TSG-RAN WG1 meeting #15 ***R1-001035***
Berlin, Germany
August 22nd – 25th, 2000

Agenda item: Release 2000 issues
Source: GBT
Title: Advantages and disadvantages of CLPC-FACH
Document for: Discussion (RAN WG1)

Background

There are three issues that should be highlighted in discussing "improvement of the Cell-FACH state" as proposed by GBT. The main advantage of introduction of CLPC in the FACH operation is dramatic improvement in downlink capacity specifically in the indoor environment and in light of imperfections in the operation of the DL Open Loop power control. This is particularly true at the FER of .05-.1. At higher FER values, the gain narrows. The disadvantage of introducing CLPC on FACH is the increase in delay in case of packet re-transmissions. In this contribution, we address the three components of such a high level analysis.

Discussion on advantages and disadvantages of CLPC-FACH

1. OLPC-FACH versus CLPC-FACH Link level Simulation results

We have shown a 2 dB gain in 5Hz fading environment and FER of .05 in comparing CLPC-FACH to a perfect OLPC-FACH (Tdoc R1-00-1034). We have also analyzed the system-wide gain in Tdoc R1-00-0917. The 2 dB gain in transmit Eb/I0 requirement translates into a 2 dB gain in forward link packet data capacity. Note that at higher FER values, the gain narrows. We have also shown that the perfect OLPC outperforms the CLPC-FACH operation at higher fading rates. Also note that we have assumed perfect open loop power control in our simulations. This issue is taken up in the next section.

2. Open Loop Power Control measurement inaccuracy and measurement period

Reference [1] section 8.1.2

A. CPICH RSCP measurement is for DL open loop power control, UL open loop power control, handover evaluation, path loss evaluation.

B. Intra frequency measurement accuracy: The measurement period for the Cell-DCH state is [150] ms and Cell-FACH is [600 ms.]

C. The absolute accuracy requirement: CPICH RSCP: one code power after de-spreading Normal condition: (+- 6 dB), Extreme Condition: (+-9 dB)

As can be seen, there can be a maximum delay of 600 ms in reporting the measurement to the RNC. In that case, the DL Open Loop estimate could potentially be off by a significant amount. Additionally the measurement could be off by 6 dB due to UE measurement inaccuracy. This means that the transmission on FACH using open loop power control method might deteriorate to a broadcast transmission to the cell-edge.

3. Delay issues:

Delay issues were discussed in R1-00-1033. We analyzed Nokia's contribution on the subject and agreed that there is a slight delay penalty associated with introduction of scheduled FACH transmission and re-transmission. Specifically, we showed that there is 35% increase in delay in comparing re-transmission via OLPC-FACH and CLPC-FACH. Basically, there is a trade-off between delay, required transmit Eb/No and capacity.

Conclusion

The capacity gain that is achieved by introducing CLPC on FACH is significant in the downlink direction. The disadvantage is a slight increase in delay in case of packet re-transmissions. While the level of gain is sensitive to the operating environment, FER operating point and the OLPC implementation error, we can safely conclude from the L1 perspective that "Introduction of CLPC on FACH provides a considerable capacity gain at the FER operating point of .05 and indoor environment". At higher FER levels and other operating environments, the level of the overall gain will be OLPC implementation error dependent.

[1] 3G TS 25.133 V3.2.0 (2000-06)