

10GBASE-L Jitter Specification

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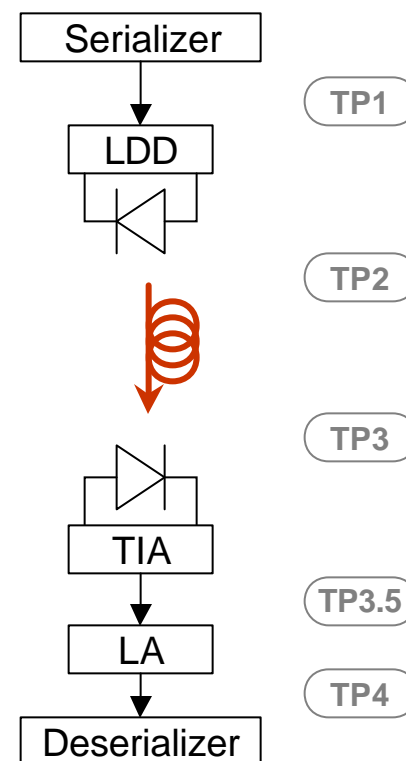
Discussion

- 802.3ae Draft 3.0
 - TP3 specified by IEEE
 - Tx jitter budget is increased by 0.05 UI (relative to 1GbE)
 - Rx jitter budget is decreased by same amount
 - Additional sine jitter component (0.05 UI)
 - 0.1 UI additional stress on the Rx and clock recovery circuits
- 10GbE
 - Only specifies a jitter mask
 - Use familiar concepts of DJ & RJ to evaluate whether current mask definition is the optimum.

Discussion (cont.)

- Compare with 1GbE
- Only TP3 is specified in 10GbE Draft 3.0 (highlighted)
- Set TP3 jitter to be consistent with Draft 3.0 specifications
 - Adjust TP1-to-TP2 and TP2-to-TP3 DJ to make the numbers agree
 - Allocate TP3-to-TP4 as in 1GbE
- Problems with current Draft 3.0 jitter mask?
 - Too much DJ & TJ at TP3 compared with 1GbE?
 - Does DJ make sense with scrambled data?

	1GbE			10GbE (Draft 3.0)		
	TJ (UI-pp)	RJ (UI-rms)	DJ (UI-pp)	TJ (UI-pp)	RJ (UI-rms)	DJ (UI-pp)
TP1	0.240	0.0100	0.100	0.240	0.0100	0.100
TP1 to TP2	0.284	0.0131	0.1000	0.226	0.0072	0.125
TP2	0.431	0.0165	0.200	0.398	0.0123	0.225
TP2 to TP3	0.169	0.0085	0.050	0.244	0.0085	0.125
TP3	0.510	0.0186	0.250	0.560	0.0150	0.350
TP3 to TP4	0.334	0.0087	0.212	0.334	0.0087	0.212
TP4	0.749	0.0205	0.462	0.804	0.0173	0.562
Sine Jitter	0.000	0.0000	0.000	0.050	0.0000	0.050
Jitter Tol.	0.749	0.0205	0.462	0.854	0.0173	0.612



Jitter Proposal

- SMF at 1300nm with DFB lasers will add little jitter to the signal
 - Decrease TP2-to-TP3 DJ and RJ
 - Allocate some to Tx and some to Rx
- A reasonable compromise?
 - Slightly better tolerance required compared to 1GbE
 - Relaxes slightly the specs on the Tx

	1GbE			10GbE Proposal		
	TJ (UI-pp)	RJ (UI-rms)	DJ (UI-pp)	TJ (UI-pp)	RJ (UI-rms)	DJ (UI-pp)
TP1	0.240	0.0100	0.100	0.240	0.0100	0.100
TP1 to TP2	0.284	0.0131	0.1000	0.308	0.0131	0.125
TP2	0.431	0.0165	0.200	0.456	0.0165	0.225
TP2 to TP3	0.169	0.0085	0.050	0.025	0.0000	0.025
TP3	0.510	0.0186	0.250	0.481	0.0165	0.250
TP3 to TP4	0.334	0.0087	0.212	0.334	0.0087	0.212
TP4	0.749	0.0205	0.462	0.723	0.0186	0.462
Sine Jitter	0.000	0.0000	0.000	0.050	0.0000	0.050
Jitter Tol.	0.749	0.0205	0.462	0.773	0.0186	0.512

