Simulation Results for Distributed Permutations

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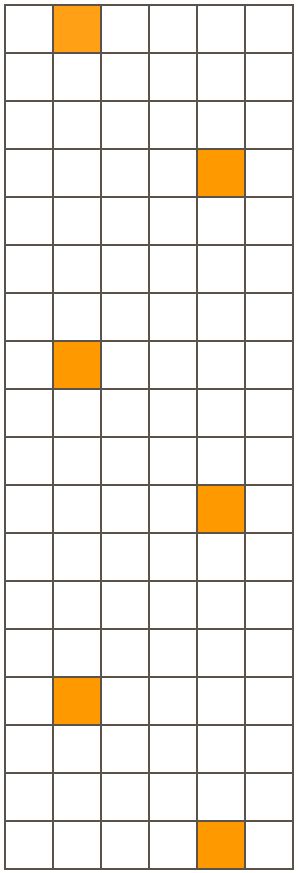
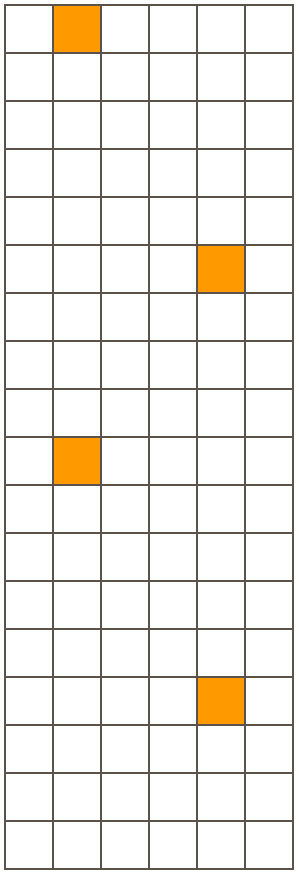
Venue:
TGm – DL PHY
Base Contribution:
IEEE C802.16m-08/504
Abstract:
Proposal for 16m downlink resource mapping.
Purpose:
Adoption of proposed text/content for 802.16m System Description Document

