

# 16m DL ACK Channel Design

## IEEE 802.16 Presentation Submission Template (Rev. 9)

### Document Number:

IEEE C802.16m-09/0209

### Date Submitted:

2009-01-07

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### Venue:

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:

IEEE C802.16m-09/0208

### 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

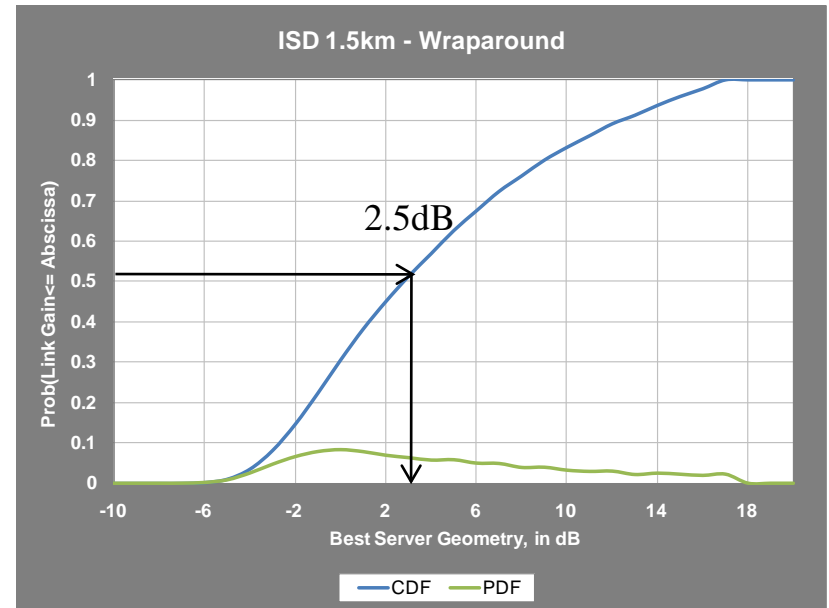
- Physical overhead should be minimized
- Link performance should be satisfied even with channel estimation impairment

