40GBASE-T PTS AND PSD

German Feyh, Tom Souvignier

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Supporters

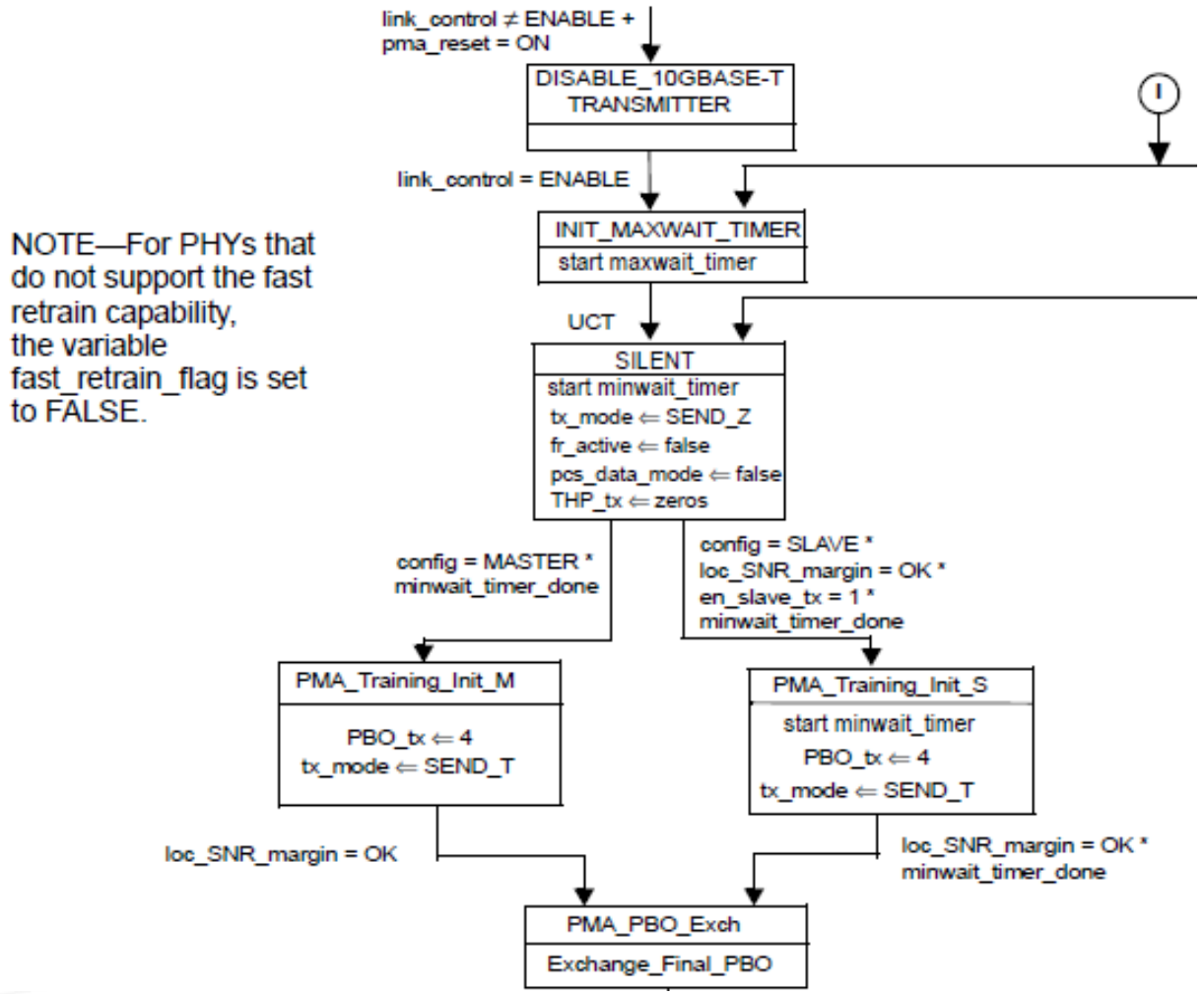
- George Zimmerman, CME Consulting, Inc.

Improve startup time: Change PTS

- 10GBASE-T Periodic Training Sequence (PTS) usage
  - 10GBASE-T PTS is (to our knowledge) not used in the field.
    - “A sequence of 16384 bits is not rich enough to adapt the ~32K filter coefficients of FFE, FEXT and ENC.”
- Correlation is a robust method to find the position in a (short) bit pattern.
  - Correlation (used in PTS) is faster than blind equalization (used in CTS).
  - Blind equalization may challenge the filter adaptation resources of 40G.
  - Correlation can accommodate higher variability in the insertion loss (IL)
    - suck outs may create notches in the IL.
- Change from 10GBASE-T standard:
  - switch to continuous training sequence (CTS) after “the eye is opened” at the start of the state: PBO exchange.
  - Both Slave and Master expect the link partner to switch from PTS to CTS, when they transition
    - from the PMA_state<7:6>=00 indicates PMA_Training_Init_M or PMA_Training_Init_S,
    - to the PMA_state<7:6>=01 indicates PMA_PBO_Exch.

