IEEE 802.16m network coding allowed on access link

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Base Contribution:

None

Purpose:

To address the FFS item in 16m SDD section 11.4.3

Notice:

Release:

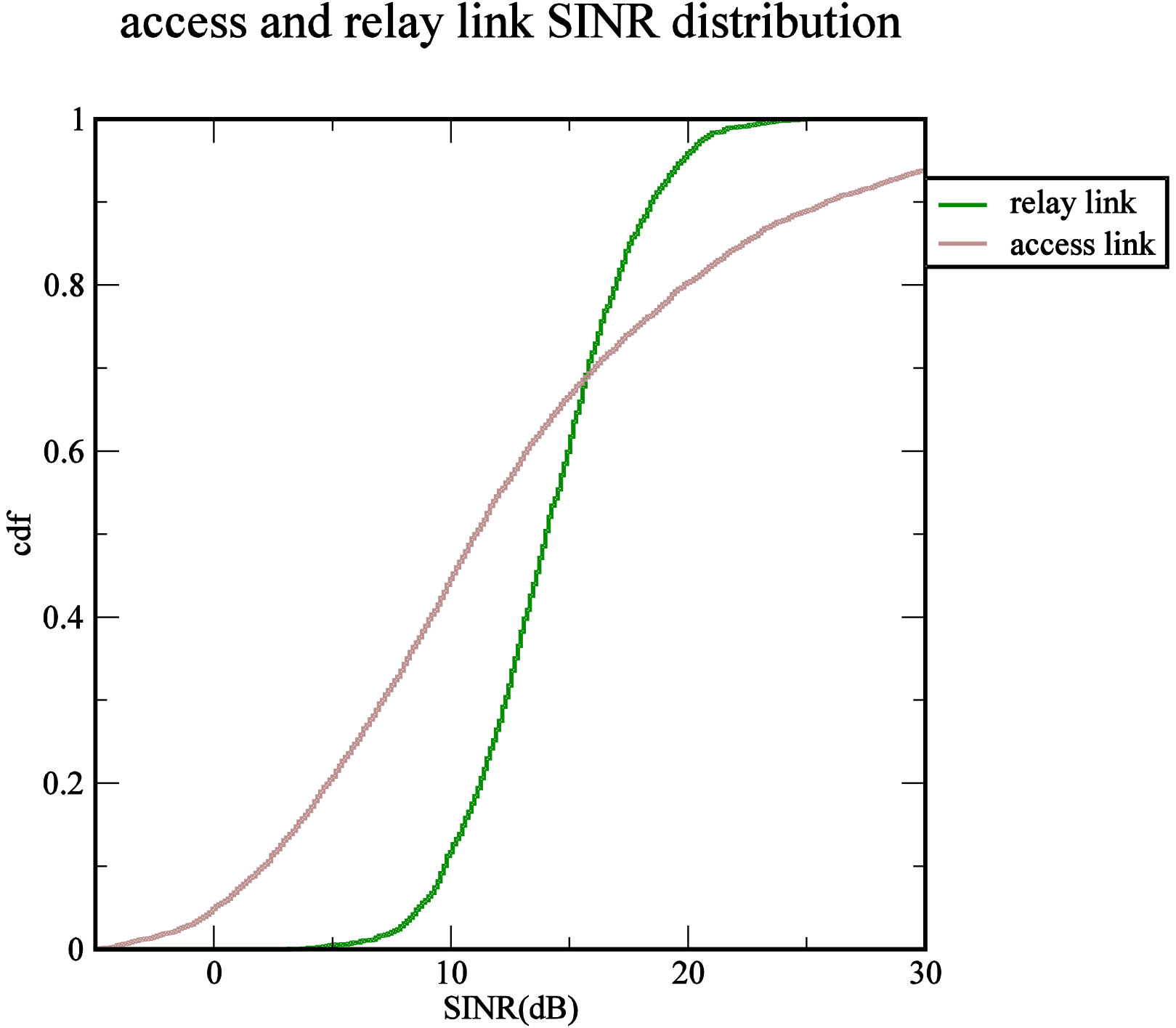
Patent Policy:

