TSG-RAN Working Group1 meeting #8 ***TSGR1#8*** *(99)e56*
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Agenda Item: **Ad Hoc 9**

Source: **Panasonic**

Title: **Pre-Wake up Power Control (PWPC) for Compressed Mode (One Simulation Result)**

Document for: **Discussion**

Introduction

The basic idea is the following: the UE records the ratio of received power of PDCH to that of a common control channel just before the transmission gap, just before transmission on the downlink is resumed the UE measures the received power of the common control channel and deducts the SIR at which the PDCH would be received if it was transmitted on the downlink. Based on this information it starts transmission on the uplink a slot earlier than normal and sends only pilot and TPC information in the first slot. This helps the downlink to converge faster.

Description of Pre-Wake up Power Control (PWPC) for Compressed Mode

The condition which I used are follows:
1)Common pilot will be accommodated.
2)There are 15 slots in 1 frame.
3)When compressed mode, data will be compressed in 7 slots from 15 slots.

There are three figures. Figure 1 is the scheme of the conventional method.
Figure 2 is the proposed scheme (PWPC) when uplink is also compressed mode and Figure 3 is PWPC when uplink is not compressed mode.
In these figures, "N" are slots in normal frame, "C" are compressed slots in compressed frame, "R" are slots in recovery frame, "P" is the extra slot and hatched boxes are idle slots in compressed frame.
Figure 1 shows an example of the conventional scheme on compressed mode. This example shows that when the recovery frame start, downlink signal is too small and uplink is too large. In this case, too bad quality for downlink and too many interference for the other uplink may occur.
Figure 2 shows PWPC with uplink compressed mode. This scheme has extra uplink which is indicated as "P" with gray colored box. When the last downlink transmission, UE calculates the power ratio of dedicated signal and common pilot signal (RDC). UE multiplies the value when it calculates SIR on the end of idle slot. The result of that indicates SIR of dedicated channel with previous power control. UE makes TPC by the value. UE transmits uplink signal before recovering frame. This signal have to have no information except TPC. Therefore, only DPCCH should be transmitted. Sice there is no DPDCH, transmission power of DPCCH can be higher. From that reason, first TPC in uplink is very accurate even if uplink power control is not done for a while. This extra transmission can be used to make TPC in the first downlink signal. For conventional method, the first TPC in downlink has no meaning, but this method can realize the effectiveness of that. This method can reduce the convergent time for 1 slot. It leads that data slots doesn't include the very bad quality slot of the first re-transmission. It also reduces the interference for the other users by the first re-transmission.
Figure 3 shows PWPC with no uplink compressed mode. Mechanism of the method is the same as the figure 2. However, the last slot before recovery period has DPDCH. Therefore, DPCCH cannot be power up. It is enough to improve the converging speed.

Advantages

1)These methods are easy to introduce with every compressed mode power control method.
2)It saves interference for the other users and also improves the BER performance of own signal.
3)Pilot symbol in this extra slot can be used for data demodulation of following slots and improve the quality.

Simulation Results

We have tried to simulate the effect of PWPC with uplink compressed mode. Here is the only one result in table 1 and Table 2.
Table 1 shows that PWPC improves both Es/No and BER for all slots. Es is symbol energy. We are continuing the simulations with many parameters and will show them later. This results show that PWPC can improve the performance of BER with all slots.

Table 2 shows that PWPC also improves both Es/No and BER for recovery period.