Pilot Formats Used

- Dedicated (EBF) – 5.56%



- Broadcast (SIMO,CSD) – 3.7%

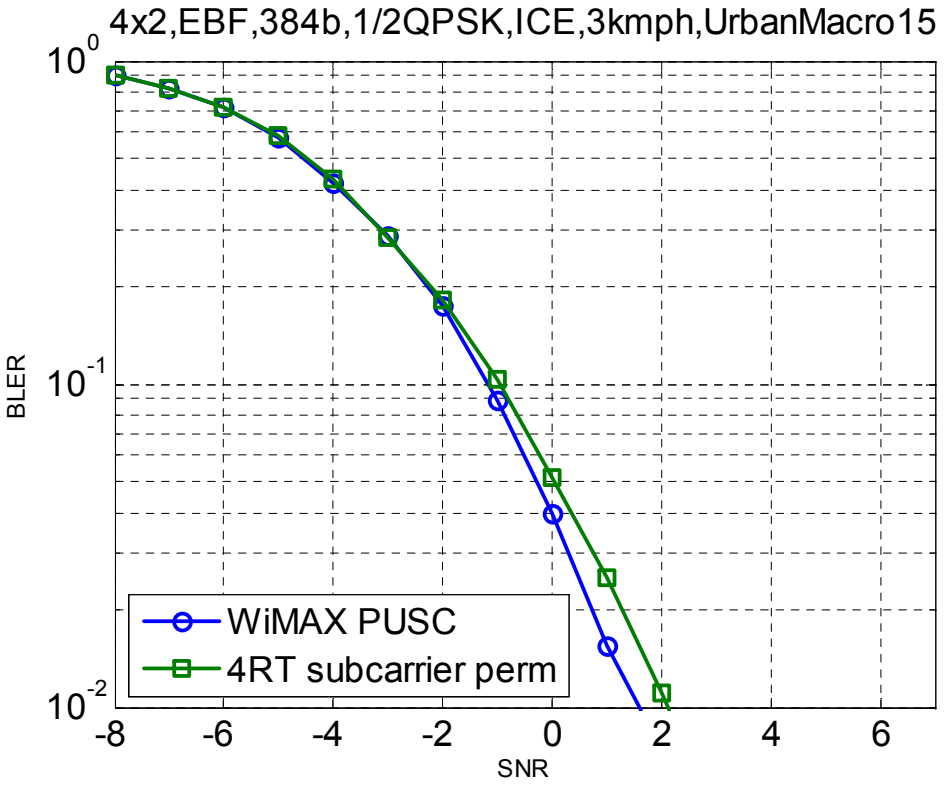


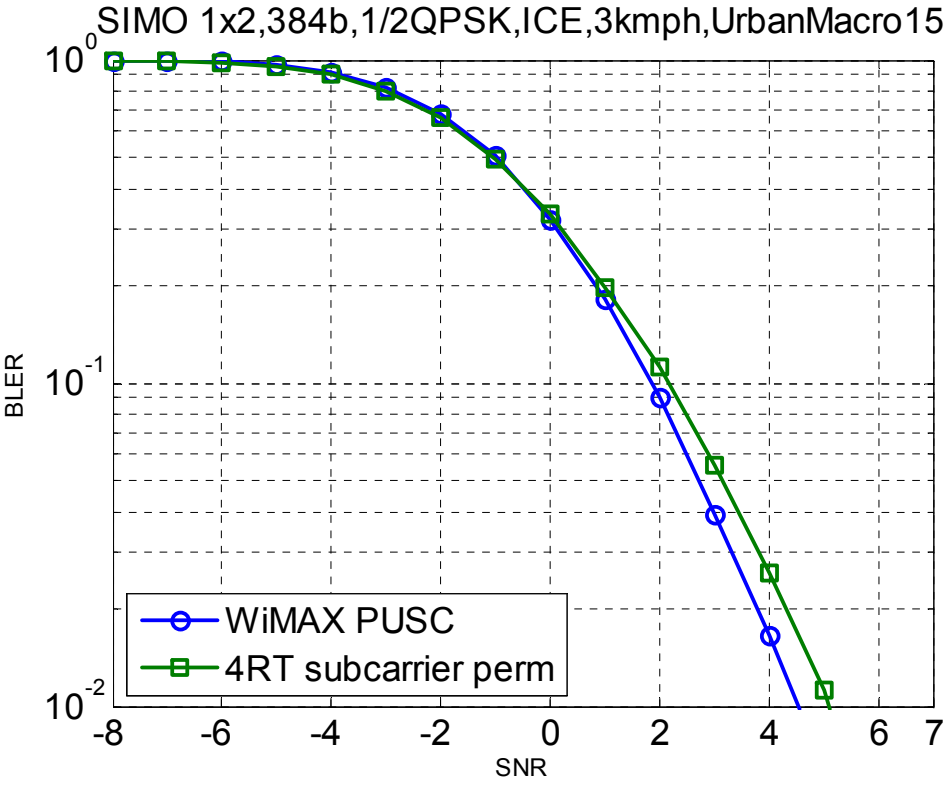
Sim1 Simulation Assumptions

Parameter	Value
NFFT	1024
Carrier frequency	2.6 GHz
# Tx antennas	4
# Rx antennas	2
Antenna spacing	1 λ for Tx, 0.5 λ for Rx
MCS	1/2 QPSK
Channel model	SCM Urban Macro 15^0
Mobile speed	3kmph
UL delay	5ms
Pilots	2.5dB boost (5.56% for dedicated and 3.7% for broadcast)
UL-DL imbalance	9 dB (total power) for sounding
ULCS	1-Antenna Sounding
UL channel estimator	Linear
DL channel estimator	Ideal
Resource tile	18x6
Permutation	1) Subcarrier permutation within 4 RT, 2) full band subcarrier permutation (PUSC)
Packet size	384 info-bits (4RT)
DL-DATA Structure	18x6 RT randomly distributed in frequency (fixed during the simulation)

