

# P802.3cn DGD penalty

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# Introduction

Baselines have been adopted for:

50GBASE-ER

200GBASE-ER4

400GBASE-ER8

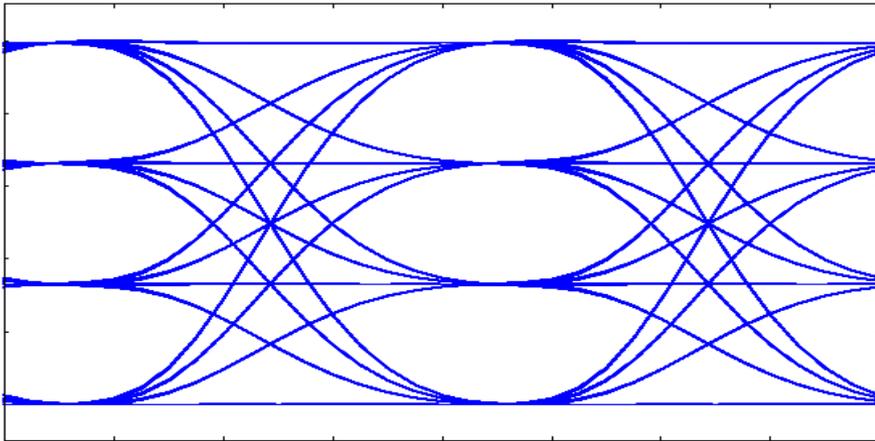
In all three baselines, an allowance of 0.5 dB has been made for the combination of MPI and DGD penalties.

A companion contribution [anslow\\_3cn\\_02\\_0119](#) analyses the MPI penalty and proposes a set of reflectances that would result in 0.25 dB of penalty. This would leave 0.25 dB in the budget for DGD.

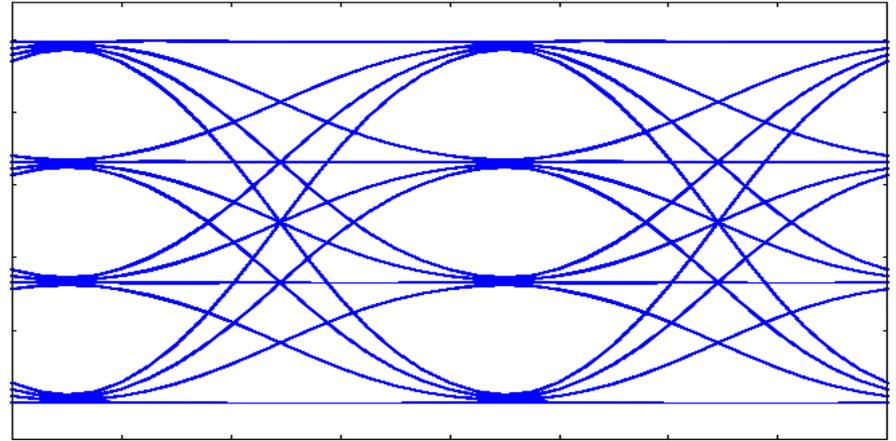
This presentation looks at the expected DGD penalty that these PMDs could have.

