PHY LINK CHANNEL AND FEC

Avi Kliger March 7th 2013

PLC FEC Background

- **PLC uses QAM16 over eight sub-carriers**
- **Centered around a 6 MHz step frequencies**
- **All sub-carriers bunched together around the PLC center frequency**
  - Provides full flexibility in the usage of the spectrum
  - Only consecutive eight subcarriers around the PLC center frequency must be available (not-nulled)
  - No other limitations on the usable sub-carriers
    - Even subcarriers on the 6MHz channel of the PLC may be nulled / unused
- **SNR less than 15 dB is required to detect the PLC channel**
  - more than 20 dB from average attenuation, 10 dB from lowest profile
    - Worst case notch on Redesign-1 loop is 9 dB
- **No Interleaver is used**
- **FEC may still be required to provide good immunity of PLC reception with worst case notched**
- **FEC is required to provide immunity against burst noise**

CODE ALTERNATIVE FOR PLC

- **No FEC - use checksum to detect errors (SNR ~ 21 dB)**
  - Pros: Simpler, no decoding latency
    - Leverages on the lower constellation to get better immunity than the coded QAM256 data
  - Cons: Do not allow margins to protect against narrowband notch
- **Short 50% code (SNR ~ 14 dB)**
  - Short LDPC (48,24) code with QAM16
  - Pros: provides good immunity against narrowband notches, low decoding latency, very simple
  - Cons: too short to provide good immunity to burst noise
- **Long 50% or 67% code (SNR ~ 12 dB)**
  - 4K code
  - Pros: excellent immunity to notches and to burst noise
  - Cons: long latency > 100 symbols
- **Mid size code**
  - Code size of 8 symbols -> ~ 128 bits seems to provide good immunity to noise and a reasonable latency.

EXAMPLES: EXISTING CODES AND QAM16

- **Short Codes (32,16 LDPC code)**
  - SNR with AWGN = 14.5 dB
- **“Long Code” ~ 4K (MoCA LDPC, 85%)**
  - SNR with AWGN = 13 dB