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Title: **Transmission of TFCI bits for TDD**

Document for: Approval

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1. Introduction

In this document we propose to change the definitions regarding the transmission of the TFCI. Since the TFCI is one of the most important components in the transmission between UE and NodeB, its reliable transmission has to be guaranteed. Therefore we propose to make the allocation of TFCI containing time slots more flexible. With the proposed scheme it is possible to assign the TFCI carrying time slots concerning to the interference situation to guarantee its reliable transmission.

2. Proposal

The reliability of the transmission can be improved if the TFCI is sent in several time slots within one frame which are chosen depending on interference conditions. In the current scheme all data of one CCTrCH within one frame are corrupted if the TFCI is misinterpreted or corrupted due to unfavourable interference conditions. A retransmission would affect all data of this frame. Therefore we propose to define the TFCI transmission in a more flexible manner.

The configuration of the TFCI is supported by means of higher layers for each time slot separately. For this there exists a flag for each allocated timeslot that states, whether a TFCI is sent in this time slot or not. To reduce the required signalling overhead we propose to sent the TFCI always in the first allocated code within the respective timeslot(s).

3. Text proposals

Modifications to **TS 25.221 (see page 2-3)**

Modifications to **TS 25.222 (see page 4)**

4. References

[1] TSG RAN WG1, TS 25.221, ‘Transport channels and physical channels (TDD)’
[2] TSG RAN WG1, TS 25.222, ‘Multiplexing and channel coding (TDD)’

5.2.2.1 Transmission of TFCI

Both burst types 1 and 2 provide the possibility for transmission of TFCI both in up- and downlink.

The transmission of TFCI is negotiated at call setup and can be re-negotiated during the call. For each CCTrCH it is indicated by higher layer signalling, which TFCI format is applied. Additionally for each allocated timeslot it is signalled individually, whether that timeslot carries the TFCI or not. ~~This means, it is indicated whether the TFCI is applied or not and how many bits are to be allocated for this purpose.~~ If a timeslot contains the TFCI, then it is always transmitted in the first physical channel of the respective timeslot, according to the order in the higher layer allocation message.~~applied,~~

The transmission of TFCI is done in the data parts of the traffic burst, this means that TFCI and data bits are subject to the same spreading procedure as depicted in [8]. Hence the midamble structure and length is not changed. The TFCI information is to be transmitted directly adjacent to the midamble, possibly after the TPC. Figure 7 shows the position of the TFCI in a traffic burst, if no TPC is transmitted. Figure 8 shows the position of the TFCI in a traffic burst, if TPC is transmitted.

