_3, \ldots, y_{Y_p}$, where Y_p is the number of bits outputted to by the physical channel segmentation block to the PhCH number p.

The bits after physical channel segmentation are denoted $y_{p,1}, y_{p,2}, y_{p,3}, \ldots, y_{p,Y_p}$ $u_{p1}, u_{p2}, u_{p3}, \ldots, u_{pU}$, where p is PhCH number and U Y_p is the number of bits in one radio frame for each PhCH number p.

Note: Below, it is assumed that all physical channels belonging to the same CCTrCH use the same SF. Hence, for all for all PhCH p, i.e. $Y_p = Y = \frac{X}{P}$ $U = \frac{Y}{P}$. The relation between x_k and u_{pk} y_{pk} is given below.

Bits on first PhCH after physical channel segmentation:

$y_{1,k} = x_k$ $u_{1k} = x_k$ k = 1, 2 , …, $Y$$U$

Bits on second PhCH after physical channel segmentation:

$y_{2,k} = x_{(k+W)}$ $u_{2k} = x_{(k+U)}$ k = 1, 2 , …, $Y$$U$

…

Bits on the P^{th} PhCH after physical channel segmentation:

$y_{P,k} = x_{(k+(P-1)W)}$ $u_{Pk} = x_{(k+(P-1)U)}$ k = 1, 2 , …, $U$$Y$

4.2.10.1 Relation between input and output of the physical channel segmentation block in uplink

The bits input to the physical channel segmentation are denoted by $s_1, s_2, s_3, \ldots, s_S$. Hence, $x_k = s_k$ and Y X = S.

The bits outputted by the physical channel segmentation are denoted by $u_{p;k}$ with p ranging from 1 to P and k ranging from 1 to U. Hence Hence, $y_{p,k} = u_{p,k}$ and $Y = U$.

4.2.10.2 Relation between input and output of the physical channel segmentation block in downlink

If fixed positions of the TrCHs in a radio frame are used then the bits input to the physical segmentation are denoted by $s_1, s_2, s_3, \ldots, s_S$. Hence, $x_k = s_k$ and Y X = S = $P{\times}W$.

If flexible positions of the TrCHs in a radio frame are used then the bits input to the physical segmentation are denoted by $w_1, w_2, w_3, \ldots, w_{(PW)}$ $w_1, w_2, w_3, \ldots, w_{(PU)}$. Hence, $x_k = w_k$ and Y X = $PU$$P{\times}W$.

The bits outputted by the physical channel segmentation are denoted by $u_{p;k}$ with p ranging from 1 to P and k ranging from 1 to W. Hence Hence, $y_{p,k} = u_{p,k}$ and $Y = W$.

4.2.11 2nd interleaving

Note : for the uplink direction we take the convention that $W = U$, in order to keep the same description of input bits for both uplink and downlink.
In the downlink, the W is equal to U in fixed positions of TrCH, and is determined as in section 4.2.9.2 in flexible positions of TrCH

The 2nd interleaving is a block interleaver with inter-column permutations. The bits input to the 2nd interleaver are denoted $u_{p1}, u_{p2}, u_{p3}, \ldots, u_{pW}$ $u_{p1}, u_{p2}, u_{p3}, \ldots, u_{pU}$, where p is PhCH number and U is the number of bits in one radio frame for one PhCH..

(1) Set the number of columns $C_2 = 30$. The columns are numbered 0, 1, 2, …, C_2-1 from left to right.

(2) Determine the number of rows R_2 by finding minimum integer R_2 such that
U W £ R_2C_2.

(3) The bits input to the 2nd interleaving are written into the $R_2 \times C_2$ rectangular matrix row by row.

$$\begin{bmatrix} u_{p1} & u_{p2} & u_{p3} & \cdots & u_{p30} \\ u_{p31} & u_{p32} & u_{p33} & \cdots & u_{p60} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ u_{p,((R_2-1)30+1)} & u_{p,((R_2-1)30+2)} & u_{p,((R_2-1)30+3)} & \cdots & u_{p,(R_2 30)} \end{bmatrix}$$

(4) Perform the inter-column permutation based on the pattern $\{P_2(j)\}$ $(j = 0, 1, ..., C_2-1)$ that is shown in Table 1, where $P_2(j)$ is the original column position of the j-th permuted column. After permutation of the columns, the bits are denoted by y_{pk}.