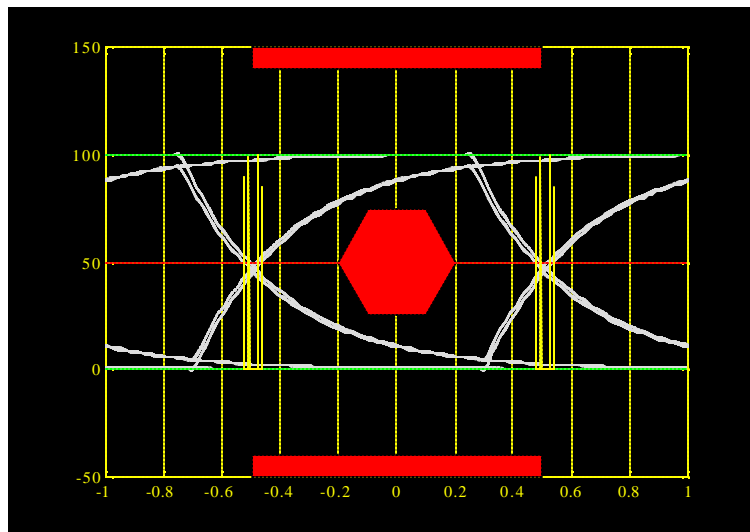
Backup Material

Link simulations

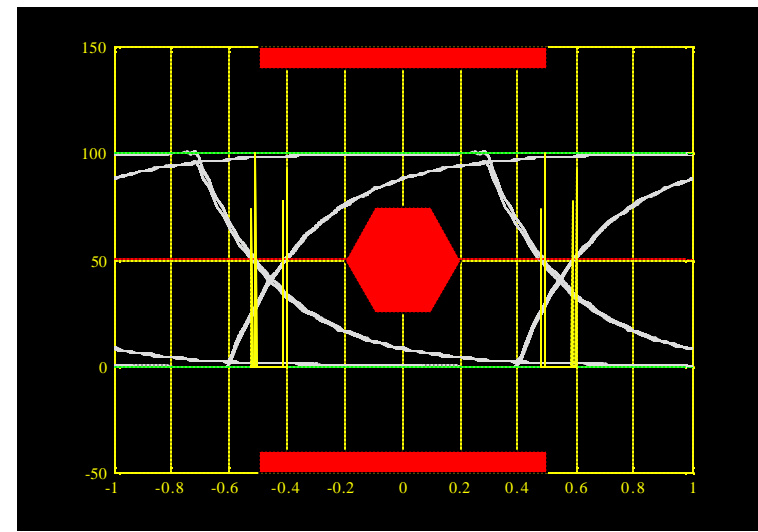
- Used the field model to simulate signal propagation
- Input signal rise time/DJ varied
- Signal at receiver output recorded, penalties and DJ extracted from signal waveform
- Fiber has negligible contribution to DJ, current allocation too high

	1st order filter	1st order filter	4th Order	4th Order
DJ2	13	8.7	13	8.7
Trise	61	71	61	71
DJ35	16	8.0	12	9
ISI	1.32	1.4	0.9	0.98
RX BW	7.725	7.725	7.725	7.725

