Refinement of SR4/SR10 Specifications

IEEE 802.3ba

Dallas

Nov 11 2008

Ali Ghiasi
Broadcom Corporation
aghiasi@broadcom.com
Key Items Require Further Work

- PMA to TP1 and TP4 to PMA loss
- Test point definition
- Channel loss budget
- Jitter Methodology
SR4/SR10 Loss Budget

- SerDes test board driving MCB

- SerDes driving channel
PMA Chip to TP1 or TP4 Loss

- It has been suggested 3” of PCB traces for SerDes to TP1 or TP4 which is unacceptable even on low loss material which will mask the measurement and reduce accuracy.
- PMA chip to TP1 or TP4 loss <=0.7 dB at Nyquist 0.2 dB higher than SFP+.
  - About 40 mm trace length in Rogers 4350B material with RF connector.

\[
SDD21\ (dB) = (-0.0007 - 0.1684 \times \sqrt{f} - 0.0617 \times f)
\]
Updated SR4/SR10 Channel Loss

• 5.3 dB loss at Nyquist include HCB loss assuming 1.3 dB
  – Host PCB Loss = 5.3 dB – 1.3 dB (HCB loss) – 0.5 (Connector loss)=3.5 dB
• Supports 3 to 6” of PCB trace

\[ SDD21(dB) = 0.5 - 0.5 \times f \]

\[ SDD21(dB) = -0.0929 - 0.7267 \times \sqrt{f} - 0.6897 \times f \]
Jitter Methodology

- Use of MJSQ if the jitter PDF is not dual-dirac often results in DJ values which much smaller than high probability jitter BER<1E-2.
  - The host output waveform may have significant DDPWS which is not fully captured by the DJ and it could result in significant optical penalty.
  - The high frequency jitter which is suppose to be captured by DJ could be severely underestimated due to the presence of RJ which will result in over stressing the host.
- Transmitter DDJ and DDPWS captures the high probability jitter effect without the DJ baggage
  - Replace DJ TBD with DDJ with value of 0.15 UI, also add DDPWS with value of 0.1 UI.
    - DDJ and DDPWS are tested with PRBS9
Jitter Methodology cont.

- For robust CDR operation high probability jitter must be limited.
  - MJSQ DJ is not the right metric for high probability jitter.
  - After about a year of investigation SFP+ went with 99% probability
  - Replace DJ=0.42 UI with 99% probability J2=0.42 UI.

- TP4 specifications TJ=0.7 UI is the same as SFP+ which means there is no SerDes, PCB routing, or crosstalk degradation on a SR4/SR10 link except the fibre reach was cut by 1/3!
  - The proposed TP4 jitter is on cliff.
  - Jitter tolerance is very expensive test.
  - Propose to reduce TP4 TJ from 0.7 UI to 0.65 UI.