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Agenda Item: AH21
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Title: Physical channel mapping
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1. Summary

Because the basic operated unit is a sub-frame in 1.28Mcps TDD, a sub-frame segmentation step is needed in the coding/multiplexing steps. As a result, it is needed to add the sub-frame segmentation unit between 2nd interleaving unit and physical channel mapping unit in TS 25.222 for 1.28Mcps TDD.

2. Introduction and comparison with 3.84Mcps TDD

In 1.28Mcps TDD, the 10ms radio frame is subdivided into 2 equal 5ms sub-frames. The bit streams in CCTrCH are mapped onto code channels of time slots in sub-frames. So, in 1.28Mcps TDD, it is needed to add a sub-frame segmentation unit between 2nd interleaving unit and physical channel mapping unit. While in 3.84Mcps TDD, there is no such need.

3. Proposal

It's proposed to discuss and include the following paragraphs into the Working CR for TS25.222 as the description of sub-frame segmentation of the 1.28Mcps TDD.

4.2 Transport channel coding/multiplexing

Figure 1 illustrates the overall concept of transport-channel coding and 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 subclause 4.2.1);

-TrBk concatenation / Code block segmentation (see subclause 4.2.2);

-channel coding (see subclause 4.2.3) ;

-radio frame size equalization (see subclause 4.2.4);

-interleaving (two steps, see subclauses 4.2.5 and 4.2.10);

-radio frame segmentation (see subclause 4.2.6);

-rate matching (see subclause 4.2.7);

-multiplexing of transport channels (see subclause 4.2.8);

-physical channel segmentation (see subclause 4.2.9);

-mapping to physical channels (see subclause 4.2.12).

The coding/multiplexing steps for uplink and downlink are shown in figures 1 and X1.

