

CI 122	SC 122.7.1	P 45	L 35	# P-197
Nowell, Mark		Cisco		
Comment Type	T	Comment Status	R	
Public Review Comment no. [197] by [mnowell@cisco.com] on draft designation [802.3cn]: This comment touches a number of different numbers in the draft beyond the one identified in the comment.				
The recent technical contributions reviewed in the P802.3cu Task Force indicate that new technical information has been made available since this draft went into SA ballot. The TDECQ value of 3.4 dB seems low (or the reach too long) for the chromatic dispersion that the 400GBASE-ER8 transmitter will experience.				
In <a href="http://www.ieee802.org/3/cu/public/Sept19/stassar_3cu_01_0919.pdf">http://www.ieee802.org/3/cu/public/Sept19/stassar_3cu_01_0919.pdf</a> it was showed that due to dispersion a CWDM based 100 Gb/s PAM4 signal would experience excessive chromatic dispersion limiting the reach of the interface. Based on this contribution and other contributions, the P802.3cu TF concluded that the reach should be reduced to 6km.				
The general rule of thumb is that the dispersion penalty scales with the square of the data rate. Therefore, it should be expected that the maximum dispersion that the 400GBASE-ER8 should be ~ 4x that defined in P802.3cu. However, comparing the adopted baseline in P802.3cu <a href="http://www.ieee802.org/3/cu/public/Sept19/lewis_3cu_02a_0919.pdf">http://www.ieee802.org/3/cu/public/Sept19/lewis_3cu_02a_0919.pdf</a> to the values in D3.0 of P802.3cn we find for negative dispersion that this results in -35.2 ps/nm vs -201 ps/nm.				
This is ~5.7x higher in D3.0 which seems excessive given the lower TDECQ in D3.0 regardless of the other differences between 100 Gb/s and 50 Gb/s.				
<b>Suggested Remedy</b>				
Re-examine the 400GBASE-ER8 link budget to ensure the same criteria is applied given the new insights and wealth of experimental evidence examined in P802.3cu.				
Based on the simple rule of thumb this would suggest a max negative dispersion of ~ -140 ps/nm which is close to the 30km reach called out in D3.0.				
Suggested change is to reduce the max reach to 30 km and reconcile that numbers in the rest of the link budget.				
This includes but is not limited to:				
- remove 40km column for 400GBASE-ER8 from Table 122-13 and Table 122-17				
- Reduce Max DGD to 8.8ps for 400GBASE-ER8 in Table 122-17				
- update dispersion length coefficient for 400GBASE-ER8 for reduced length in Table 122-16				
Response	Response Status C			
REJECT.				
As noted in the comment, the IEEE P802.3cu project is addressing solutions based on 100 Gb/s PAM4 signaling, while the IEEE P802.3cn project (that is the subject of this comment) is addressing solutions based on 50 Gb/s PAM4 signaling. Therefore, a detailed analysis,				

not a rule of thumb approach, is necessary.

The data for the highest CD penalty (TDECQ-SECQ) vs dispersion values submitted to the P802.3cu project was present in

[http://www.ieee802.org/3/cu/public/May19/anslow\\_3cu\\_02a\\_0519.pdf#page=4](http://www.ieee802.org/3/cu/public/May19/anslow_3cu_02a_0519.pdf#page=4) presented on 23 May 2019. All data regarding CD penalty (TDECQ-SECQ) vs dispersion that has been made available to the P802.3cu task force since then has been lower penalty for a given dispersion. There have been 3 ballots of the P802.3cn draft subsequent to 23 May 2019 and no comments were received claiming that the CD penalty for 400GBASE-ER8 is too high.

Using the rough "rule of thumb" cited in the comment, the dispersion limits of +37 ps/nm and -201 ps/nm for the 400GBASE-ER8 PMD would be roughly equivalent to 9 ps/nm to -50 ps/nm at the wavelength extremes for the measurements shown on

[http://www.ieee802.org/3/cu/public/Sept19/stassar\\_3cu\\_01\\_0919.pdf#page=11](http://www.ieee802.org/3/cu/public/Sept19/stassar_3cu_01_0919.pdf#page=11)

All of the measurement results in the region of +9 ps/nm show a value of TDECQ - SECQ of less than 1 dB.

In the region of -50 ps/nm, measurement results are shown for 8 different devices. Of those only one would be expected to exceed 2 dB of CD penalty. Looking at the value of TDECQ for these 8 devices, 6 of them would be expected to meet the 3.4 dB TDECQ limit despite the fact that they are running at 53.125 GBd, which is double the symbol rate of the 400GBASE-ER8 PMD.

Taking all of the 100 Gb/s device results illustrated in [stassar\\_3cu\\_01\\_0919.pdf](http://www.ieee802.org/3/cu/public/Sept19/stassar_3cu_01_0919.pdf) and averaging the SECQ values gives 2.34 dB. Taking the 6 separate 50 Gb/s results from the central chart on

[http://www.ieee802.org/3/cd/public/July18/mazzini\\_3cd\\_01d\\_0718.pdf#page=10](http://www.ieee802.org/3/cd/public/July18/mazzini_3cd_01d_0718.pdf#page=10) gives an average TDECQ of 1.06 dB, which is lower than the average of the 100 Gb/s results by 1.28 dB. A shift of this amount in the 100 Gb/s TDECQ results would bring all of them except one below the 3.4 dB limit. Consequently, the 100 Gb/s per lane data submitted to the IEEE P802.3cu project does not show that the penalty allowed for in the P802.3cn 400GBASE-ER8 budget is not adequate for a reach of 40 km as required by the Task Force adopted objectives and as described in the project CSD responses.

Straw poll:

Do you support changing the reach for 400GBASE-ER8 to 30 km?

Y: 5

N: 14

There was no consensus to make the change.