# ~20 GHz bandwidth Tx eyes

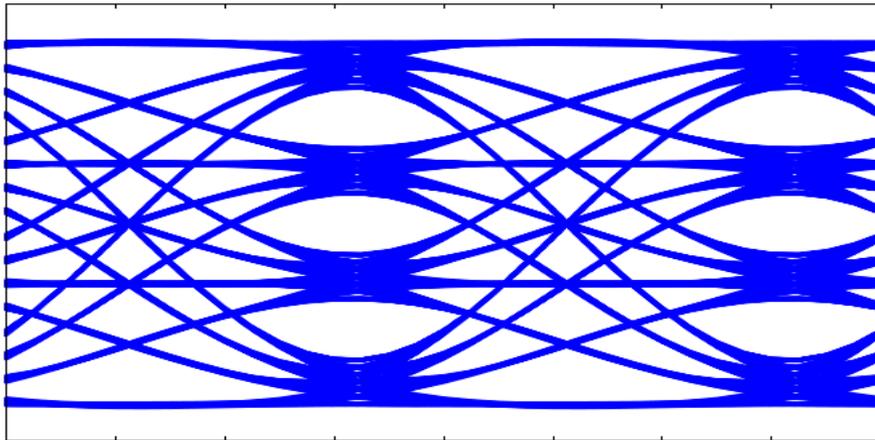
Tx eye 0ps DGD



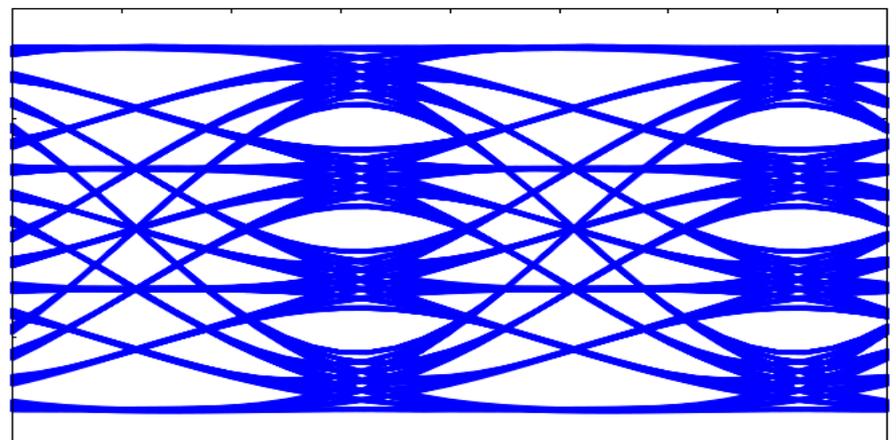
Tx eye 10.3ps DGD



Eye as seen via a 13.28 GHz Rx 0ps DGD

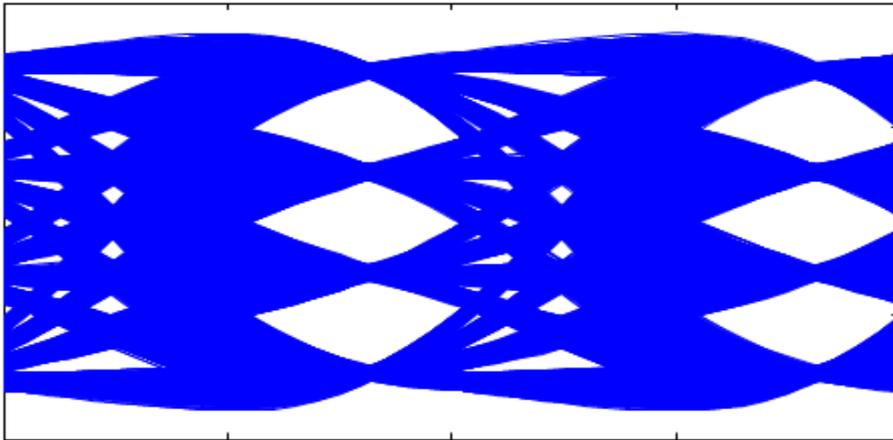


Eye as seen via a 13.28 GHz Rx 10.3ps DGD