Sim1: 4RT subcarrier permutation vs. full band subcarrier permutation

- 4x2 EBF, 384b, 1/2QPSK
- SIMO 1x2, 384b, 1/2QPSK





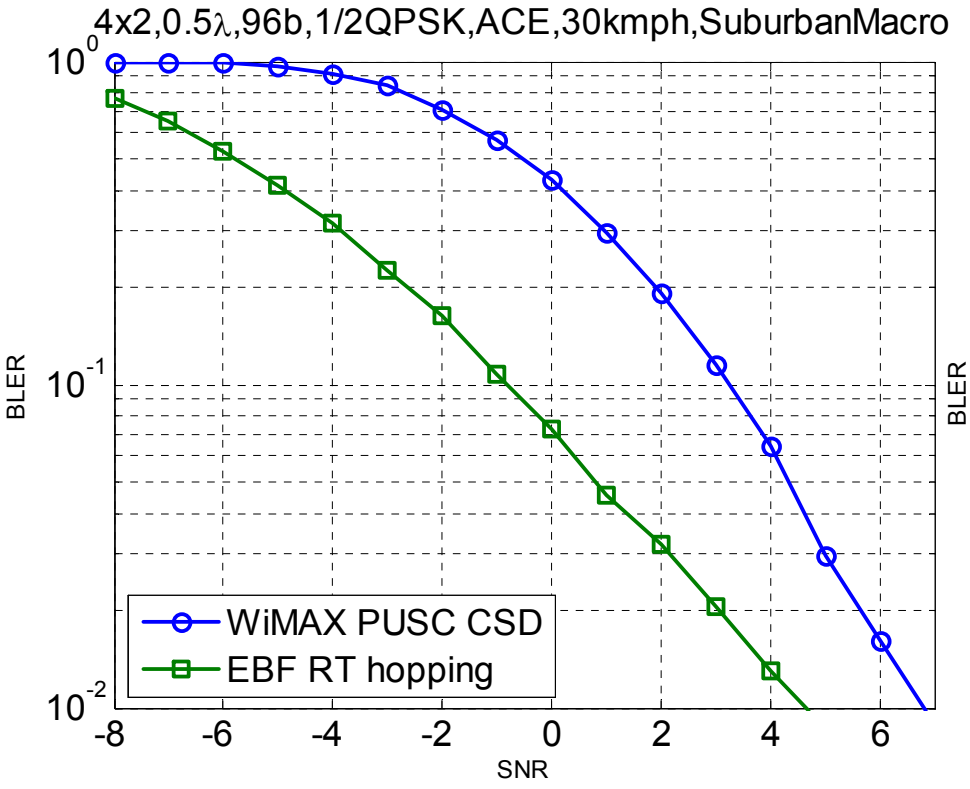
Shows that subcarrier permutation can be restricted to only 4 PRUs to capture most of the frequency diversity inherent in the channel