- 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

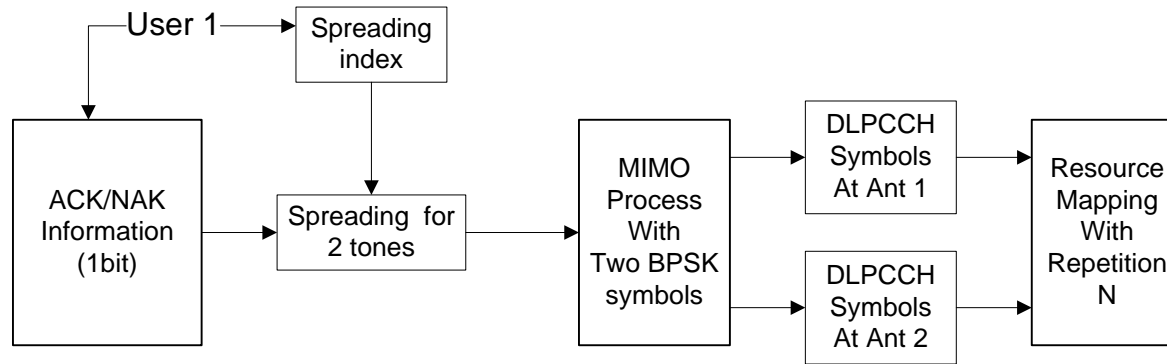
- Need to Decide

- Repetition number  $N$  for given common pilot boosting value

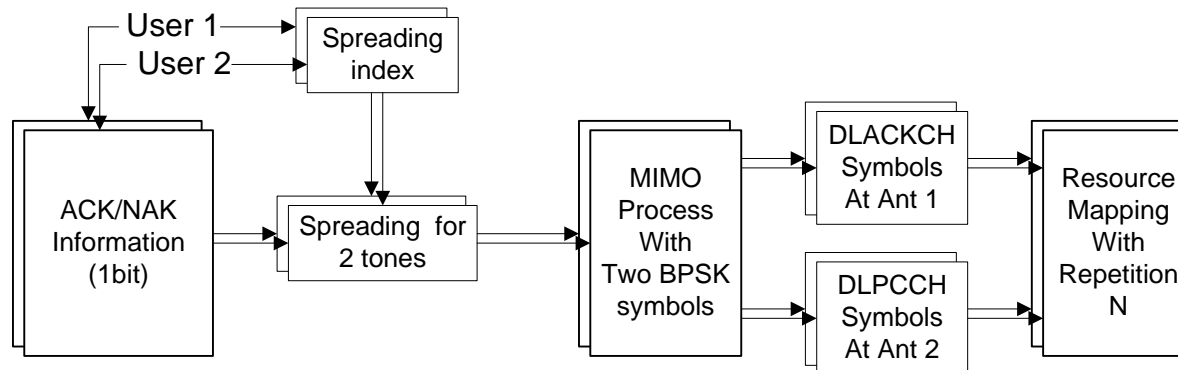


# DL ACK Channel Design

- Block Diagram



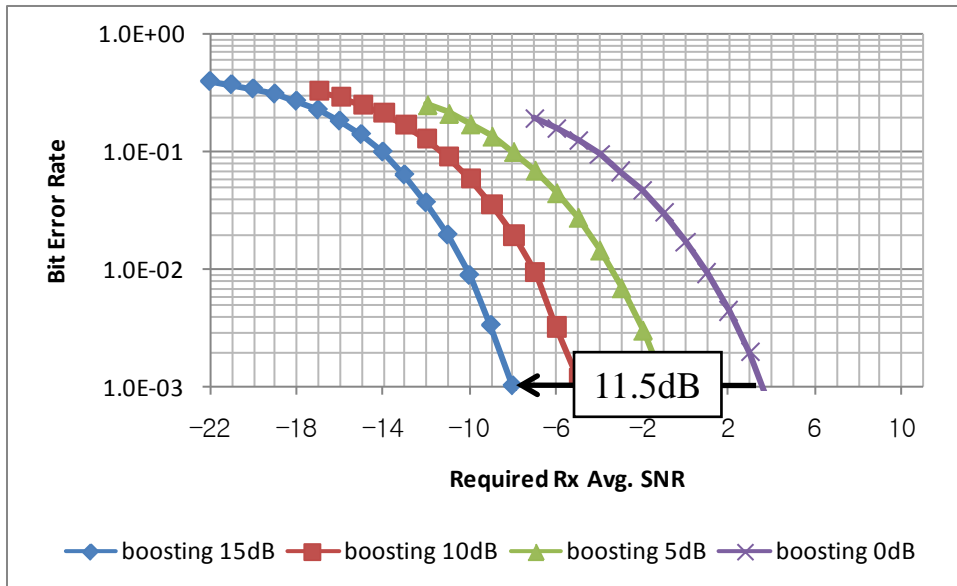
– Two users are multiplexed in CDM-fashion



# 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 : PedB 3km/h
- Channel estimation : averaging within 1 PRU
- Repetition N=1



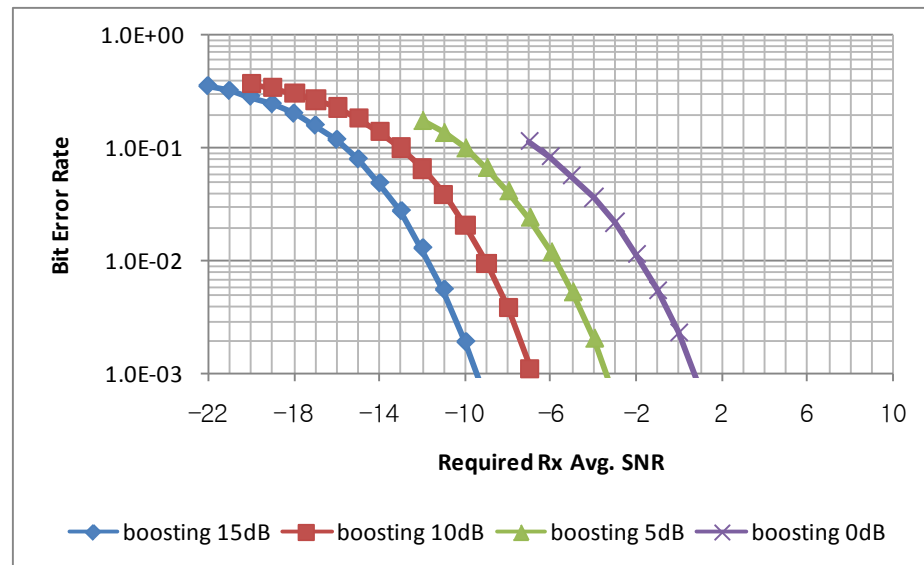
Compared to 0dB boosting, 15dB boosting can obtain only 11dB gain. This is because of channel estimation impairment.

Questions is how many repetition is required for 0dB boosting to satisfy requirement?

- Requirement : BER 0.1% @ 2.5dB

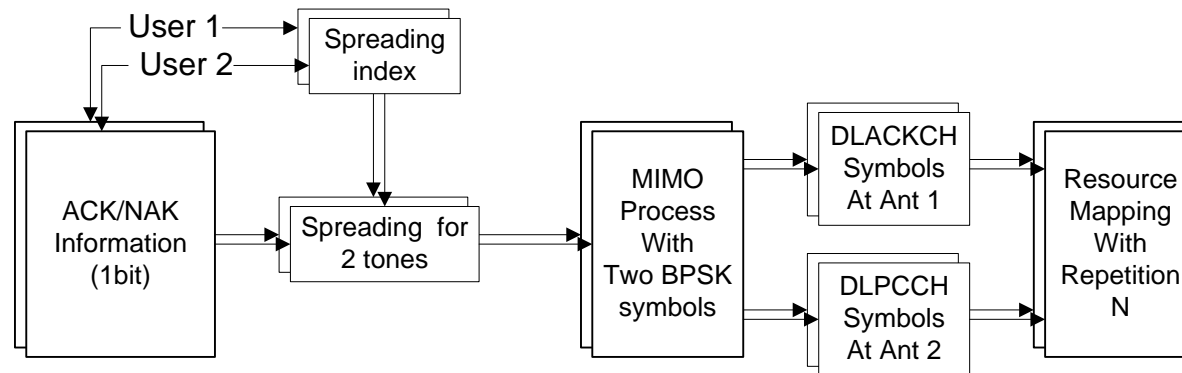
# Simulation Results

- 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
  - Repetition N would be different for different deployment scenario
  - Thus, N information is sent in BCH



# Conclusions and Text Proposal

- ACK/NAK IE
  - 1 bit
  - Tx MIMO scheme : SFBC
  - Block diagram for TPC command symbol
    - User multiplexing : Max 2 user CDM



- Text Proposal
  - See C80216m-09/0208