PBO in 40GBase-T ?

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PBO- Power Back off

- Used in 10Gbase-T
  - Normal transmit power at 4.2dBm, backed off up to 14dB by the 2 dB step
  - To avoid the worst case Alien cross talk – very short channel bundled with very long channel
  - Save transmit power when not needed for short length channels

PBO in 40gbase-T

- Shielded Cat8 Cables make the Alien Cross talks not a major concern
- PBO Cons:
  - Removing PBO will shorten link up time
  - Removing PBO would also ease interoperability, by removing one extra parameter to align.
- PBO Pros:
  - PBO at transmitter will relax dynamic range requirements at receiver
  - PBO Saves Transmit power
- still makes sense to keep it in 40GBase T?

Transmit power consumption vs.
Transmit launch Power

- Total driver power takes roughly half the AFE power
- Digital power and AFE power may be comparable for 40Gbase-T (assuming PHY baseline Strawman proposal)
- Driver power
  - Clocking distribution
    - Implementation dependent, may change with higher clock frequencies
  - DAC/Drive circuit power – dominates at 10GbaseT
    - The power can be managed to be scaled with the transmit amplitude
    - Half Transmit Amplitude – save 15~30% of total AFE power
  - Total around 7%~15% power save for the transceiver with 6dB PBO

Reference:
- *ISSCC papers, 2011, 2012 (Teranetics, Aquantia)*
- *http://www.ieee802.org/3/bq/public/jan14/langner_3bq_01_0114.pdf*

PBO for 40Gbase T (1)

- Around 15% of power reduction does not make PBO a MUST
- But most likely PBO capability will be there
  - If 10Gbase-T be supported with the same AFE, which will request PBO, most of circuitry can be shared with 40Gbase-T *
  - Most likely, PBO Enable/control circuitry will be there*

  *Speeds that a PHY implementation may support is a separate discussion, outside of 802.3 standards scope

PBO for 40Gbase-T (2)

- Possible simple PBO scheme with 2-3 steps
  - Assume 0dBm normal TX power at MDI
  - PBO with 0dB, 6dB and 12dB(Depending real noise condition ?)
  - Total power saving- reduced TX power, and digital filter taps utilization and etc.
  - Reduced link up time
- Still too early to decide, may be decided later when more complete PHY picture available
  - Complete noise environments
  - Final decisions on Symbol rates, modulation schemes …