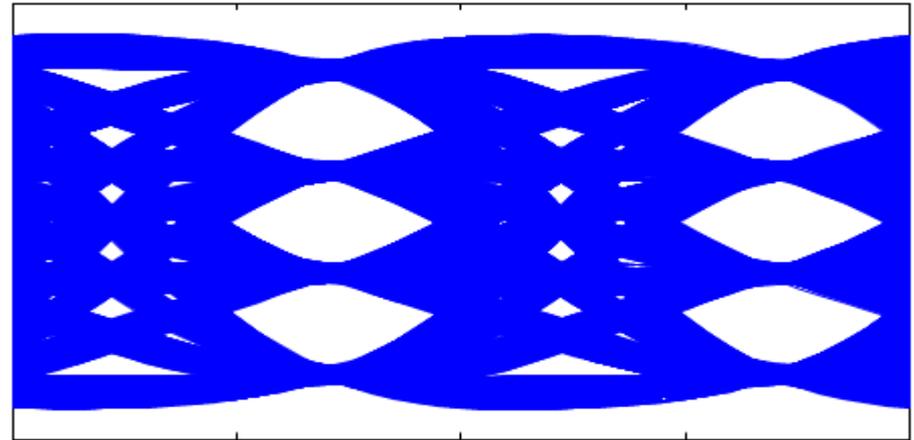
# SECQ for ~20 GHz bandwidth Tx

Eye after equalizer 0ps DGD



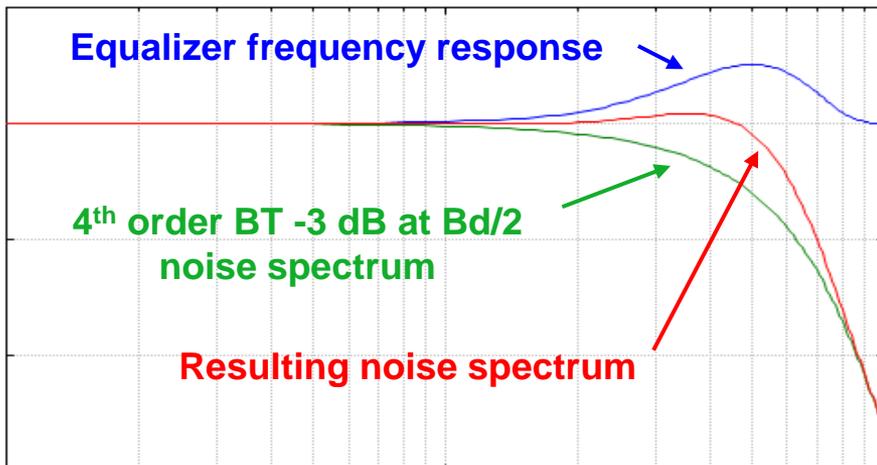
SECQ = 1.02 dB

Eye after equalizer 10.3ps DGD

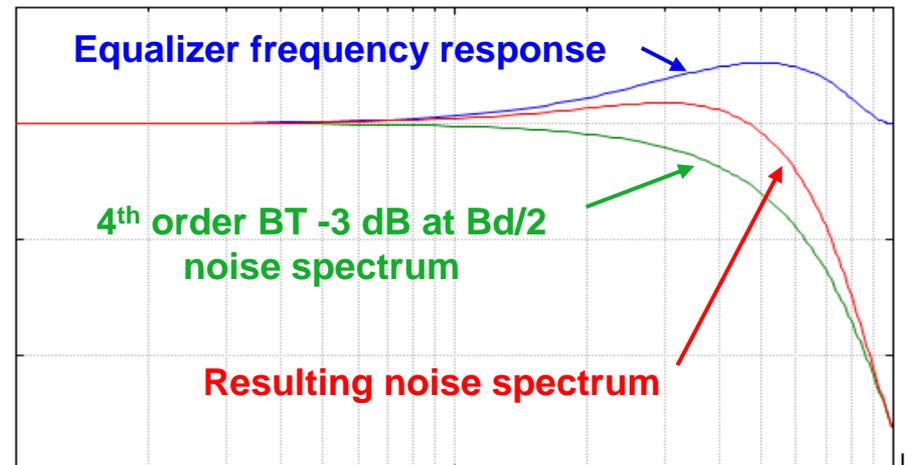


SECQ = 1.27 dB  
0.25 dB DGD penalty

