Time-Domain CSI Feedback for MU-MIMO

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Venue:

TGm SDD: Other; in response to the TGm Call for Contributions and Comments IEEE C802.16m-08/040 for Session 58

Base Contribution:

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Purpose:

For discussion and approval by TGm

Rationale

- CSI Feedback Schemes for MU-MIMO
  - Codebook-based feedback
  - Analog feedback
- Frequency-Domain CSI Feedback for Distributed MU-MIMO
  - Acquiring full-band CSI from sub-band CSIs by
    - Simple MMSE interpolation requiring the knowledge of the second-order statistics
    - Practical interpolation not achieving good enough performance due to neglecting the correlation at different subcarriers

Rationale (Cont'd)

- Frequency-Domain CSI Feedback for Short Multipath Delay
  - Not guaranteeing FSS gain or MU diversity gain from Best-M feedback schemes
  - Necessary to use the full-band CSI

Time-domain CSI feedback can resolve those problems.

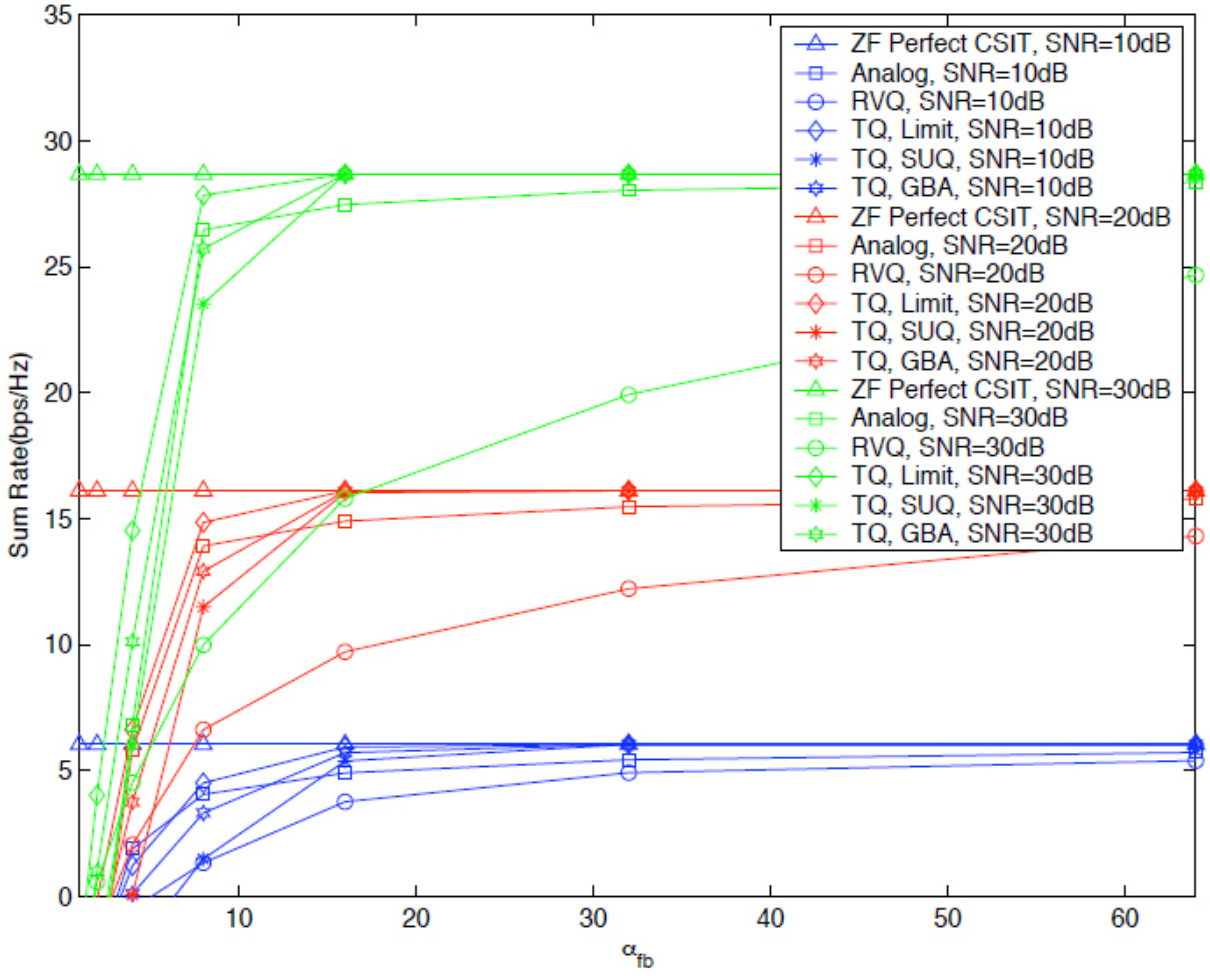
Time-Domain CSI Feedback

- Feedback Information
  - Transmitting only time impulse response
    - Requiring less overhead depending on multipath profile
    - Enabling to cover the whole channel bandwidth for distributed MU-MIMO
- Time-Domain Quantization Feedback
  - Training Stage
    - Measuring the multipath profile (i.e., delay profile and power profile)
  - Quantizing Stage
    - Based on the measured or known multipath profile, quantizing the time impulse response on the sampled delay profile
    - Power profile used for efficiently quantizing the impulses on each delay to reduce feedback overhead

Lower Bound on Sum-Rate

- System Parameters
  - Number of Tx antennas in BS: 4
  - Number of users with single antenna: 4
  - Number of subcarriers: 64
  - Multipath power profile: {0.5, 0.24, 0.17, 0.06, 0.03}
- Compared Schemes under ZFBF
  - Perfect CSIT
  - Analog feedback
  - Random vector quantization (RVQ) feedback
  - Time-domain quantization (TQ) feedback
    - Limit, scalar uniform quantization, greedy bit allocation

Lower Bound on Sum-Rate



– Time-domain quantization feedback with greedy bit allocation shows the best performance.

Suggested Remedy

- *At line 9 in page 85, add the following sentence*
  - *Codebook-based feedback and analog feedback are performed in frequency-domain. As well, time-domain CSI feedback such as time-domain quantization feedback is also supported.*