AAS Direct Signaling Methodologies to Support High Capacity MR-BS to RS Links

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Purpose:
This document provides a Technical Proposal for an AAS Signaling Methodology for consideration by the 802.16j Multi-hop Relay Task Group.
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Motivation: MR-BS w/ 18 RS nodes

- Relay Nodes
  - DL spectral efficiency
    ~ 1 bps/Hz
  - 18 nodes, 50% Loading

- MR-BS
  - DL spectral efficiency required
    ~ 9 bps/Hz
  - Coherence BW of Relay Link
    ~ 200 kHz
Multi-user Beamforming, Relay Link

RS #1

RS #2

RS #3

Out-of-cell Interference

K=1 Cell to Cell

Multiple “Spatial Planes” -> Higher Spectral Efficiency

Non AAS Cell Coverage

AAS Cell Coverage

Multiple users on the same frequency (each with high link quality)
Wireless Network Simulation:
19 MR-BS w/ 10 RS nodes per BS

- 200 Monte Carlo Trials
- 190 co-channel links
- Random RS selection from uniform distribution
- Propagation: Geometric Elliptical Model w/ angle spread
- SUI-3s w/ Erceg B
- Log Normal Fading
- 16 antennas at MR-BS
- 1 antenna at RS
- Preamble Length = 64
Simulation Results:
SINR w/ 10 Co-channel RS

Adequate SINR for 10 Simultaneous Link at ¾ rate 64 QAM
SINR Degradation as a Function of Preamble Bandwidth, Length = 64

Recommend 1 bin x 8 symbol or 2 bin x 4 symbol preamble training
AAS Relay Zone Construction

Part of DL Relay Zone

Part of UL Relay Zone

AAS relay zone DL access (sub channel 0)

AAS relay zone UL access

DL Burst #1

UL Burst #1

DL Burst #2

DL Burst #4

UL Burst #2

DL Burst #3

DL Burst #5

UL Burst #3

Training Preambles

Training Preambles

DL Pre-amble

AMC Slots, Repetitions in subchannel 0

UL Pre-amble

AMC Slots, Reps in subchannel 0

AAS relay zone DL access

AAS relay zone UL access
Frame Structure Reference
Conclusion

• MR-BS to RS Link Requirements
  – O9, Multiple Antenna Support, Technical Requirements Guideline for Relay TG
  – Bandwidth concentration property of MR-BS
    – High Spectral Efficiency Required
    – High Bandwidth Request Activity
  – Low Coherence Bandwidth, 100 to 200 kHz

• Multi-user AAS Option proposed for MR-BS <-> RS Link
  – Longer UL training preambles to adapt larger arrays
  – Multiple “spatial planes” for payload transport
  – Multiple “spatial planes” for bandwidth request/ranging
  – Spectral efficiency ~ 9 bps/Hz with 16 antennas

• Proposed Text
  – Applies to MR-BS to RS link
  – Augment AAS_Zone definition & add preamble definition in section 8.4.4.8
  – Modify AAS_UL_IE