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## 1. Introduction

In numerous contributions, we investigated the system level performance of E-DCH HARQ. Due to fast power control, the received *SIR* of a failed transmission will in most of the cases be only slightly smaller than the target *SIR*. It was therefore proposed to use a reduced retransmission power to reduce interference, UE power consumption and decrease the probability of UE power limitations of retransmissions. For the same average cell load throughput gains between 10 - 20% have been shown.

In this paper we investigate the system performance for varying target BLERs of the initial transmission (Vehicular A channel at 30 km/h). We show the average cell throughput and also look on the performance of the Qualcomm "nominal mode". It can be seen that if we use power adaptation of HARQ retransmissions, we obtain a good performance and a low delay. Compared to the "nominal mode" the performance is similar with less delay.

## 2. HARQ Performance

We show system-level performance of E-DCH for an average noise rise of about 4.7 dB and a varying BLER of the initial transmission. We use a full buffer scenario with 10 ms TTI, Chase combining and Veh. A channel at 30 km/h. Further details on the simulation assumptions are similar as described in [2].

Fig. 1 displays the average cell throughput versus the BLER of the initial transmission for a system without and with power adaptation of the HARQ retransmissions. Comparing the system with HARQ retransmission power reduction for a BLER of 20% we see a gain of the retransmission power reduction scheme of more than 10% (max C/I scheduler).

Compared to the "nominal mode" operation point the performance in terms of average throughput and overall power consumption is similar or slightly better.

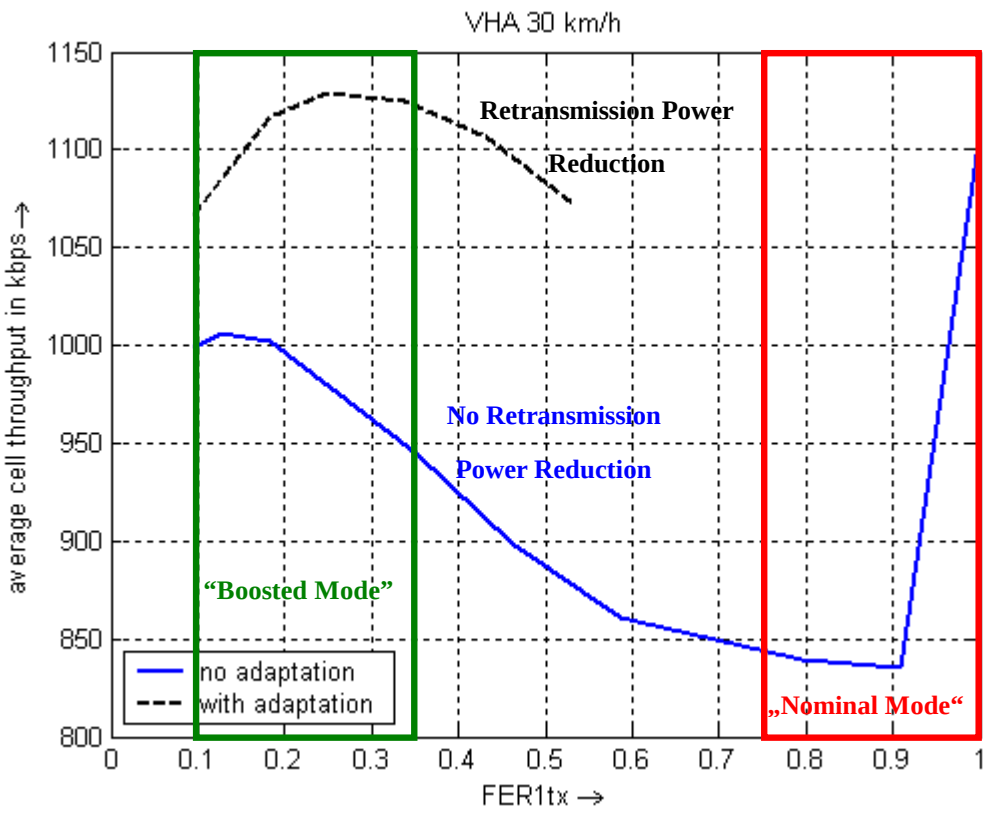


*Fig. 1: Average cell throughput for HARQ with and without power adaptation of retransmissions*

## 3. Conclusion

The advantages of retransmission power reduction are the reduced interference, low UE power consumption and an decreased probability of UE power limitations during retransmissions for services restricted to low delay (initial BLER 10% to 30%). However also compared to the "nominal mode" the achievable average cell throughput for the retransmission power reduction scheme is similar.

Compared to operating at initial BLERs of 10% - 30% in "nominal mode" to transmit a packet successfully (initial BLER > 75%) mostly two physical layer transmissions are needed. This demands for an increased amount of processing resources. If the first transmission BLER is high and the single user throughput is kept the same the peak data rate has to be increased and therefore more hardware and/or software resources in the network and the UE are needed. On the other hand, if single user throughput is allowed to decrease and the system throughput is increased by allowing more users in the cell this also requires more hardware and/or software resources in the network side and higher power consumption in the UE for repeated signal processing for retransmissions. As stated in [4] an operation point of 50-60% initial BLER requires that the base-band buffers and amount of processing resources are doubled compared to the BLER 10% operation point.

Concluding in order to have the full flexibility on optimising the achievable cell throughput for delay sensitive as well as for non delay sensitive services (e.g. background services) we propose to allow to have the full control over the power setting of initial transmission and retransmissions [3].

## 4. References


[1] R1-040446, Siemens, "Performance of the HARQ Retransmission Power Offset Scheme for 10ms TTI," Montreal, Canada, May, 2004

[2] R-041190, Siemens, "E-DCH HARQ with Power Offset," Seoul, South Korea, September, 2004

[3] R1-041356, Siemens, "TP on De-boosting of Retransmissions", Japan, November, 2004

[4] R1-040392, TR 25.896 v2.0.0 "Feasibility Study for Enhanced Uplink for UTRA FDD (Release 6)"