

Baseline Proposal for 50, 100, and 200 Gb/s Backplane and Copper Cable

For IEEE 802.3cd

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Methodology

- Leverage the latest CEI-56G-LR-PAM4 spec (oif2014.380.03), the latest specifications of 802.3bs CDAUI-8 c2c (120D of 802d3bs_D2p0.pdf), 802.3bj, 802.3by, and modified/scaled with the latest COM from the Ad Hoc ([1],[2],[3],[4],[5],[6])
- Propose to use the same per lane specifications for 50GBASE-KR, 100GBASE-KR2 and 200GBASE-KR4. The rest of the presentation just refers to 50GBASE-KR for all these per lane specifications.
- Propose to use the same per lane specifications for 50GBASE-CR, 100GBASE-CR2 and 200GBASE-CR4. The rest of the presentation just refers to 50GBASE-CR for all these per lane specifications.

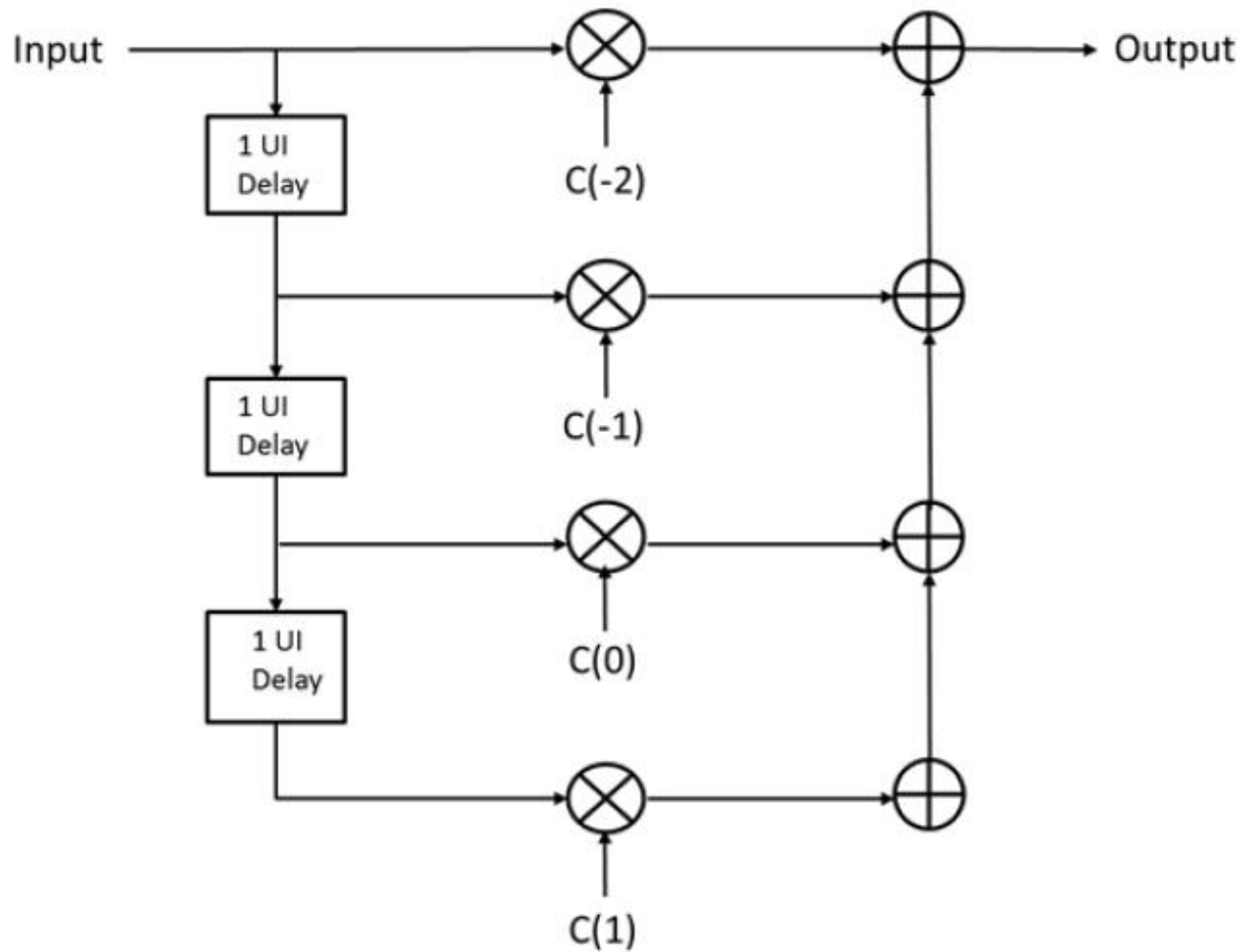
Part I: 50GBASE-KR

- Compliance point definition
 - The electrical characteristics for the 50GBASE-KR interfaces are defined at compliance points for the transmitter (TP0a) and receiver (TP5a), respectively.
 - The location of TP0a and electrical characteristics of the test fixture used to measure transmitter characteristics are defined in Figure 93-5 and 93.8.1.1, respectively.
 - The location of TP5a and electrical characteristics of the test fixture used to measure the receiver are defined in Figure 93-10 and 93.8.2.1, respectively.
- MDI
 - The MDI for 50GBASE-KR PHY is an implementation-dependent direct electrical connection between the PMD and the medium.
 - The MDI comprises two differential pairs, one for the transmit function and one for the receive function, marked by TP0 and TP5 in Figure 111–2.
 - Transmitter and receiver characteristics are defined at TP0a and TP5a, which are connected to the MDI through the test fixtures described in 93.8.1.1 and 93.8.2.1.

50GBASE-KR TX Spec (I)

- Transmitter electrical characteristics at TP0a for 50GBASE-KR the same as those summarized in Table 120D-1 and detailed in 120D.3.1.1 through 120D.3.1.2.2, except
 - Steady state voltage v_f (max): 0.60 V
 - Steady state voltage v_f (min): 0.40 V