Table 1 Es/No-BER performance of PWPC for all slots

Maximum Doppler freq.	BER,Es/No	Conventional		PWPC	
		Downlink	Uplink	Downlink	Uplink
185Hz	BER with FEC	1.26e-3	2.41e-3	1.31e-3	2.24e-3
	Es/No [dB]	9.95	5.96	9.93	5.97
74Hz	BER with FEC	2.49e-3	3.94e-3	1.86e-3	3.93e-3
	Es/No [dB]	7.76	5.09	7.76	5.10
37Hz	BER with FEC	1.50e-3	1.56e-3	1.36e-3	1.02e-3
	Es/No [dB]	7.05	5.50	7.04	5.50
18.5Hz	BER with FEC	2.34e-3	3.55e-3	2.22e-3	3.40e-3
	Es/No [dB]	5.59	4.34	5.57	4.36
5.55Hz	BER with FEC	8.00e-4	1.51e-3	4.57e-4	1.35e-3
	Es/No [dB]	4.39	4.07	4.41	4.10

Table 2 Es/No-BER performance of PWPC for only recovery period

Maximum Doppler freq.	BER,Es/No	Conventional		PWPC	
		Downlink	Uplink	Downlink	Uplink
185Hz	BER with FEC	1.03e-3	3.07e-3	9.08e-4	2.27e-3
	Es/No [dB]	9.94	6.02	9.92	6.07
74Hz	BER with FEC	3.89e-3	3.72e-3	2.30e-3	3.69e-3
	Es/No [dB]	7.97	5.21	7.94	5.27
37Hz	BER with FEC	4.62e-3	3.72e-3	4.17e-3	1.77e-3
	Es/No [dB]	7.53	5.62	7.45	5.62
18.5Hz	BER with FEC	5.51e-3	7.13e-3	4.48e-3	5.42e-3
	Es/No [dB]	5.94	4.43	5.84	4.49
5.55Hz	BER with FEC	1.53e-3	2.44e-3	9.72e-4	1.44e-3
	Es/No [dB]	4.44	4.12	4.42	4.23

Conclusion

PWPC can help fast convergence and leads less interference for the other users and improvement of the BER performance of own signal. We confirmed the effect by simulation.

