

16m DL ACK Channel Design

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IEEE 802.16m-08/053r1, “Call for Comments and Contributions on Project 802.16m Amendment Working Document”

Target topic: “11.7 DL PHY control structure, especially mapping”.

Base Contribution:

None

Purpose:

To be discussed and adopted by TGm for use in stage 3 document development

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Outline

- Requirement for ACK Channel
- Design Approach
- DL ACK Channel Design
- Simulation Results
- Conclusions and Proposed Text
- Appendix

Requirement for ACK Channel

- Link Performance
 - ACK to NAK : 1%
 - NAK to ACK : 0.1%
- Derived from SDD
 - USCCH is multiplexed with data in FDM-fashion
 - Both power boosting and repetition can be used for improving link performance
 - Tone-pair permuted resource would be used
 - SFBC is good for MMO transmission
 - Channel estimation should be based on common pilot

Design Approach

- Design Criteria

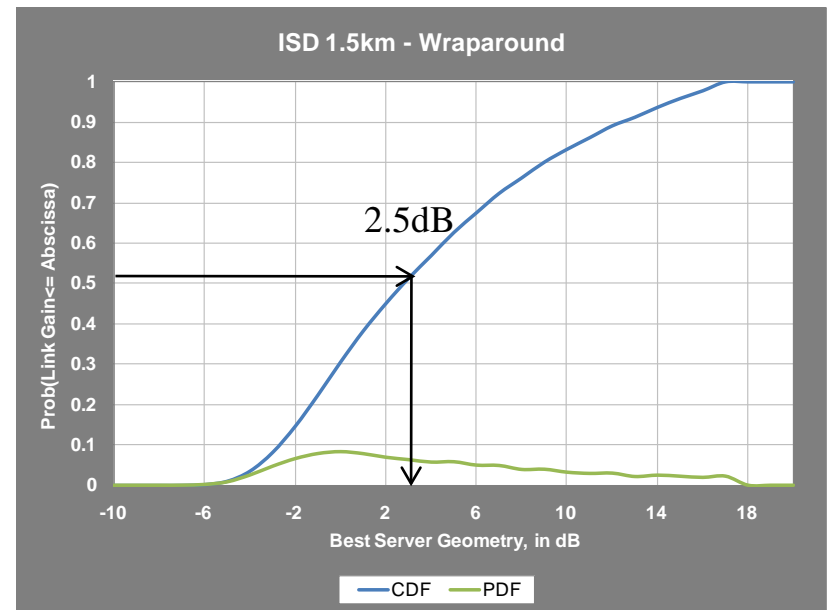
- Physical overhead should be minimized
- Link performance should be satisfied even with channel estimation impairment

- Reference SNR

- Required received SNR in which user of 0.5 CDF point can satisfy the requirement without power boosting
- For example, SNR 2.5dB is reference SNR in 1.5km ISD