Eye Diagrams at TP2

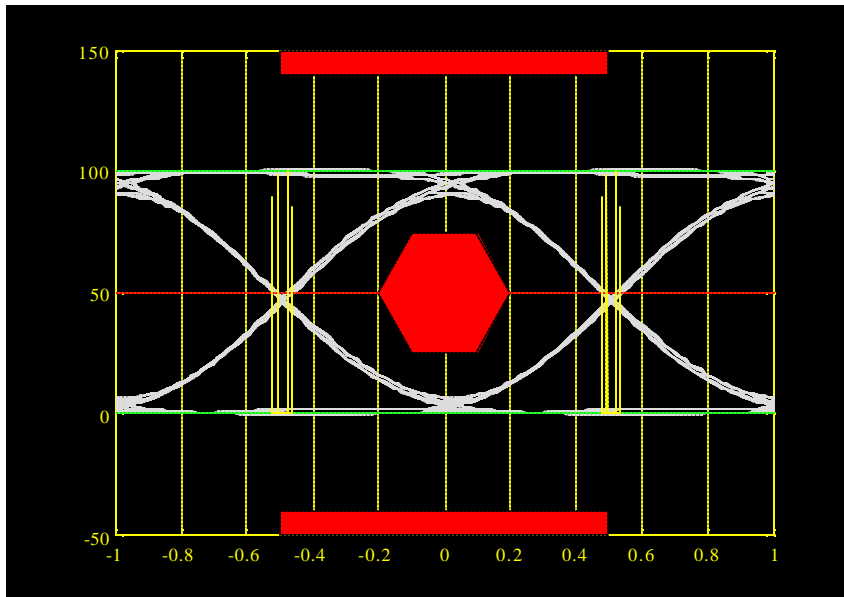


Eye diagram @ TP2, (without BT filter) Trise 71 ps, nominal DJ (8 ps)



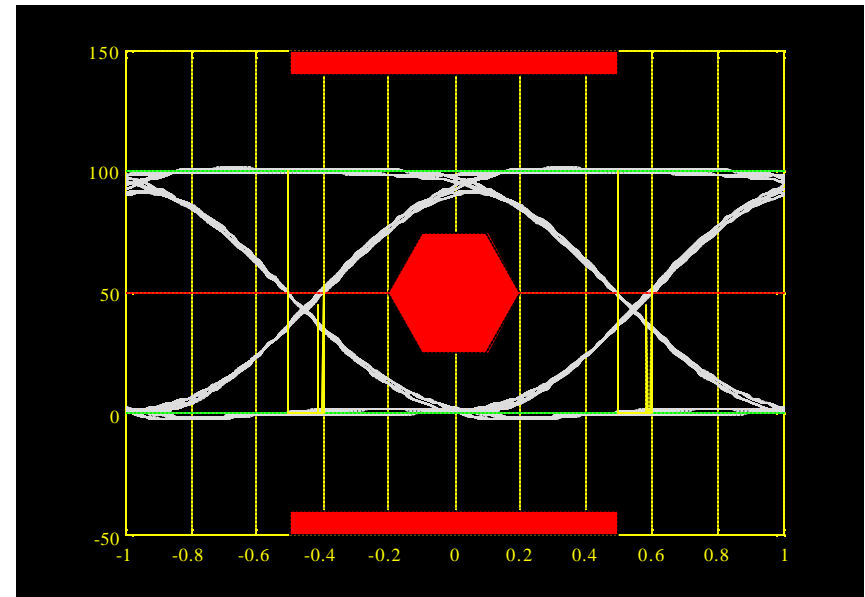
Eye diagram @ TP2, (without BT filter) Trise 61 ps, nominal DJ (12 ps)

Eye Diagrams: Receiver Transfer Function with Filter Order N=4



RX BW=7725 MHz; Nfilter=4;