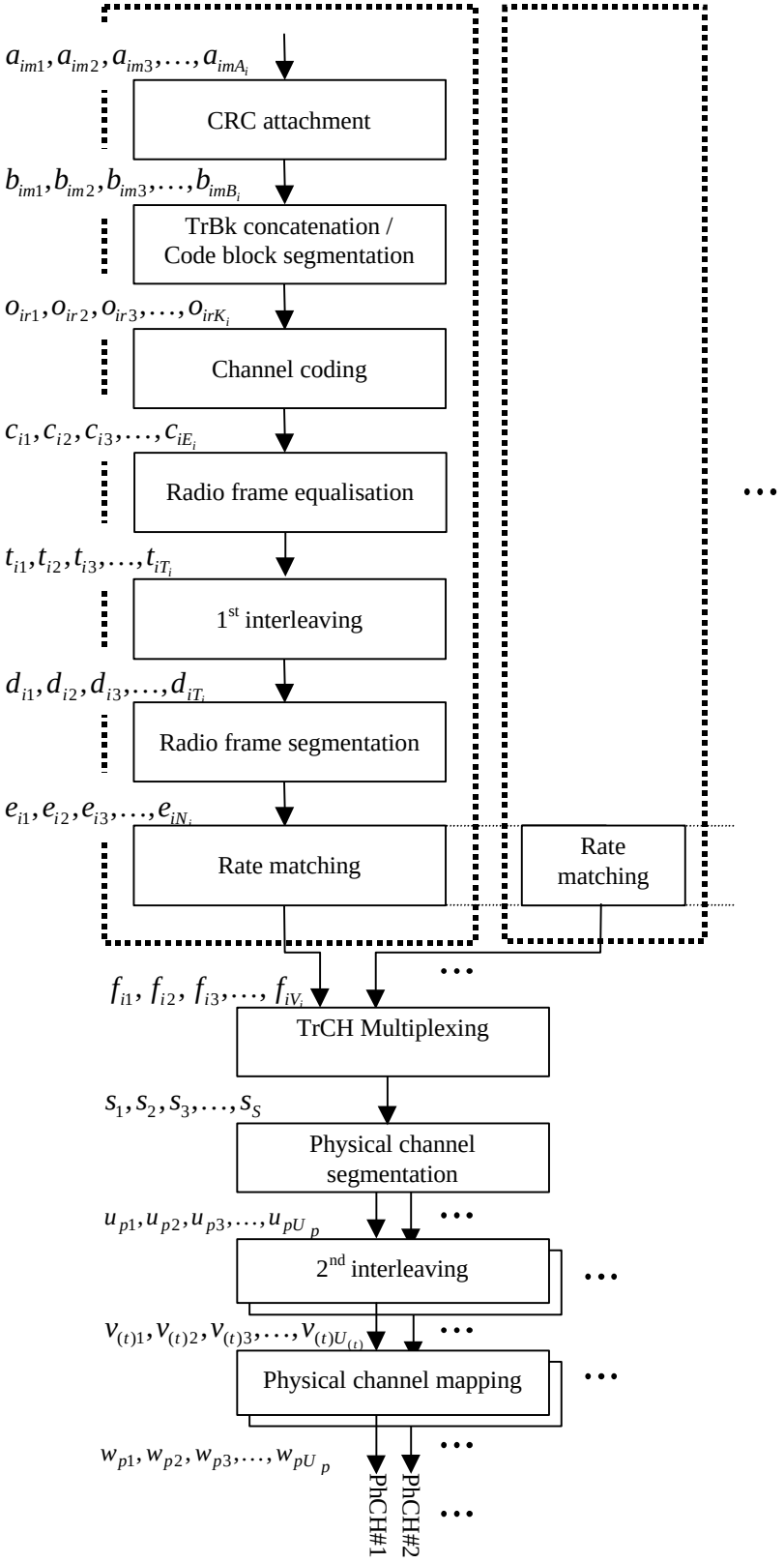

Figure 1: Transport channel multiplexing structure for uplink and downlink for 3.84 Mcps TDD