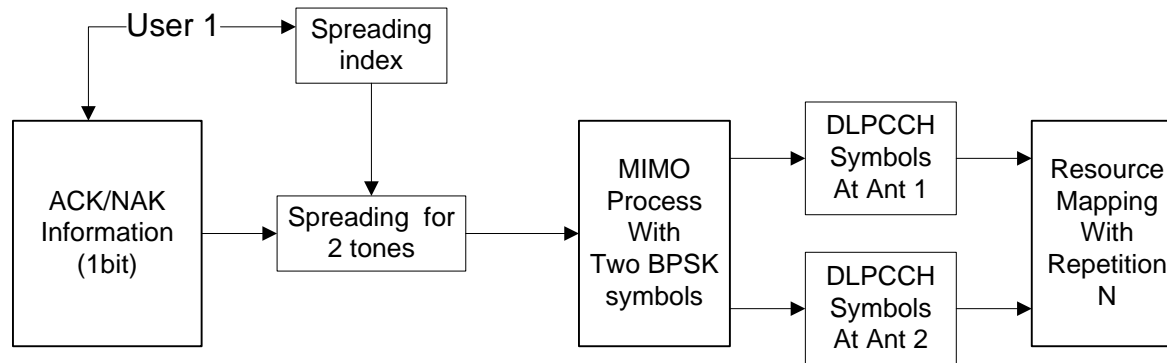
- Need to Decide

- Repetition number N for given common pilot boosting value

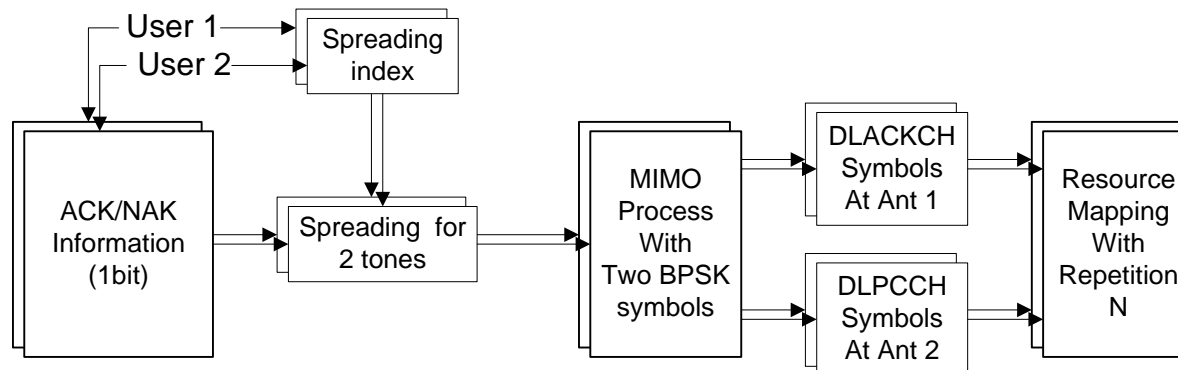


DL ACK Channel Design

- Block Diagram



– Two users are multiplexed in CDM-fashion



Simulation Results

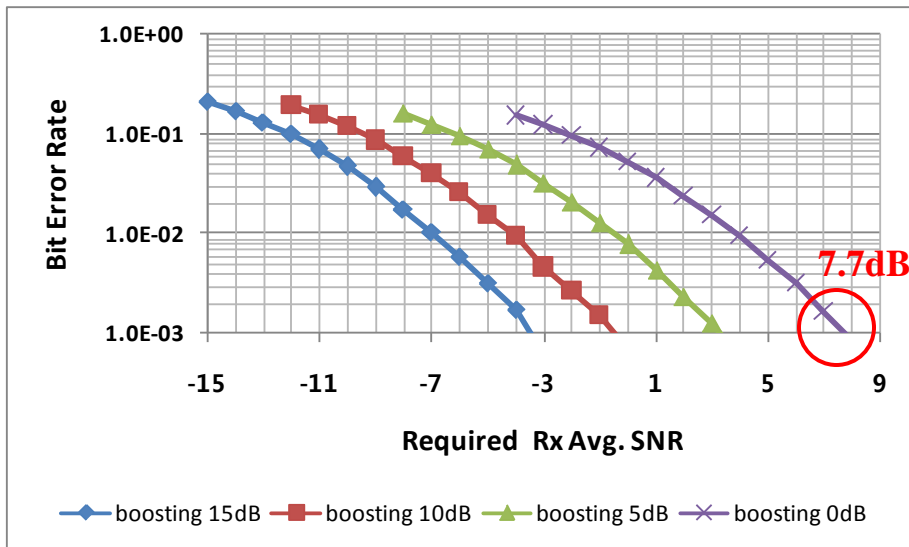
- Conditions

- MIMO : SFBC
- Common pilot boosting: 3dB*
 - * If pilot boosting is 0dB, then pilot tone power is same to data tone power with 0dB boosting
- Channel: Ped-B 3km/h
- Channel estimation: averaging within 1 PRU

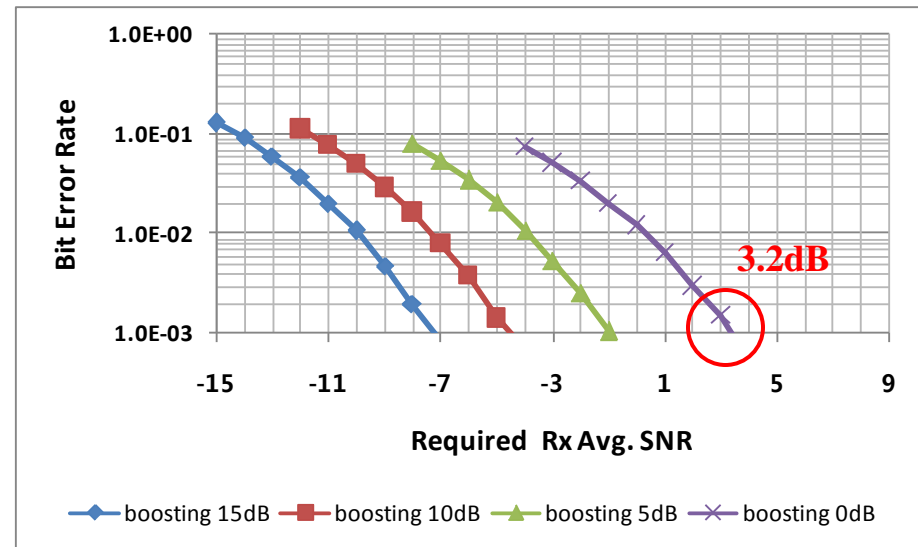
Compared to 0dB boosting, 15dB boosting can obtain only 11dB gain. This is because of *channel estimation impairment*.