Equalizer frequency response 0ps DGD

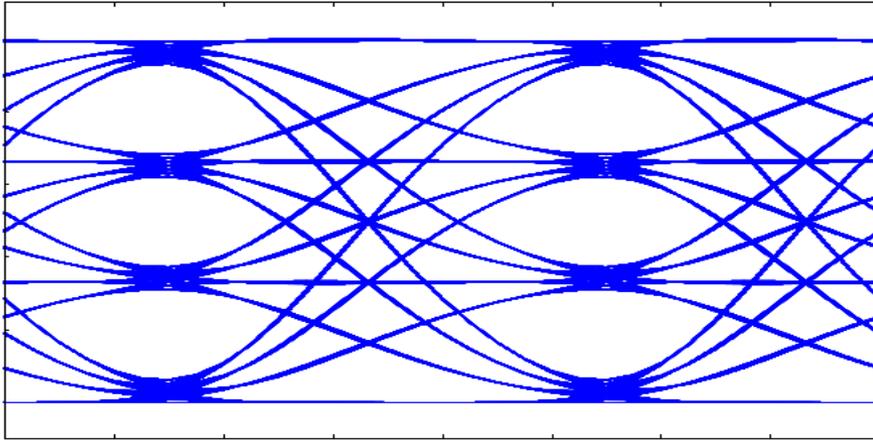


Equalizer frequency response 10.3ps DGD

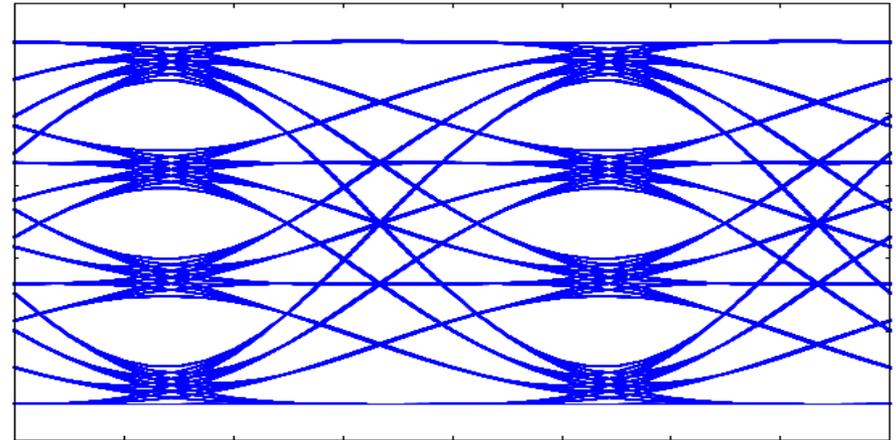


# ~13.28 GHz bandwidth Tx eyes

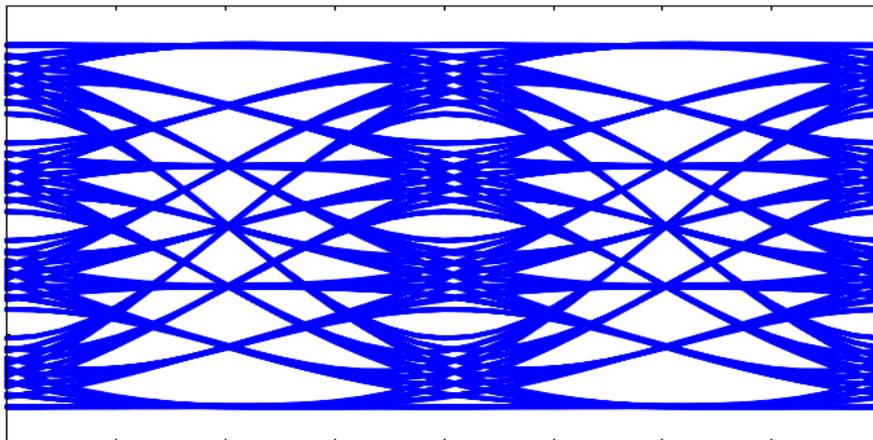
Tx eye 0ps DGD



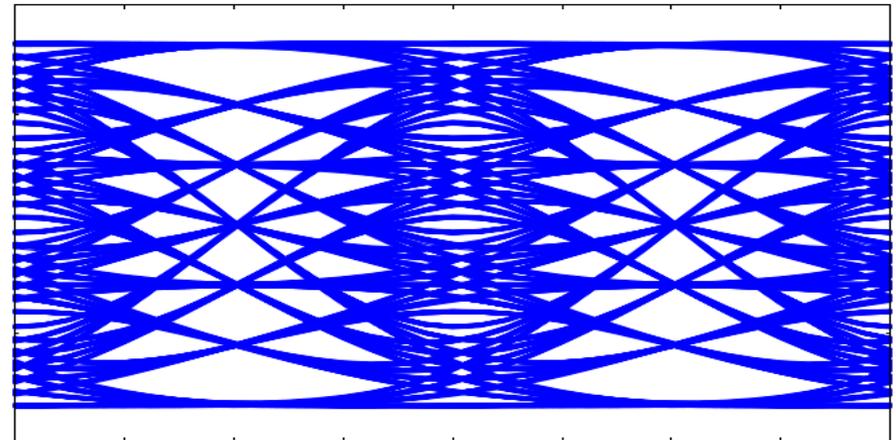