 - Linear fit pulse peak (min): $0.75 \times v_f$
 - Signal-to-noise-and-distortion ratio (min): 31 dB
 - Pre and post cursor equalizations: defined in slide 5 and 6 respectively
 - Replace “J5(max): 0.128 UI” with “J4(max): TBD ”

50GBASE-KR TX Spec (II): Equalization Functional Model



50GBASE-KR TX Spec (III): Pre and post Cursor Coefficients

TX Equalization Coefficients

Coefficients	Normalized Amplitude		Normalized Step Size (%)
	Min (%)	Max (%)	
C-2	0	10	2.5
C-1	-25	0	5
C1	-25	0	5
C0	60	100	5

50GBASE-KR RX Spec

- Receiver electrical characteristics at TP5a for 50GBASE-KR the same as those summarized in Table 120D-4 and detailed in 120D.3.2.1 through 120D.3.2.2, except
 - For Table 120D-5 (Interference Tolerance Parameters)
 - Change RS-FEC Symbol error ratio to $1e-3$
 - Change Insertion loss at 13.2813 GHz to: 14.5 -15.5 dB for Test1 and 29.5-30.5 dB for Test 2 respectively
 - Change RSS_DFE4 to 0.05 for Test1
 - References in the Jitter tolerance section should be to this modified table
 - Normative specifications for differential return loss and differential to common-mode return loss should be taken from equations 93-3 and 93-5 and but should be in Magenta.

50GBASE-KR Channel Spec

- See http://www.ieee802.org/3/cd/public/Sept16/kareti_3cd_01_0916.pdf for COM
- The informative insertion loss characteristic is a maximum 30dB at Nyquist. A scaled version of Equation 93-6 with all factors multiplied by 30/35 should be included in Magenta
- The normative differential return loss specification should be in Magenta below (taken from OIF CEI-56G-LR-PAM4 (oif2014.380.03) [2])

$$RL_{max} = - \begin{bmatrix} 12, & f_{min} \leq f < \frac{f_b}{4} \\ 12 - 15 \log_{10} \left(\frac{4f}{f_b} \right), & \frac{f_b}{4} \leq f \leq f_b \end{bmatrix}$$

Part II: 50GBASE-CR

- PMD functional specifications
 - Shall be the same as those detailed in 110.7.1 through 110.7.10 except change 25GBASE-CR and/or 25GBASE-CR-S to 50GBASE-CR.
 - This presentation is to add to the already adopted baseline provided by
http://www.ieee802.org/3/cd/public/July16/diminico_3cd_01a_0716.pdf.