Sim2 Simulation Assumptions

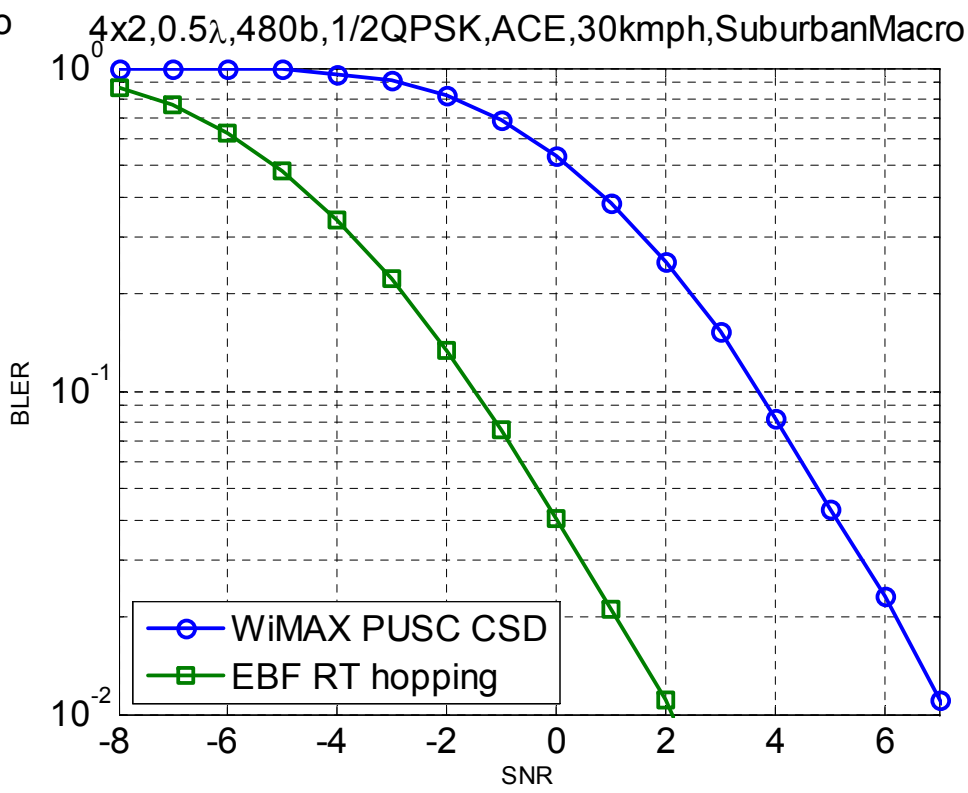
Parameter	Value
NFFT	1024
Carrier frequency	2.6 GHz
# Tx antennas	4
# Rx antennas	2
Antenna spacing	0.5 λ for Tx, 0.5 λ for Rx
MCS	1/2 QPSK
Channel model	SCM Suburban Macro
Mobile speed	30kmph, 120kmph
UL delay	5ms
Pilots	2.5dB boost, 16m format same as before
UL-DL imbalance	9 dB (total power) for sounding
ULCS	1-Antenna Sounding
UL channel estimator	Linear
DL channel estimator	2D-MMSE for dedicated, 2-1D MMSE for broadcast using 18 taps
Resoruce tile	18x6
Permutation	1) RT hopping (no subcarrier permutation), 2) full band subcarrier permutation (PUSC)
Packet size	96 info-bits (1RT) or 480 info-bits (5RT)
DL-DATA Structure	18x6 RT randomly distributed in frequency (but fixed during the simulation)

Sim2 - EBF with cluster permutation vs. full band subcarrier permutation w/ CDD

- 4x2, 96b (1RT)



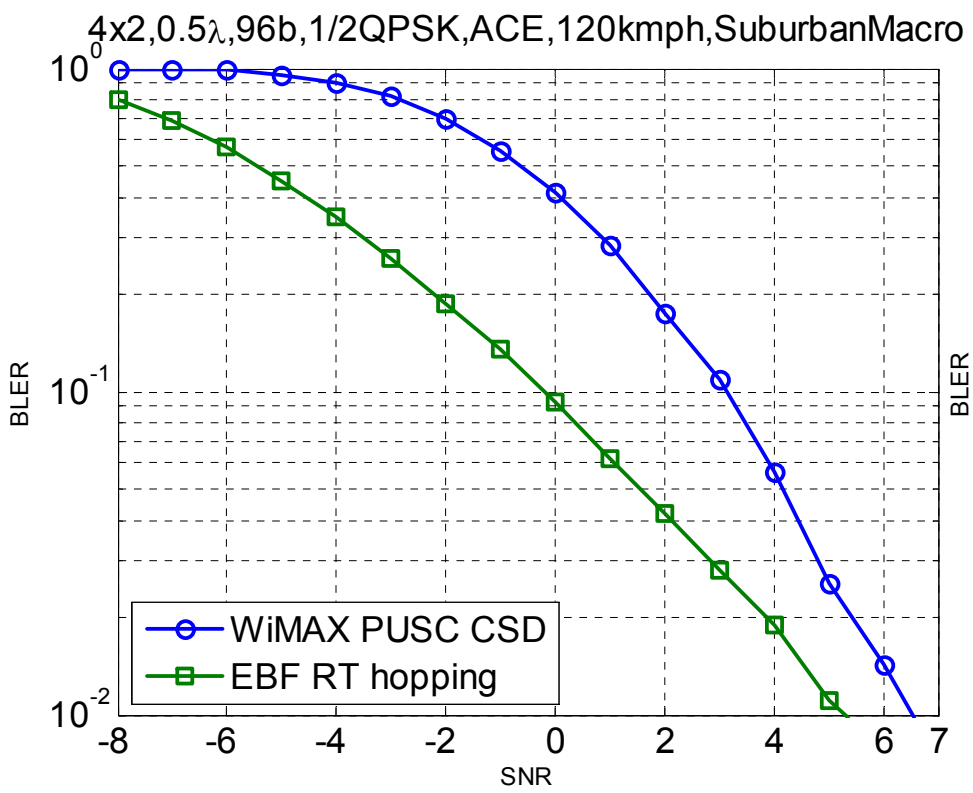
- 4x2, 480b (5RT)