55.4.6.1 PHY Control state diagram

- At the transition from
  - PMA_Training_Init_M and PMA_Training_Init_S
- to PMA_PBO_Exch
- the transceiver of both link partners stops to reinitialize the value of its scrambler state every 16384 symbol periods.



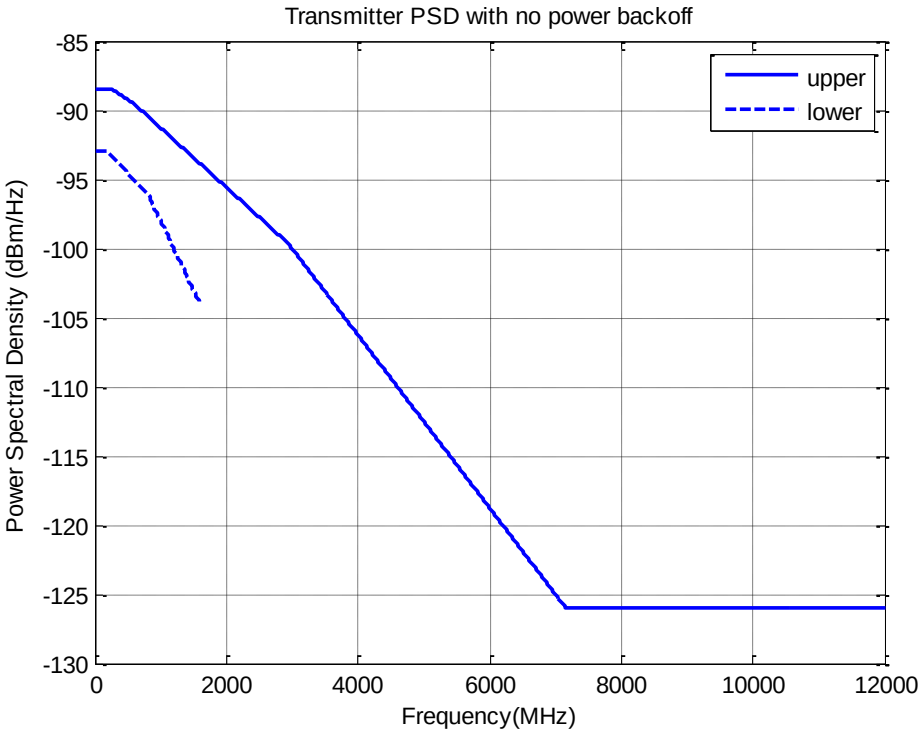
NOTE—For PHYs that do not support the fast retrain capability, the variable fast_retrain_flag is set to FALSE.

Transmit power spectral density (PSD) and power level

- Range of transmit power from 3.2dBm to 5.2dBm was appreciated for 10GBASE-T
  - Process, voltage and temperature variations may result in power variations.
    - Tighter range results in higher power consumption of the transmitter.
  - Suggest similar range for 40GBASE-T: -0.8dBm to 1.2dBm for a 0dBm/Hz “nominal” transmit power.
- Reduce power numbers by 10dBm/Hz in equation (55-9) and (55-10)
- Spread frequencies by factor 4.
- $$\text{Upper PSD}\,(f) \leq \begin{cases} -88.5\,\frac{\text{dBm}}{\text{Hz}} & 0 < f \leq 280 \\ -88.5 - \left(\frac{f/4-70}{80}\right)\frac{\text{dBm}}{\text{Hz}} & 280 < f \leq 600 \\ -89.5 - \left(\frac{f/4-150}{58}\right)\frac{\text{dBm}}{\text{Hz}} & 600 < f \leq 2920 \\ -89.5 - \left(\frac{f/4-330}{40}\right)\frac{\text{dBm}}{\text{Hz}} & 2920 < f \leq 7160 \\ -126\,\frac{\text{dBm}}{\text{Hz}} & 7160 < f \leq 12000 \end{cases}$$

Transmit power spectral density (PSD) and power level

- Lower PSD $(f) \leq \begin{cases} -93\,\frac{\mathrm{dBm}}{\mathrm{Hz}} & 20 < f \leq 200 \\ -93 - \left(\frac{f/4-50}{50}\right)\frac{\mathrm{dBm}}{\mathrm{Hz}} & 200 < f \leq 800 \\ -96 - \left(\frac{f/4-200}{25}\right)\frac{\mathrm{dBm}}{\mathrm{Hz}} & 800 < f \leq 1600 \end{cases}$



Proposals

- Proposal 1: The subclause 55.3.4 PMA training side-stream scrambler polynomials will be amended by: If the device auto-negotiated to reinitialize the values of its scrambler state every 16384 symbol periods, the device will stop re-initialization at the start of the state: PBO exchange.
- Proposal 2: The subclause 55.5.3.4 Transmitter power spectral density (PSD) and power level will be modified to the equations and graph given in this presentation, slide 5 and 6.