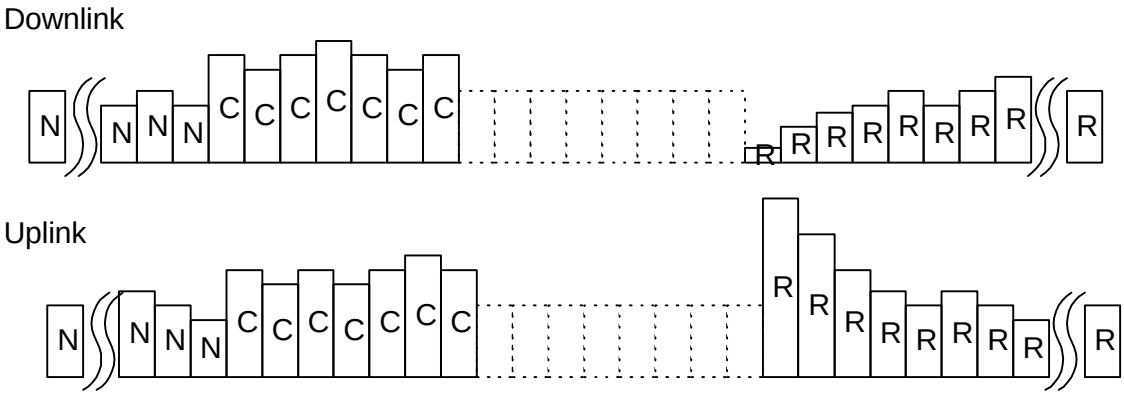

Figure 1 CONVENTIONAL SCHEME

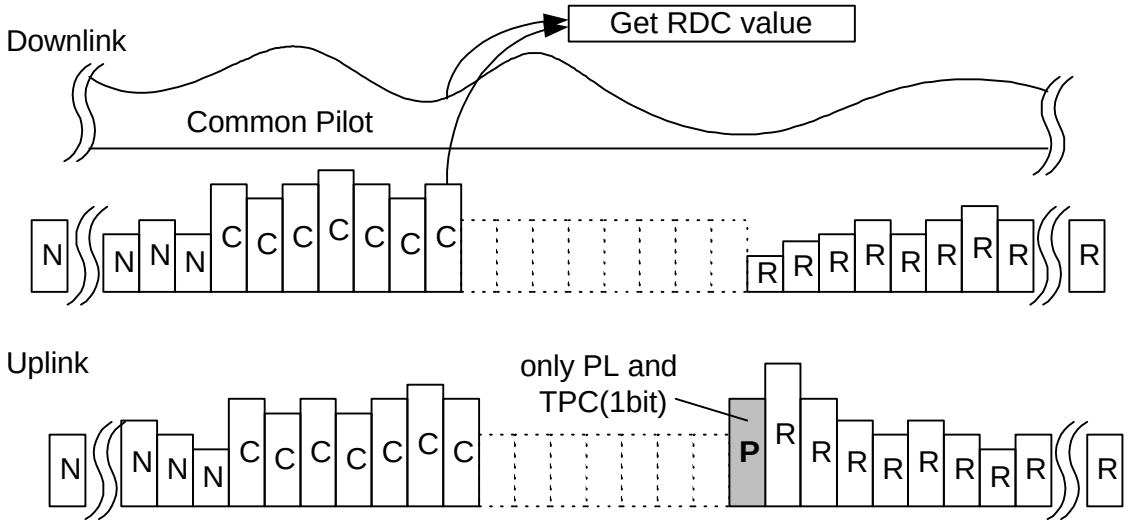

Figure 2 SCHEME OF PWPC WITH UPLINK COMPRESSED MODE

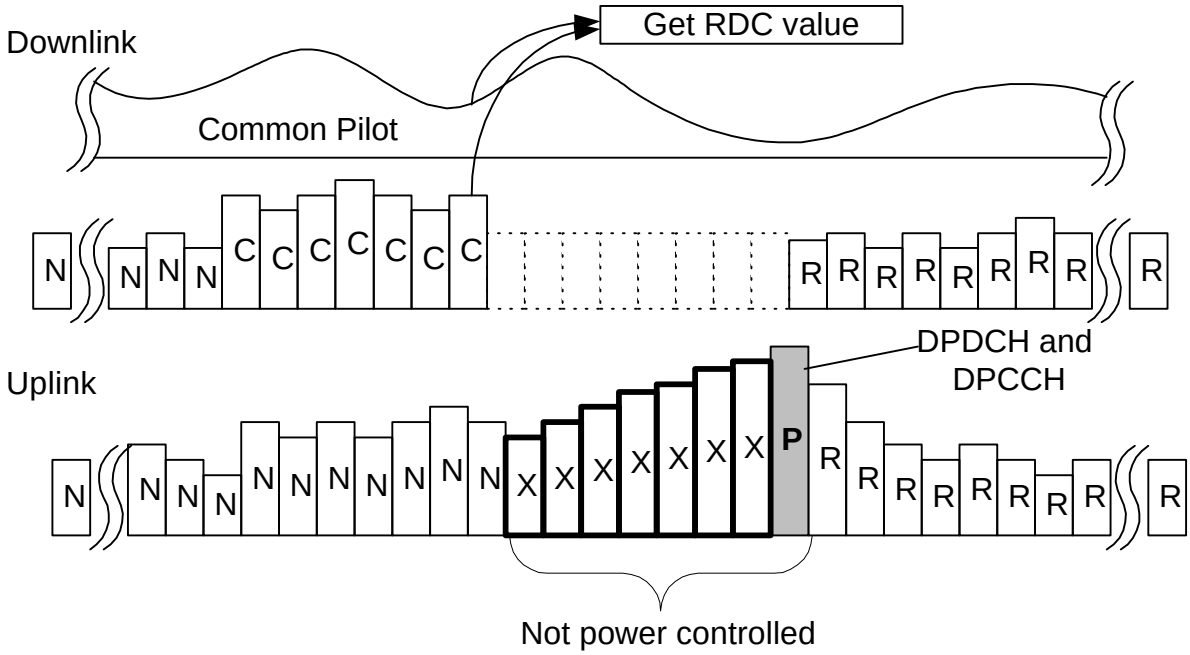

Figure 3 SCHEME OF PWPC WITHOUT UPLINK COMPRESSED MODE