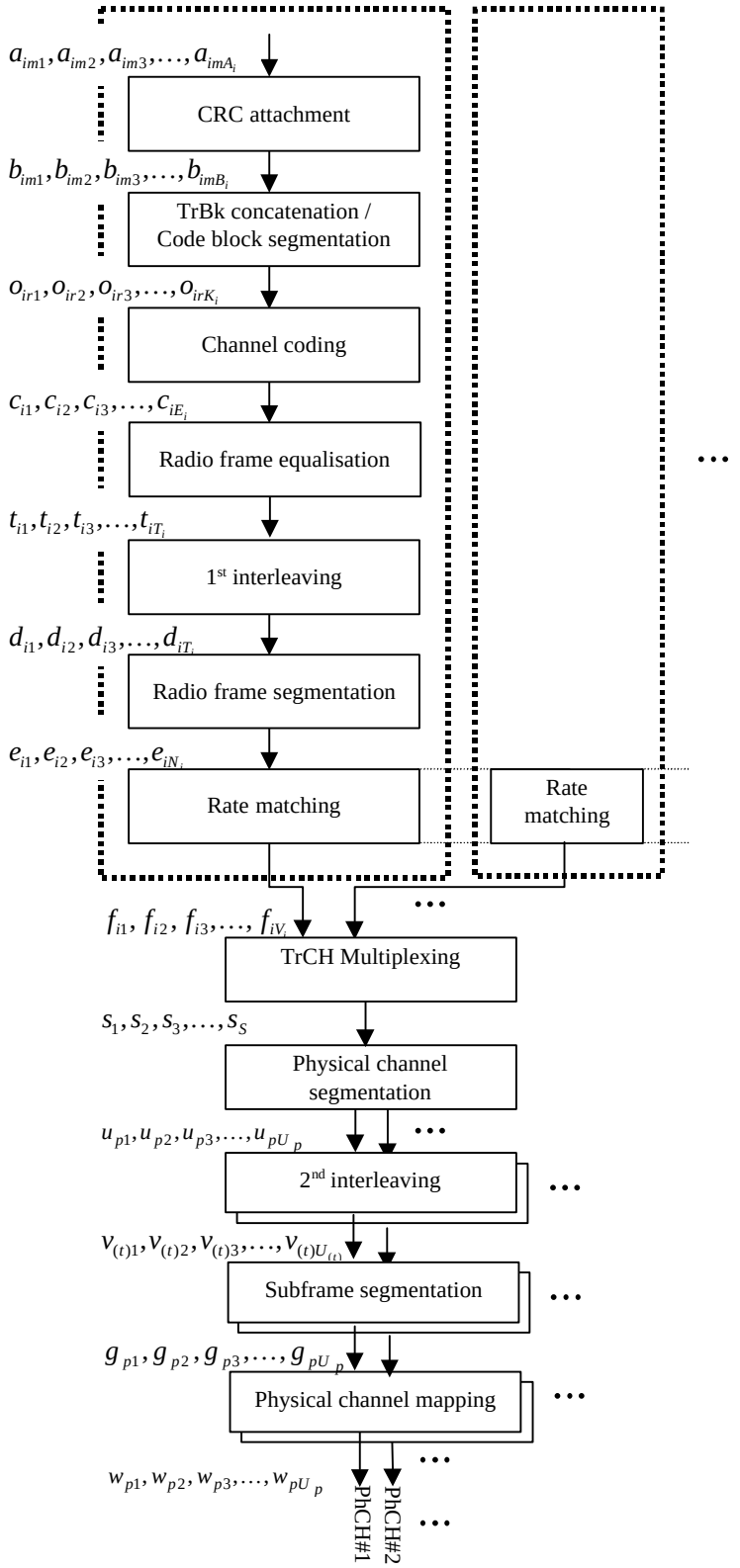

Figure X1: Transport channel multiplexing structure for uplink and downlink of 1.28Mcps TDD

Primarily, transport channels are multiplexed as described above, i.e. into one data stream mapped on one or several physical channels. However, an alternative way of multiplexing services is to use multiple CCTrCHs (Coded Composite Transport Channels), which corresponds to having several parallel multiplexing chains as in figure 1, resulting in several data streams, each mapped to one or

several physical channels.

4.2.11 Sub-frame segmentation for the 1.28 Mcps TDD

In the 1.28Mcps TDD, it is needed to add a sub-frame segmentation unit between 2nd interleaving unit and physical channel mapping unit. The operation of rate-matching guarantees that the bit streams is a even number and can be subdivided into 2 sub-frames. The transport channel multiplexing structure for uplink and downlink is shown in figure X1.

The input bit sequence is denoted by $x_{i1}, x_{i2}, x_{i3}, \ldots, x_{iX_i}$ where i is the TrCH number and Xi is the number bits. The two output bit sequences per radio frame are denoted by $y_{i,n_i1}, y_{i,n_i2}, y_{i,n_i3}, \ldots, y_{i,n_iY_i}$ where ni is the sub-frame number in current radio frame and Yi is the number of bits per radio frame for TrCH i. The output sequences are defined as follows:

$y_{i,n_ik} = x_{i,((n_i-1)\cdot Y_i)+k}$, ni = 1 or 2, k = 1…Yi

where

Yi = (Xi / 2) is the number of bits per sub-frame,

x_{ik} is the kth bit of the input bit sequence and

y_{i,n_ik} is the kth bit of the output bit sequence corresponding to the nth sub-frame

The input bit sequence to the radio frame segmentation is denoted by $v_{(t)1}, v_{(t)2}, \ldots, v_{(t)U_{(t)}}$, xik = v(t)k and Xi = U(t).

The output bit sequence corresponding subframe ni is denoted by $g_{p1}, g_{p2}, \ldots, g_{pU_p}$, where p is the PhCH number and Up is the number of bits in one subframe for the respective PhCH. Hence, $g_{pk} = y_{i,n_ik}$ and Up = Yi.