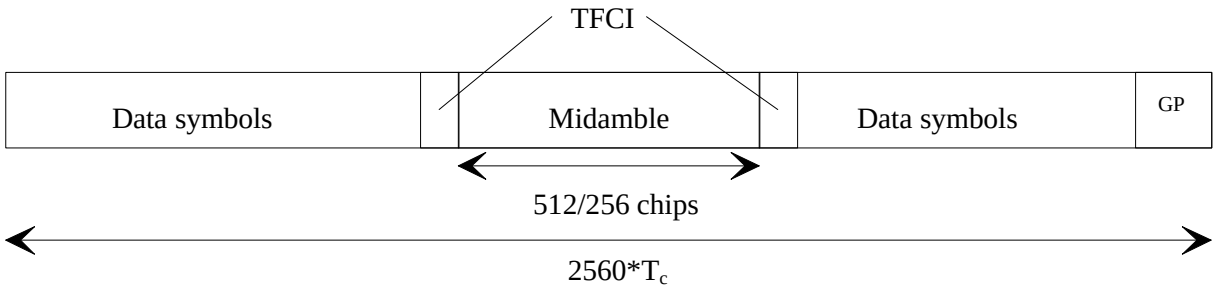

Figure 7: Position of TFCI information in the traffic burst in case of no TPC

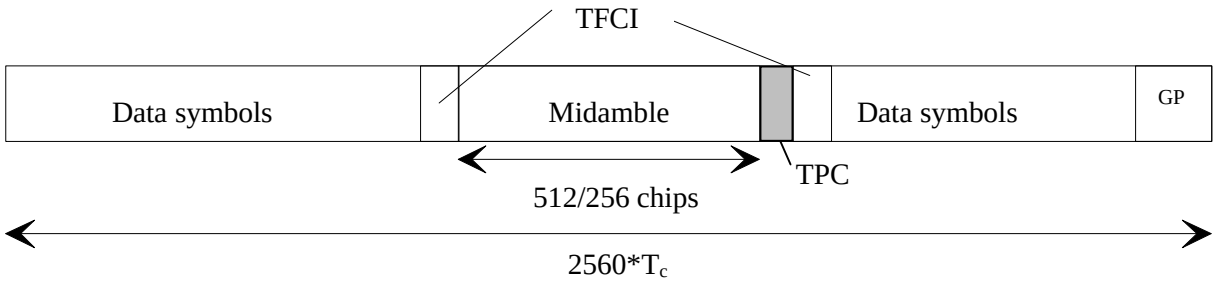

Figure 8: Position of TFCI information in the traffic burst in case of TPC

~~For every user the TFCI information is to be transmitted once per frame. Different numbers of symbols can be allocated for TFCI. The TFCI is spread with the same spreading factor (SF) as the data parts. The SF of the burst which contains the TFCI is applied to both data and signalling and shall be constant, except when a negotiation between transmitter and receiver initiates a change of the SF. Variable Data Rates shall be handled by DTX.~~

Two examples of TFCI transmission in the case of multiple DPCHs used for a connection are given in the figure 9 and figure 10 below. Combinations of the two schemes shown are also applicable. It should be noted that the SF can vary for the DPCHs not carrying TFCI information.

5.2.2.2 Transmission of TPC

Both burst types 1 and 2 for dedicated channels provide the possibility for transmission of TPC in uplink. The transmission of TPC is negotiated at call setup and can be re-negotiated during the call. If applied, transmission of TPC is done in the data parts of the traffic burst. Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after the midamble. Figure 11 shows the position of the TPC in a traffic burst.

For every user the TPC information is to be transmitted once per frame. The timeslot which carries the TPC bits in the frame is signalled by means of higher layers. If the TPC is applied, then it is transmitted always in the first physical channel of the respective timeslot, according to the order in the higher layer allocation message. The TPC is spread with the same spreading factor (SF) as the data parts. ~~TPC and TFCI are always transmitted in the same physical channel.~~

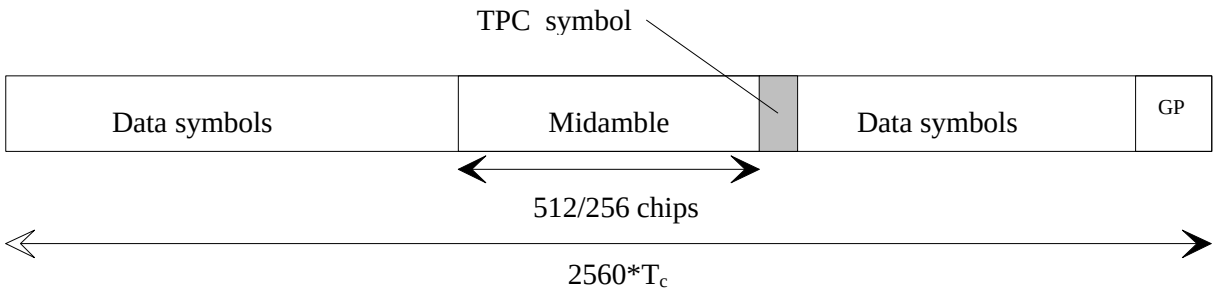

Figure 11: Position of TPC information in the traffic burst

4.3.1 Coding of transport format combination indicator (TFCI)

The number of TFCI bits is variable and is set for each CCTrCH ~~at the beginning of the call~~ via higher layer signalling. Encoding of the TFCI bits depends on the number of them. If there are 6-10 bits of TFCI the channel encoding is done as described in section 4.3.1.1. Also specific coding of less than 6 bits is possible as explained in section 4.3.1.3. For improved TFCI detection reliability TFCI words can be repeated in different timeslots within one frame.~~repetition is used to increase the number of TFCI bits. Additionally, with any TFCI coding scheme it is assumed that i~~In the receiver combining of ~~two successive~~ all redundant TFCI words ~~will~~ shall be performed. This is applicable either for TFCI word repetition within one frame, or if the TFCI word is repeated within one TTI for the case that the shortest transmission time interval of any TrCH is at least 20 ms.