Questions is how many repetitions is required for 0dB boosting to satisfy requirement?
- Requirement : BER 0.1% @ 2.5dB

1 Repetition

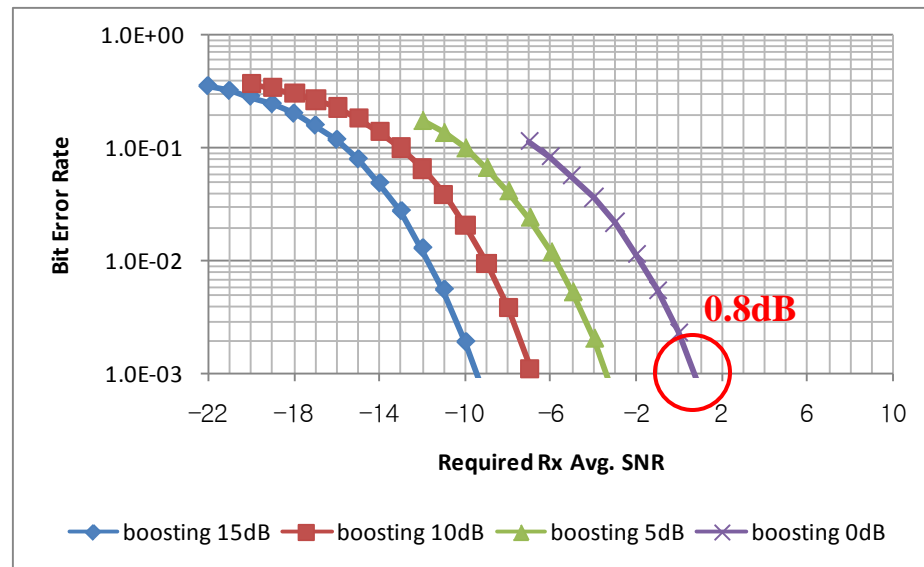


2 Repetition



Simulation Results

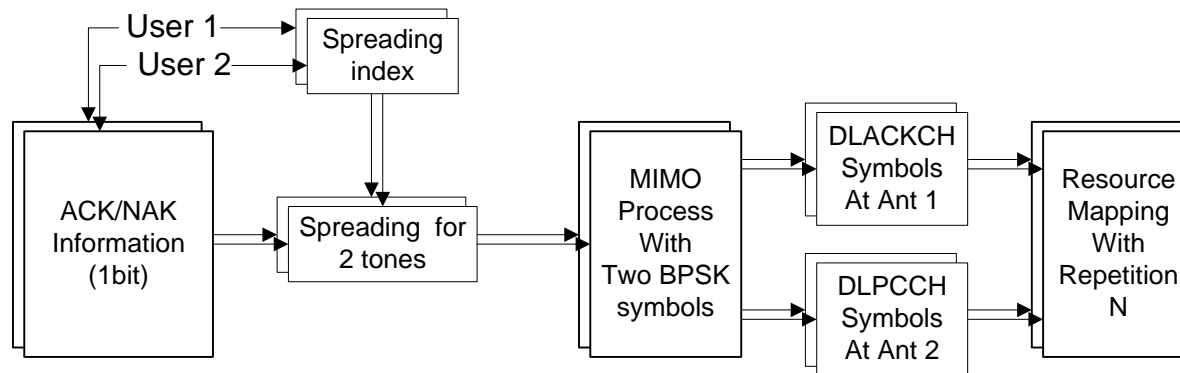
- Required Repetition N
 - Assumptions
 - Reference SNR of 0dB boosting : 50% user
 - For given geometry of ISD 1.5km, approx. 2.5dB is necessary for 0dB boosting
 - To obtain 2.5dB of Rx SNR for 0dB boosting
 - 3 repetitions are required to satisfy BER requirement (3 tones / 1 ACK)
 - Repetition N would be different for different deployment scenario
 - Thus, N information is sent in BCH



Conclusions and Text Proposal

- ACK IE

- 1 bit
- Tx MIMO scheme : SFBC
- Block diagram for ACK channel
 - User multiplexing : Max 2 user CDM



- Text Proposal

- See the latest version of C802.16m-09/0208

Appendix

Simulation Results for Multiplexing

Simulation Results

- Multiplexing between Users (ACK channels): CDM
 - 1ch (no muxing) vs. 2chs (2 users are multiplexed in CDM manner)
 - Performance degradation of multiplexing
 - Why? Interference caused by channel estimation errors
 - If two CDM-ed users have the same power \rightarrow performance gap within around 1dB

