

# Max DGD Penalty

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# Background

- In recent 802.3 task force contributions, anslow\_3cu\_01\_0519 and castro\_3cu\_adhoc\_070319, new lower Max DGD values have been proposed and accepted
- These recommendations for lower values are based on deployment of primarily G.652.B and D fiber over the last 10-15 years.
- These fiber types have a lower  $\text{PMD}_Q$  specification value of 0.2 ps/ $\sqrt{\text{km}}$  as compared to earlier G.652.A and C fiber types with value of 0.5 ps/ $\sqrt{\text{km}}$
- These new values have been written into the 802.3cu draft

# Data from anslow\_3cu\_01\_0519

## **DGD\_max 3**

Vince Ferretti from Corning has helpfully pointed out a relevant publication:

JACOBS, S.A. et al., Statistical Estimation of PMD Coefficients for System Design. Electronics Letters, 1997, 33, pp. 619-621

This includes an analysis of 288 randomly selected scaled cabled fibers.

Equation 10 of this is:

$$X_Q = \frac{(2.004 + 0.975\sqrt{n \times 0.979})}{\sqrt{n \times 48.6}}$$

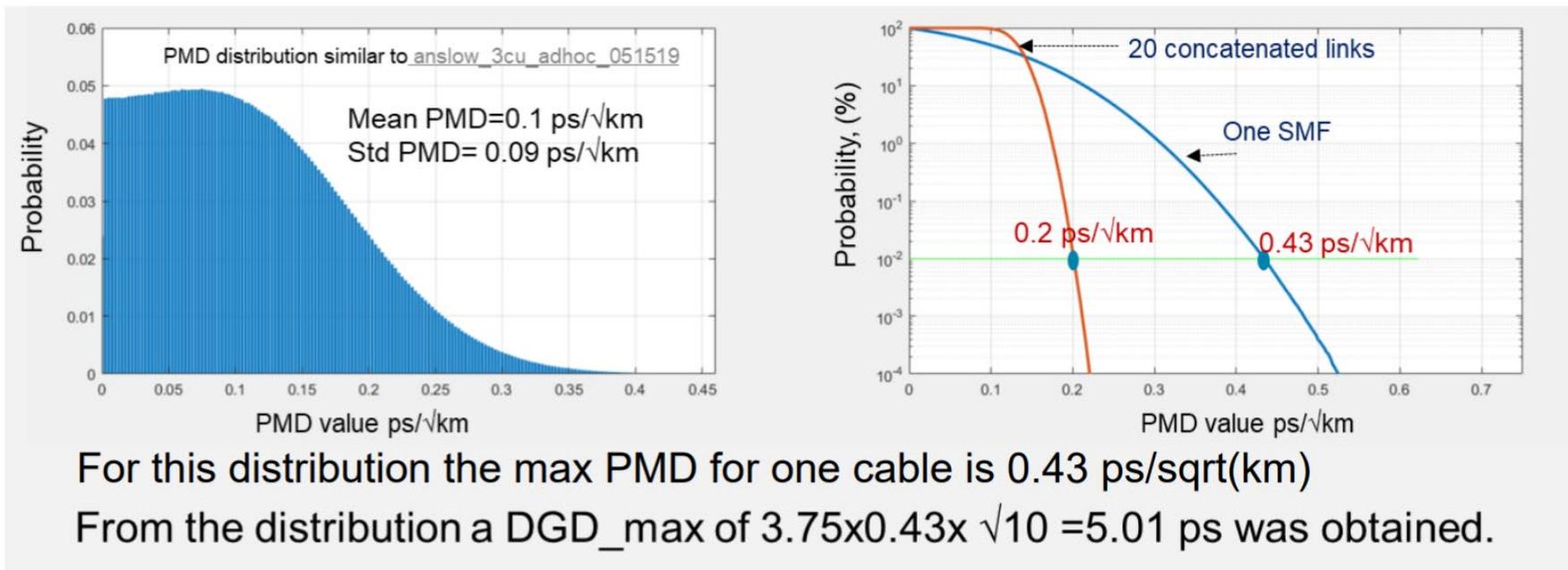
For  $n = 1$  (one cable segment), this evaluates to  $X_Q = 0.426$  ps/ $\sqrt{\text{km}}$

For a 10 km link and with a ratio of “Max” DGD to mean DGD of 3.75, this is also a DGD\_max of 5 ps.

# Data from castro\_3cu\_adhoc\_070319

## PMD distribution used to estimate PMD penalty

If the  $PMD_Q$  (20 concatenated cables) is 0.2 ps/sqrt(km) what is the maximum PMD for one that occurs with probability of 0.01% ?



For this distribution the max PMD for one cable is 0.43 ps/sqrt(km)

From the distribution a  $DGD_{max}$  of  $3.75 \times 0.43 \times \sqrt{10} = 5.01$  ps was obtained.

The correct parameters for the shown distribution are: MEAN= 0.1 ps/ √km STD i=0.074 ps/ √km

# Proposed Max DGD values for 802.3cs

- For 50km:  $0.43 \text{ ps}/\sqrt{\text{km}} \times 3.75 \times \sqrt{50\text{km}} = 11.4\text{ps}$

# Conclusions

- 802.3cu has provided updated max DGD values to be considered for 802.3 projects
- These updates are based on considering that most if not all of the fiber that has been deployed over the last 10-15 years has been G.652.B or D fiber, both of which have a lower  $\text{PMD}_Q$  specification
- Recommend that 802.3cs adopt this same methodology

Thanks!