**Trise (10-90)=71.3ps; DJ@TP2=8.7 ps;
DJ@TP35=9.0 ps; ISI @TP35=0.98 dB**

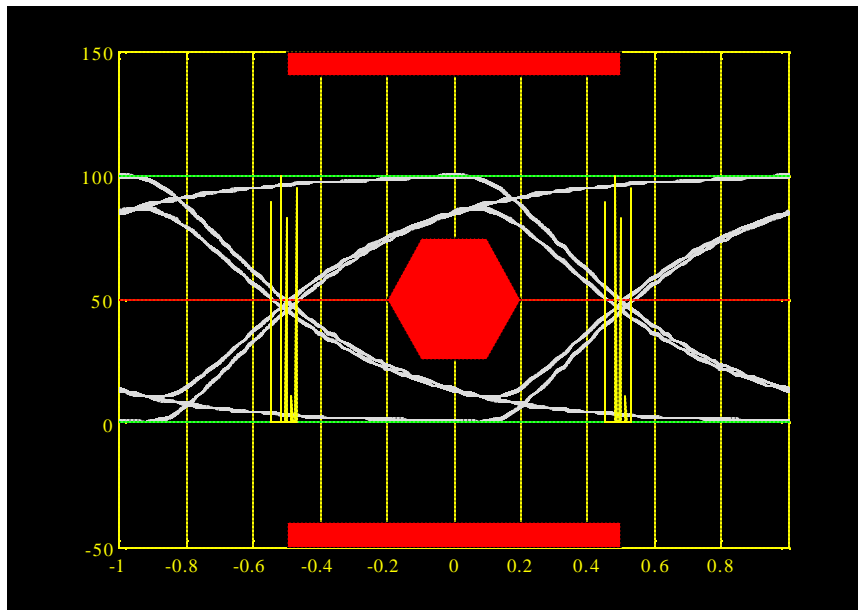


RX BW=7725 MHz; Nfilter=4;

**Trise(10-90)=61ps; DJ@TP2=13 ps
DJ@TP35=12 ps; ISI @TP35=0.9 dB**

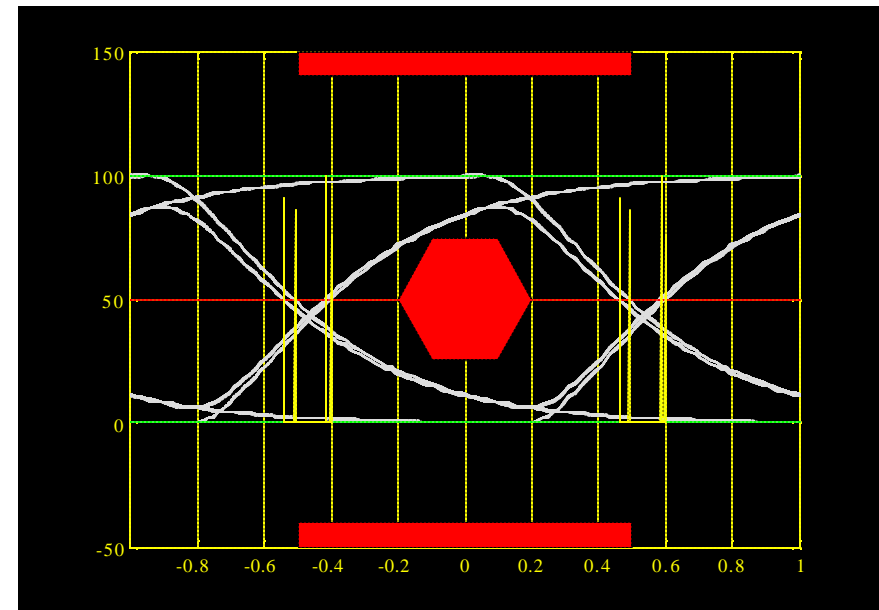
Eye Diagrams Receiver Transfer Function With Filter Order N=1

- change in ISI penalty/DJ 0.08 dB - similar to the case when filter order N=4
- jitter slightly higher when rise time longer



RX BW=7725 MHz; Nfilter=1;

**Trise (10-90)=71.3ps; DJ@TP2=8.7 ps;
DJ@TP35=8.0 ps; ISI @TP35=1.4 dB**



RX BW=7725 MHz; Nfilter=1;

**Trise (10-90)=61ps; DJ@TP2=13 ps;
DJ@TP35=16 ps; ISI @TP35=1.32 dB**