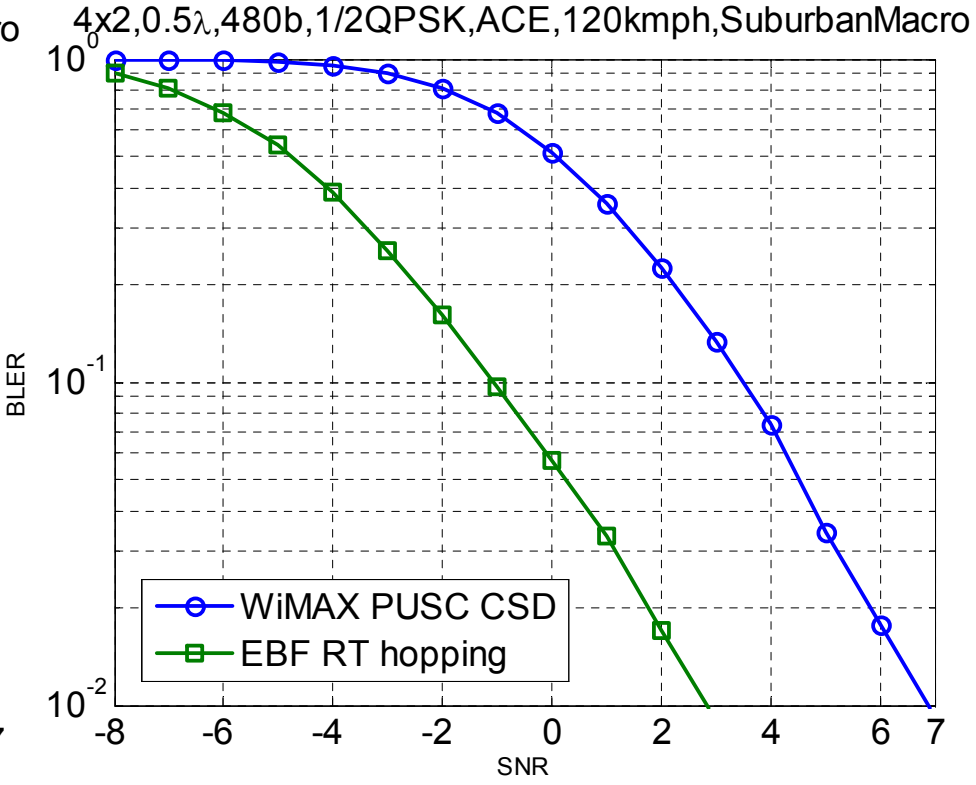
Illustrates a scope of application for 1-PRU block distributed mode and the potential gains with this approach in certain cases

Sim2 - EBF with cluster permutation vs. full band subcarrier permutation w/ CDD

- 4x2, 96b (1RT)



- 4x2, 480b (5RT)



Illustrates a scope of application for 1-PRU block distributed mode and the potential gains with this approach in certain cases

Conclusion and Proposal

- Frequency diversity of 4th order provides most of frequency diversity
  - 4 distributed PRUs provide similar frequency diversity as full band subcarrier permutation, for 1 Tx antenna
  - With Tx diversity, the small performance gap may be further reduced
- Block distributed permutation with dedicated pilots and BF provides significant gain over subcarrier distributed permutation with common pilot
- Block distributed permutation should be supported in 16m
  - Co-exist with subcarrier distributed permutation, with subcarrier distributed permutation for small payload
- Adopt the proposal C802.16m-08/PHY1

Proposal

- Adopt the proposal C802.16m-08/503