Tx eye 10.3ps DGD



Eye as seen via a 13.28 GHz Rx 0ps DGD

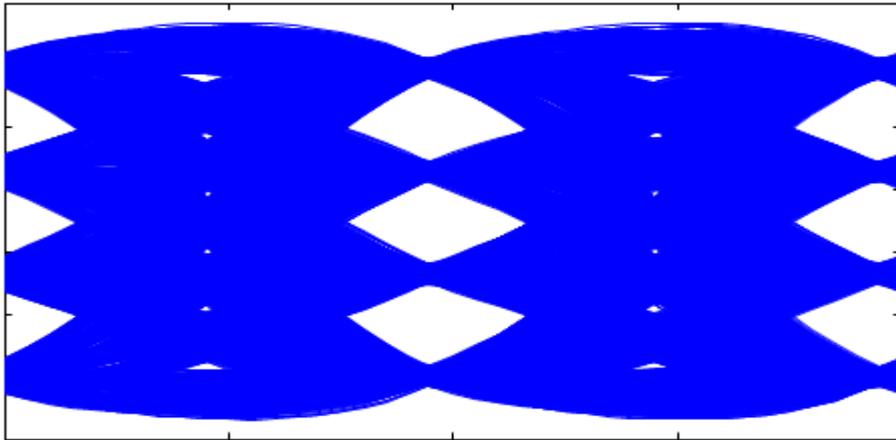


Eye as seen via a 13.28 GHz Rx 10.3ps DGD



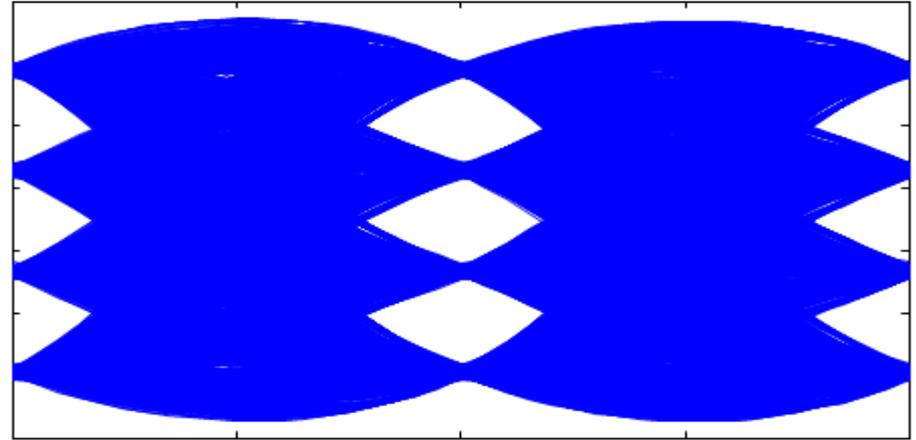
# SECQ for ~13.28 GHz bandwidth Tx

Eye after equalizer 0ps DGD



SECQ = 1.48 dB