50GBASE-CR TX Spec

- Transmitter electrical characteristics at TP2 for 50GBASE-CR the same as those summarized in Table 92-6 and detailed in 92.8.3.1 through 92.8.3.9, except
 - Differential peak-to-peak output voltage (max.) with Tx disabled: 30 mv
 - Replace “Transmitted waveform: abs coefficient step size (min.), abs coefficient step size (max.), minimum precursor full-scale ratio, minimum post cursor full-scale ratio” with “Pre and post cursor equalizations: defined in slide 5 and 6 respectively”
 - Signal-to-noise-and-distortion ratio (min.): TBD
 - Replace “Effective bounded uncorrelated jitter, peak-to-peak” with “Jrms (max): TBD”
 - Replace “Effective total uncorrelated jitter, peak-to-peak” with “J4(max): TBD”
 - Signaling rate, per lane: 26.5625 +-100 ppm GBd
 - Unit interval nominal: 37.64706 ps

50GBASE-CR RX Spec (I)

- Receiver electrical characteristics at TP3 for 50GBASE-CR the same as summarized in Table 92–7 and detailed in 92.8.4.2, 92.8.4.3 and 92.8.4.6, except
 - Interference Tolerance: defined by slide 13
 - Signaling rate, per lane: 26.5625 \pm 100 ppm GBd
 - Unit interval nominal: 37.64706 ps
- In addition, the requirements in 110.8.4.1, 110.8.4.2, 110.8.4.3, and 110.8.4.4 apply, except
 - Table 110-6 is modified in slide 13
 - Tables 110-7, 110-8 are removed
 - Table 110-9 is replaced with Table 120D-6

50GBASE-CR RX Spec (II)

- Receiver Interference Tolerance at TP3 for 50GBASE-CR the same as summarized in Table 110-6, except
 - RS-FEC symbol error ratio required: $1e-3$
 - The Test 2 (high loss) value for the Test channel becomes 23.21dB min and 23.71dB max and the Cable assembly insertion loss becomes 14.06dB min and 16.06dB max.
 - Even-odd jitter: 0.019 UI
 - b_{max} used in COM calculation: 0.7
 - DER0 used in COM calculation: $1e-4$
 - Unit interval nominal: 37.64706 ps

50GBASE-CR COM

- The COM requirements for the cable assembly types are the same as those specified in 110.10.7, except
 - COM parameter table is replaced with that in http://www.ieee802.org/3/cd/public/Sept16/kareti_3cd_01_0916.pdf

References

- [1] http://www.ieee802.org/3/50G/public/Mar16/li_50GE_NGOATH_01a_0316.pdf
- [2] OIF, CEI-56G-LR-PAM4, oif2014.380.03, www.oiforum.com
(That document was provided as an attachment to the July, 2016 liaison from OIF to IEEE 802.3. The liaison and its attachments can be found in the IEEE P802.3cd 50, 100 Gb/s Ethernet Task Force private area)
- [3] http://www.ieee802.org/3/cd/public/Sept16/kareti_3cd_01_09016.pdf
- [4] IEEE P802.3bs™/D2.0, 28th July 2016 (Amendment of IEEE Std 802.3™-2015), Draft Standard for Ethernet, Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 200 Gb/s and 400 Gb/s Operation
- [5] IEEE P802.3by™, (Amendment of IEEE Std 802.3™-2016), Standard for Ethernet Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 25 Gb/s Operation
- [6] IEEE P802.3bj™, Standard for Ethernet Amendment 2: Physical Layer Specifications and Management Parameters for 100 Gb/s Operation Over Backplanes and Copper Cables