



Proposed DGDmax for 100GBASE-FR and 400GBASE-FR4

IEEE 802.3cu Task Force
David Lewis, Lumentum

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Discussion of DGDmax for 2 km links

- At last Task Force meeting a DGDmax value of 5 ps was adopted for 100GBASE-LR. The estimated DGD penalty for 10 km is 0.25 dB.
- Other 2 km PMDs (e.g., 50GBASE-FR, 200GBASE-FR4, 400GBASE-FR8) set DGDmax at 3 ps which results in a non-negligible penalty (see [anslow_3cu_01_0519.pdf](#)).
- If we make the same assumptions as were used to reduce the 10 km value from 8 to 5 ps, we could set the 2 km value at 2.3 ps, close to the value used for 100GBASE-DR and 400GBASE-DR4. This results in a very small penalty requiring no change to the link power budget.

Proposal - 1

In Table 140-11 of 802.3cu, replace the TBD for DGD_max in the 100GBASE-FR column with a value of 2.24 ps.

Table 140–11—Fiber optic cabling (channel) characteristics

Description	100GBASE-DR	<u>100GBASE-FR</u>	<u>100GBASE-LR</u>	Unit
Operating distance (max)	500	<u>2 000</u>	<u>10 000</u>	m
Channel insertion loss ^{a,b} (max)	See Table 140–12	<u>4.0</u>	<u>6.3</u>	dB
Channel insertion loss (min)	0	<u>0</u>	<u>0</u>	dB
Positive dispersion ^b (max)	0.8	<u>3.2</u>	<u>16</u>	ps/nm
Negative dispersion ^b (min)	–0.93	<u>–3.7</u>	<u>–18.6</u>	ps/nm
DGD_max ^c	2.24	2.3	<u>5</u>	ps
Optical return loss (min)	27	<u>25</u>	<u>22</u>	dB

^aThese channel insertion loss values include cable, connectors, and splices.

^bOver the wavelength range 1304.5 nm to 1317.5 nm

^cDifferential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal. DGD_max is the maximum differential group delay that the system must tolerate.

Proposal - 2

In Table 151-13 of 802.3cu, replace the TBD for DGD_max in the 400GBASE-FR4 column with a value of 2.24 ps.

Table 151–13—Fiber optic cabling (channel) characteristics

Description	400GBASE-FR4	400GBASE-LR4	Unit
Operating distance (max)	2		km
Channel insertion loss ^{a,b} (max)	4		dB
Channel insertion loss (min)	0		dB
Positive dispersion ^b (max)	6.7		ps/nm
Negative dispersion ^b (min)	-11.9		ps/nm
DGD_max ^c	2.3		ps
Optical return loss (min)	25		dB

^a These channel insertion loss values include cable, connectors, and splices.

^b Over the wavelength range 1264.5 nm to 1337.5 nm for 400GBASE-FR4.

^c Differential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal. DGD_max is the maximum differential group delay that the system must tolerate.