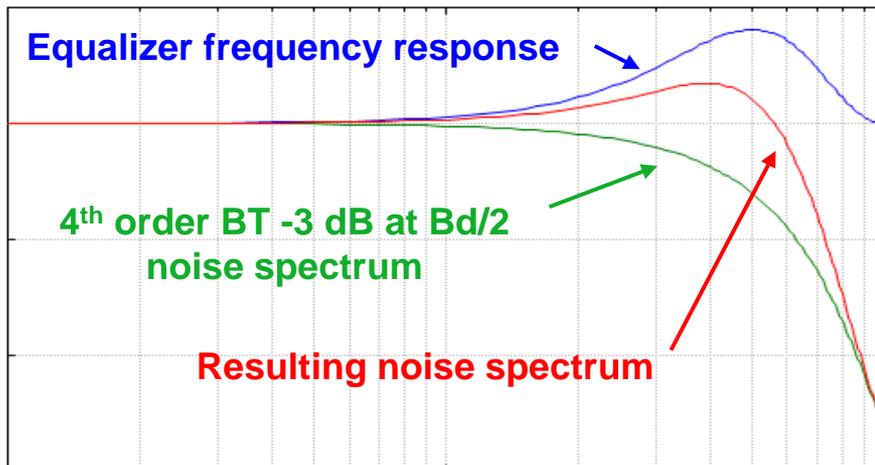
Eye after equalizer 10.3ps DGD



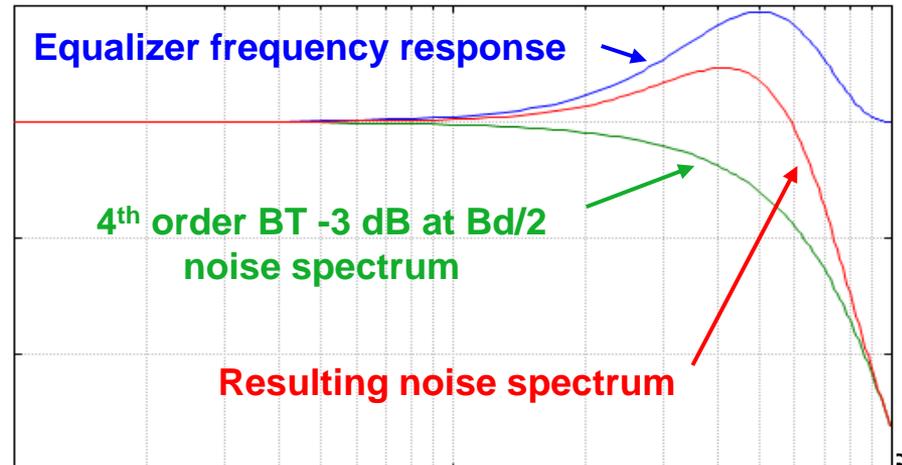
SECQ = 1.74 dB

0.26 dB DGD penalty

Equalizer frequency response 0ps DGD

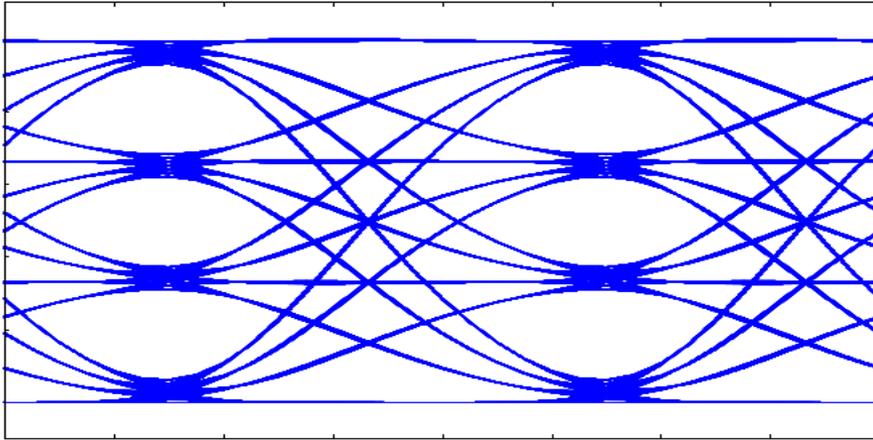


Equalizer frequency response 10.3ps DGD

