TSG-RAN Working Group 1 meeting#13 **TSGR1(00)0815**

Tokyo, Japan, May 22 ~ 25, 2000

Agenda Item: AH21
Source: CWTS
To: TSG RAN WG1
Title: Transmission of TPC
Document for: Discussion and Approval

Introduction

This document describes transmission of TPC for low chip rate TDD option.

Conclusion

It's proposed to discuss and include the following text proposal into the clause 7.2.2.2.2 Transmission of TPC of TR25.928.

---------- changes to TR25.928 begin ----------

7.2.2.2.2 Transmission of TPC

[Description:]

There is only one burst type for normal time slot in the low chip rate option. It provides the possibility for transmission of L1 control signal "TPC" both in up- and downlink. For every user the TPC information is to be transmitted once per 5ms subframe.

[Rational:]

There is only one burst type for normal time slot in the low chip rate option. It provides the possibility for transmission of TPC both in up- and downlink. The transmission of TPC is negotiated at call setup and can be re-negotiated during the call. For every user the TPC information is to be transmitted once per 5ms subframe. So it gives faster power control function in the low chip rate option than it does in high chip rate option. If applied, transmission of TPC is done in the data parts of the traffic burst and it can be transmitted using the first allocated channelisation code and the first allocated timeslot, according to the order in the higher layer allocation message. The TPC is spread with the same spreading factor (SF) and spreading code as the data parts of the respective physical channel. Other allocations (more than one TPC transmission in one sub-frame) of TPC is also possible.

Each of the power control symbols of the UL will be responsible for the DL and vice versa.

The following is an example of downlink power control :
In case a UE has e.g. more than one or a bigger UL RU. The power control commands for each DL time slots (all RU on that time slots have the same power control command) will be distributed to the following rules,)

1. The order of the served DL time slots will be form the first to the last DL time slot occupied by user in the frame.
2. The order of the serving power control symbols is according to the following rules:
   a) first to last UL time slot
   b) small to big spreading code number within a time slot
   c) first to last PC symbol transmitted on the RU.

3. The first serving UL power control symbols belong to the first served DL times slot in absolute system frame number (SFN) 0.
4. In case the services is established or changed in a frame with a frame number being unequal to 0 the order is as if this configuration had been started in absolute frame number 0.

In order to achieve rule number 4, the following equation is used to determine the DL time slot controlled by the first PC symbol:

$$UL_{pos} = (SFN \cdot N_{PCsymbols}) \bmod (N_{DLslot})$$

where SFN is the system frame number, $N_{PCsymbols}$ the number of PC symbols in a frame and N_{DLslot} the number of DL slots in a frame.

Table 1 Two Examples of UL PC command distribution with $N_{DLslotos}$=3

Case 1: $N_{PCsymbols}$=2; Case 2: $N_{PCsymbols}$=4

System Frame Number	Case 1 (2 UL PC symbols)		The order of the served DL time slot (DL time slot number)	Case 2 (4 UL PC symbols)	
	The order of UL PC symbols			The order of UL PC symbols	
SFN=0	(UL_{pos}=0)	0	0 (TS3)	0	(UL_{pos}=0)
		1	1 (TS4)	1	
			2 (TS5)	2	
			3 (TS3)	3	
SFN=1	(UL_{pos}=2)	0	0 (TS3)	0	(UL_{pos}=1)
		1	1 (TS4)	1	
			2 (TS5)	2	
			3 (TS3)	3	
			4 (TS4)		
SFN=2	(UL_{pos}=1)	0	0 (TS3)	0	(UL_{pos}=2)
		1	1 (TS4)	1	
			2 (TS5)	2	
			3 (TS3)	3	
			4 (TS4)		
			5 (TS5)		
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For the UL power control the situation is vice versa.

The TPC of multiple CCTRCH is under considering.

Hence the midamble structure and length is not changed. The TPC information is to be transmitted directly after ~~the midamble~~SS. Figure 1 shows the position of the TPC in a traffic burst.

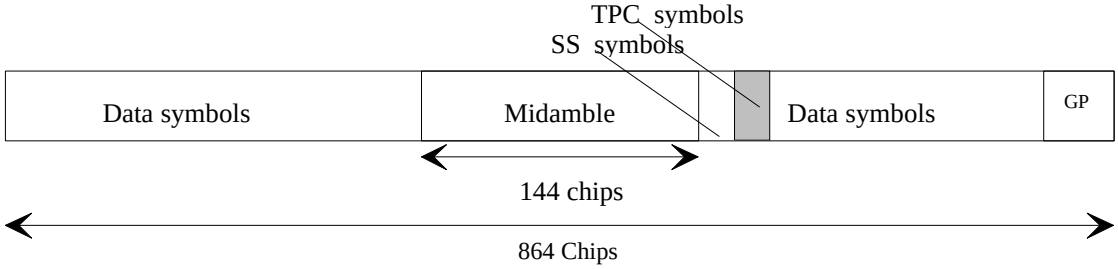

Figure 1: Position of TPC information in the traffic burst

For the number of layer 1 symbols there are 3 possibilities configurable for each channelisation code during the call setup:

- one SS and TPC symbol
- no SS and TPC symbols
- 16/SF SS and 16/SF TPC symbols

[Explanation difference:]

In high chip rate option, both burst types 1 and 2 provide the possibility for transmission of TPC only in uplink.

While in the low chip rate option, there is only one burst type for normal time slot. For the number of layer 1 symbols there are 3 possibilities configurable for each channelisation code during the call setup. It provides the possibility for transmission of TPC both in up- and downlink. For every user the TPC information is to be transmitted once per 5ms subframe. So it gives faster power control functionality in the low chip rate option than it does in high chip rate option. This is advantageous, because

1. Due to the lower chip rate there is less frequency diversity which can be compensated with faster control algorithms.
2. The smart antenna feature increases the demand on the speed of the control algorithms, because the smart antenna algorithms tend to focus on one DOA which has more Rayleigh fading than all DOAs received at a single antenna.

---------- changes to TR25.928 end ----------