

Considerations on chromatic dispersion requirements for 400GBASE-LR4 (10 km)

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Introduction

- This presentation provides considerations on chromatic dispersion requirements for fibers supporting distances longer than 6 km currently specified for 400GBASE-LR4-6
- In P802.3cu draft D2.0 for 400GBASE-LR4-6 a chromatic dispersion range of -35.2 to 19.9 ps/nm is specified to support at least up to 6 km of standard G.652 fibers for maximum TDECQ – TECQ of 2.5 dB
- Comment #82 by David Lewis proposes to increase the maximum distance of 6 km to 10 km
- In [chang_03cu_01_033120](#) it is suggested that by tightening fiber chromatic dispersion requirements it would be possible to significantly increase the maximum distance from 6 km, for instance by a lambda zero range from 1305 to 1315 nm (instead of 1300 to 1324 nm)

Current dispersion specification for 400GBASE-LR4-6

- Chromatic dispersion range: -35.2 to 19.9 ps/nm
- Effective wavelength range: 1264.5 nm to 1337.5 nm
- Maximum TDECQ – TECQ: 2.5 dB
- Fiber specifications:
 - G.652
 - Lambda zero: $1300 - 1324$ nm
 - Dispersion slope: 0.092 ps/nm².km max
 - Dispersion coefficient:
 - -5.87 ps/nm.km @ 1264.5 nm
 - 3.31 ps/nm.km @ 1337.5 nm

Limiting G.652 lambda zero range to 1305 – 1315 nm

- Assuming, chromatic dispersion range: -35.2 to 19.9 ps/nm
- Fiber specifications:
 - Selected G.652
 - Lambda zero: 1305 – 1315 nm
 - Dispersion slope: 0.092 ps/nm².km max
 - Dispersion coefficient:
 - -4.93 ps/nm.km @ 1264.5 nm
 - 2.88 ps/nm.km @ 1337.5 nm
- Achievable distance:
 - -35.2 ps/nm & -4.93 ps/nm.km @ 1264.5 nm provides a distance of 7.14 km
 - 19.9 ps/nm & 2.88 ps/nm.km @ 1337.5 nm provides a distance of 6.91 km
 - **Roughly 7 km instead of 6 km, which is by far not enough to get to 10 km**

Required lambda zero range to achieve 10 km

- Assuming, chromatic dispersion range: -35.2 to 19.9 ps/nm over 10 km
- Fiber specifications:
 - Selected G.652
 - Dispersion slope: 0.092 ps/nm².km max
 - Calculated dispersion coefficient for 10 km distance:
 - -3.52 ps/nm.km @ 1264.5 nm
 - 1.99 ps/nm.km @ 1337.5 nm
- Required lambda zero for selected G.652 fiber:
 - -3.52 ps/nm.km @ 1264.5 nm requires a maximum lambda zero of 1301 nm
 - 1.99 ps/nm.km @ 1337.5 nm requires a minimum lambda zero of 1315.5 nm
 - **Thus lambda zero ≤ 1301 nm AND lambda zero ≥ 1315.5 nm**
 - **Both are mutually exclusive**

Thanks!