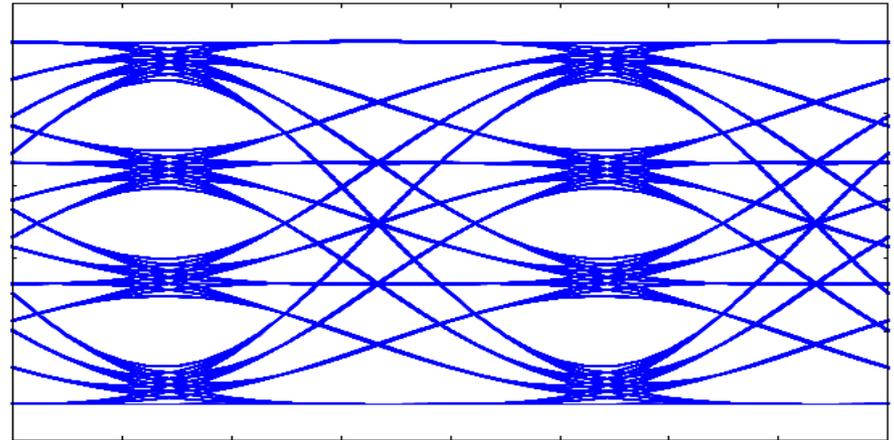


# ~13.28 GHz bandwidth noisy Tx eyes

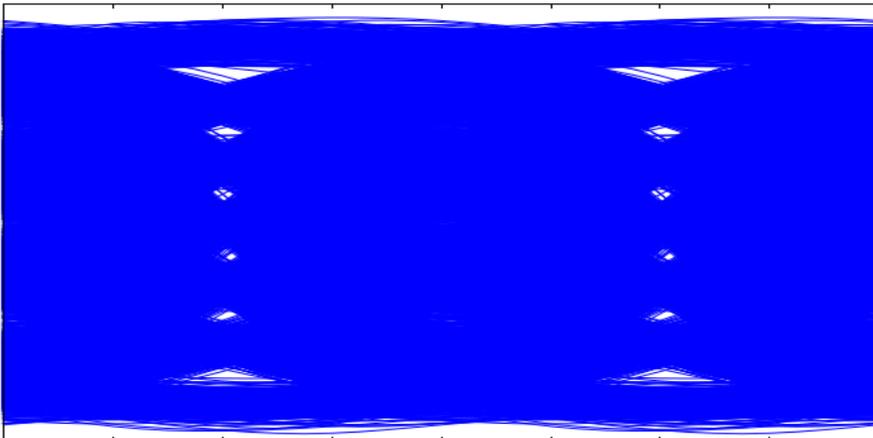
No noise Tx eye 0ps DGD



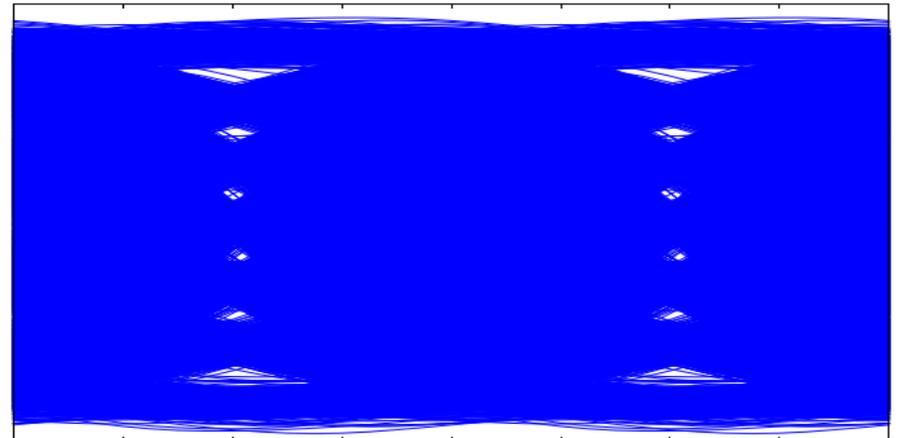
No noise Tx eye 10.3ps DGD



Noisy eye as seen via a 13.28 GHz Rx 0ps DGD