Introduction

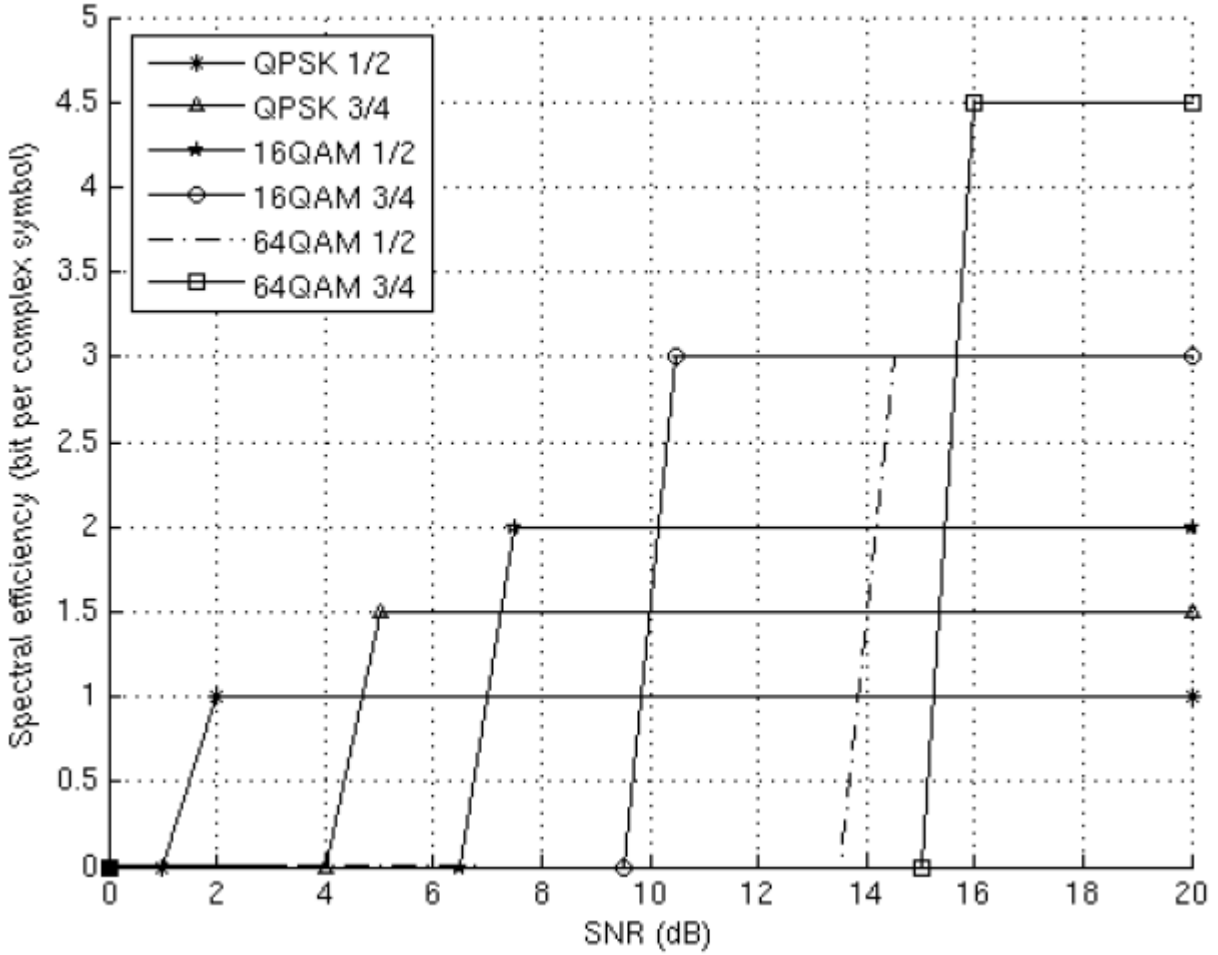
- Currently in 16m network coding zone, the transmission to AMS is FFS
- Given there are opportunities for network coded transmissions to AMS, what is to be studied is whether network coding provides enough gains on access link, whose channel condition is assumed to be quite different from the relay link

Analysis assumption

- ART Scenario in EMD
- ARS uses the the Omni-directional antenna to transmit to both ABS and AMSs
- ABS has rx antennas pointed to its subordinate ARS with 20dBi boresight gain and 20º 3dB-beam width when at network coding sub-frame
- Fading assumption
  - RS-BS LOS flat fading
  - RS-MS ITU pedestrian B
- Independent shadowing on access and relay links


access and relay link SINR distribution
1
0.8
0.6
0.4
0.2
0
cdf
0
10
20
30
SINR(dB)
relay link
access link

MCS selection threshold [1]



MCS selection of each link

- ARS selects independently a MCS for each link based on the threshold in the previous slide
- If the modulation orders are different, the lower modulation order is chosen. The link with loss of modulation order uses the highest code rate of the chosen modulation order

Spectral efficiency

spectral efficiency (se)	Pa, se	Pr,se
0	0.068	0.000
1	0.103	0.002
1.5	0.129	0.015
2	0.146	0.101
3	0.235	0.543
4.5	0.319	0.341

- Average access link spectral efficiency without network coding = 2.72*2
- Average relay link spectral efficiency without network coding = 3.38*2
- Average loss of spectral efficiency due to modulation order mismatch = 0.7842*2
- Average sector spectral efficiency = 2*((2.72+3.38)-0.7842)=10.66

Observation

- The spectral efficiency is high even with independent access, relay link channels, hence the gain of network coding is primarily limited by the opportunity of performing the network coding
- By allowing additional networked coded transmission to AMS, the utilization of the network-coding zone is increased because of the increased opportunity of performing the network coding

Proposed text change

- Network Coding Transmit Zone: An integer multiple of subframes located in the DL of the frame of the Odd Hop ARS which is directly attached to the ABS, where an Odd Hop ARS can transmit network coded transmissions to the ABS and Even Hop ARS or AMS. ~~Transmissions to the AMS in this zone are FFS.~~

Reference

[1] Bertrand Muquet, Ezio Biglieri and Hikmet Sari, "MIMO Link Adaptation in Mobile WiMAX Systems", WCNC 2007