

400GBASE-LR4 Engineered Link Specification Approach Proposal

P802.3cu 100 Gb/s and 400 Gb/s over SMF at
100 Gb/s per Wavelength Task Force Ad Hoc

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FINISAR[®]

Introduction

- At the May Interim, there was discussion of alternatives to 400G LR4 spec based on worst case 10km SMF link
 - What's so special about 10km?
http://www.ieee802.org/3/cu/public/May19/cole_3cu_02c_0519.pdf
 - Two SMF Spec Limit Types for 802.3 PMDs Proposal
http://www.ieee802.org/3/cu/public/May19/cole_3cu_01a_0519.pdf
- At the July Plenary, a path forward was considered to reduce the 400G LR4 10km reach objective
- While 10km has some operating advantages, end users are not willing to pay an appreciable cost premium for this exact reach over a somewhat shorter reach with same loss budget

Cost is King

- CWDM grid has technical cost advantages:
 - No TEC, and associated simpler assembly techniques
 - Simpler WDM filters
- However, main cost drivers are:
 - Volume
 - Manufacturing margin
- 400G FR4 in 3+ years is expected to be a high volume interface in the cloud datacenter
- Based on TF contributions, worst case 10km SMF link CWDM4 spec does not have a lot of manufacturing margin
- Ideal spec leverages the FR4 volume and has comfortable manufacturing margin

100GBASE-ER4 Style Discussion Link Budget

Illustrative Link Power Budget

Description	400GBASE-LR4		Unit
Power budget (for max TDECQ)	10.5	10.5	dB
Operating distance	8	10	km
Channel insertion Loss	5.8	6.3	dB
Allocation for penalties (for max TDECQ)	4.0	4.2	dB
Additional insertion loss allowed	0.7	0.0	dB

This still leaves the problem identified by Brian of how to prevent bad transmitters for middle wavelengths

This Issue Will Come Up Again

- There will be future 200 Gb/s and 400 Gb/s per wavelength specs. (hopefully these we will write when ready)
- It is unreasonable to expect that regardless of technology break-points, we will have to hit 10km reach objectives
- We might as well deal with this issue now

400GBASE-LR4 Engineered Link Specification

Thank You