

EEE in 40/100G PMA



Hugh Barrass

IEEE P802.3bj

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With thanks...

With thanks to –

**all those who participated in
conference call reviews**

Agenda

- **Options**
- **Clause 74 FEC compatibility**
- **PMA/PMD function**
- **Changes required**
- **Questions...**

D-1.0 – Comment #128

- **A proposal to make the two EEE modes optional was rejected because there was insufficient argument in favor...**
 - **However, during discussions, 2 significant reasons later emerged**
- **A separated PMA/PMD might consume more energy inferring the EEE state than it saves during quiescent phase.**
- **The inclusion of .3ba PHYs opens the issue of backward compatibility with modules or devices that will not support quiescent state.**

Optional behavior

- **EEE is an optional function:**
- **Fast Wake should be the default behavior for 40G and above (also works for optics!).**
- **Line quiescence should be an option for all PHYs that can support it.**
- **Negotiation required for the option.**
 - **Handle using LLDP only – since dynamic changes needed (per baseline).**

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Clause 74 FEC with 10GBASE-KR

- **Only intended for integrated PHY implementation**
 - Signals from PCS – tx_mode, rx_mode, LPI_active
 - Signal from PMA/PMD – energy_detect (not just signal_detect)
- **FEC relies on scrambler_bypass for rapid lock**
 - Pre-determined data contents for 1uS during wake
 - 74.7.4.8 FEC rapid block synchronization for EEE (optional)

Scrambler bypass?

- **40/100G should not need scrambler bypass**
 - RAMs are not scrambled – may be used for rapid sync by FEC
- **Some change to Clause 74 may be required**
 - Wording of 74.7.4.8 needs to accommodate RAM behavior

Logical service interfaces

- **40/100G service interfaces need to match 10G**
 - Although functional behavior of 40/100G may be better...
 - ... because of RAMs
- **Proposals for interface definitions depend on PMA/PMD**
 - Look at energy detect & rx_mode

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Transmit direction

- **Functionally, 40/100G very similar to .3az 10G**
 - PMA/PMD controlled by tx_mode
 - Only QUIET, ALERT & DATA have any real effect (all others act the same as DATA for PMA/PMD)
- **Use a note for Clause 74 FEC compatibility**
 - (if FEC sublayer present, only convey the 3 states)

Receive direction

- **Problems still unresolved in 802.3bj**
 - “clean” solution (with detached PMA) not acceptable
 - 802.3az solution might be problematic with CAUI
- **Compatibility with CI 74 FEC requires az-like signals**
 - i.e. rx_mode/energy_detect – not compatible with CAUI
- **Solution can define integrated PHY operation...**
 - ... allow inference for detached PMA
 - Only required for optional quiescent line mode
 - “complex” detached parts (e.g. FEC/PMA/PMD) uses inference
 - “simple” detached parts (e.g. PMA/PMD) uses fast-mode only

Therefore!

- **From the PCS “down” the PHY – rx_mode: QUIET or DATA**
 - This allows PMA/PMD to know when to expect quiescence...
 - ... and therefore when to “arm” energy detect circuit
 - Also used to decide when to go into low power mode
- **From PMA/PMD “up” the PHY – energy_detect: FAIL or OK**
 - Set to FAIL when rx_mode changes to QUIET, set to OK when ALERT received.
- **Reuse these definitions – PCS/PMA/FEC sublayers**
 - No definition for how these cross CAUI
 - PCS can still use received_tx_mode (more flexible than .3az)

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Definitions

- **Change direction of rx_mode (all instances)**
 - Only 2 states – DATA & QUIET
 - Add energy_detect (from PMD to PCS – as for .3az)
 - Add rx_lpi_active (for FEC only)
- **85.7.4 Global PMD energy detect**
 - Use definition from Clause 72
 - Also works for Clause 84
- **Note used for tx_mode from PCS to allow Clause 74**
 - States DATA, SLEEP, FW, WAKE and RF_WAKE all map to DATA
 - States ALERT and RF_ALERT both map to ALERT
 - (LP gets fully functional received_tx_mode from RAMs)

Rx LPI state machine

- **Assign rx_mode = DATA in states RX_ACTIVE & RX_WAKE**
 - Assign rx_mode = QUIET in state RX_QUIET
- **State transitions:**
 - RX_SLEEP > RX_SLEEP; RX_SLEEP > RX_ACTIVE - replace rx_mode = DATA with rx_block_lock
 - RX_SLEEP > RX_QUIET – replace rx_mode = QUIET with !rx_block_lock
 - RX_QUIET > RX_LINK_FAIL – replace rx_mode = QUIET with !energy_detect
 - RX_QUIET > RX_WAKE – replace rx_mode != QUIET with energy_detect
 - RX_WAKE > RX_TIMER; RX_WAKE > RX_ACTIVE – replace rx_mode = DATA with rx_block_lock
 - RX_WTF > RX_TIMER; RX_WTF > RX_ACTIVE – replace rx_mode = DATA with rx_block_lock

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