$$\begin{bmatrix} y_{p1} & y_{p,(R_2+1)} & y_{p,(2R_2+1)} & \cdots & y_{p,(29R_2+1)} \\ y_{p2} & y_{p,(R_2+2)} & y_{p,(2R_2+2)} & \cdots & y_{p,(29R_2+2)} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ y_{pR_2} & y_{p,(2R_2)} & y_{p,(3R_2)} & \cdots & y_{p,(30R_2)} \end{bmatrix}$$

(5) The output of the 2nd interleaving is the bit sequence read out column by column from the inter-column permuted $R_2 \times C_2$ matrix. The output is pruned by deleting bits that were not present in the input bit sequence, i.e. bits y_{pk} that corresponds to bits u_{pk} with k>U W are removed from the output. The bits after 2nd interleaving are denoted by $z_{p,1}, z_{p,2}, \ldots, z_{p,W}$ $v_{p1}, v_{p2}, \ldots, v_{pU}$, where v_{p1} $z_{p,1}$ corresponds to the bit y_{pk} with smallest index k after pruning, v_{p2} $z_{p,2}$ to the bit $y_{p,k}$ with second smallest index k after pruning, and so on.

Table 1

Number of column C_2	Inter-column permutation pattern
30	{0, 20, 10, 5, 15, 25, 3, 13, 23, 8, 18, 28, 1, 11, 21, 6, 16, 26, 4, 14, 24, 19, 9, 29, 12, 2, 7, 22, 27, 17}

4.2.11.1 Relation between input and output of the 2nd interleaving in uplink

The bits outputted by the 2nd interleaving are denoted by $v_{p;k}$ with the PhCH number p ranging from 1 to P, and the bit number k ranging from 1 to W. Hence, $z_{p,k} = v_{p,k}$.

4.2.11.2 Relation between input and output of the 2nd interleaving in downlink

The bits outputted by the 2nd interleaving are denoted by $r_{p;k}$ with PhCH number p ranging from 1 to P, and bit number k ranging from 1 to W. Hence, $z_{p,k} = r_{p,k}$.

4.2.12 Compressed mode function

For the PhCH number p, the input bits of the compressed mode function are denoted by $r_{p,1}, r_{p,2}, \ldots, r_{p,W}$, and the output bits are denoted by $v_{p,1}, v_{p,2}, \ldots, v_{p,U}$.

Two cases are to be distinguished :

1st case $U \le W$:

$v_{p,k} = r_{p,k}$ for $k = 1, 2, \ldots, U$

2nd case $U > W$:

$v_{p,k} = r_{p,k}$ for $k = 1, 2, \ldots, W$, and

$v_{p,k} = r_{p,k-U+W}$ for $k = W+1, W+2, \ldots, U$.

Note 1 : In normal mode, $W = U = U^{nm}$, and therefore the input and output bits are identical in values and in number.

Note 2: In compressed mode, The value of U is known in anticipication and is a semi-static constant $U^{cm,o}$ depending on the compressed mode format o.

Note 3: in fixed position of TrCH W is a semi-static constant equal to U^{nm} be it normal or compressed mode. So U being know in anticipation, the compressed mode function is operated in a way predicable to the receiver.

~~4.2.12~~4.2.13 Physical channel mapping

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4.2.13.1 Mapping of TFCI word in Split Mode

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4.4 Coding of compressed mode

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4.4.1 Frame structure types in downlink

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4.4.2 Transmission time reduction method

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4.4.2.1 Method A1: By puncturing, basic case

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1) This figure does not take into account the extra TFCI bits from deleted slots

2) If no TFCI then the TFCI field is blank

Note: Compressed mode with puncturing cannot be used for SF=512 with TFCI

4.4.2.2 Method A2: By puncturing, for services that allow larger delay

Other methods of supporting compressed mode may be considered as options. For example, with services that allows for a larger delay, e.g. data services with interleaving over several frames, multiple frames might be compressed together in order to create a short measurement slot. As an example, for a 2 Mbps service, with interleaving of 5 frames (50 ms), a 5 ms idle slot can be created by puncturing only 10% of 5 frames, as illustrated in Figure 18.

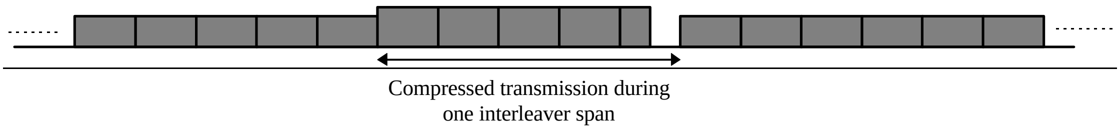

Figure 18: Multi-frame compressed mode for long-delay services

4.4.2.34.4.2.2 Method B: By reducing the spreading factor by 2

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