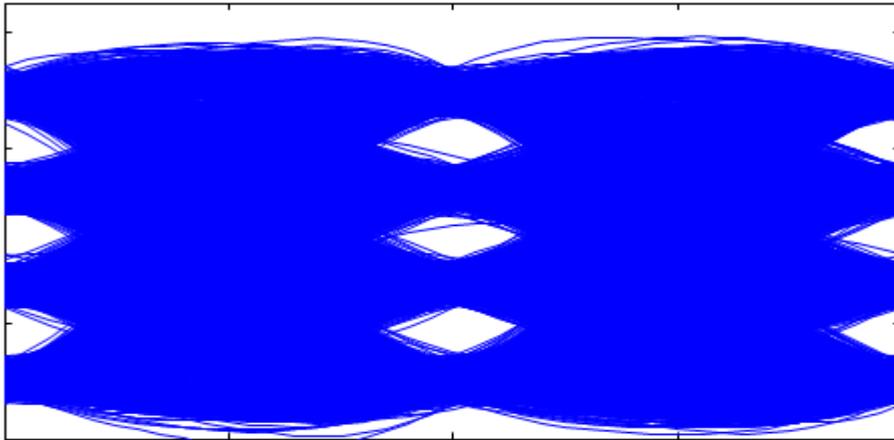


Noisy eye as seen via a 13.28 GHz Rx 10.3ps DGD



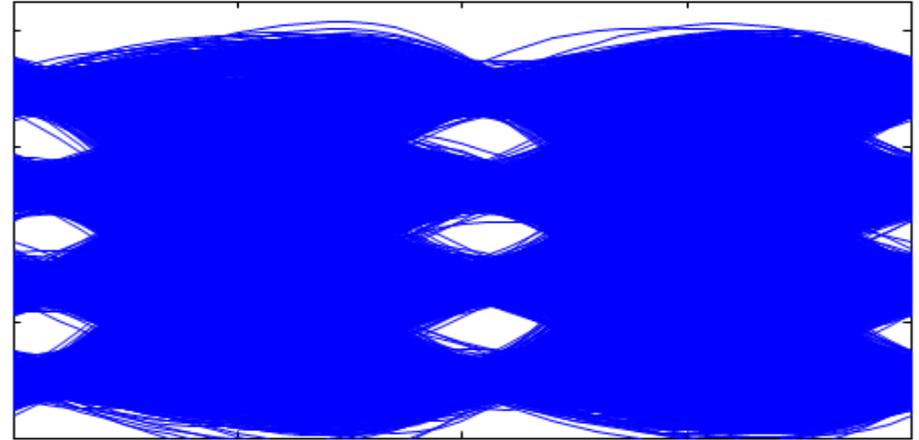
# SECQ for ~13.28 GHz bandwidth noisy Tx

Eye after equalizer 0ps DGD



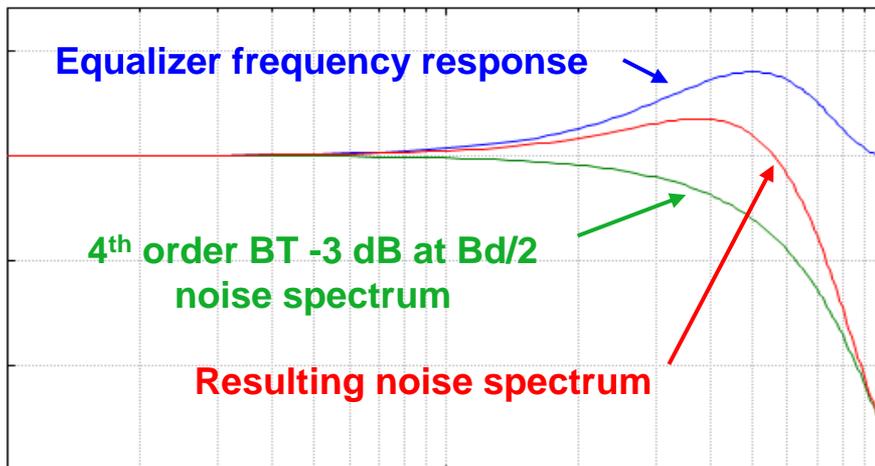
SECQ = 2.68 dB

Eye after equalizer 10.3ps DGD

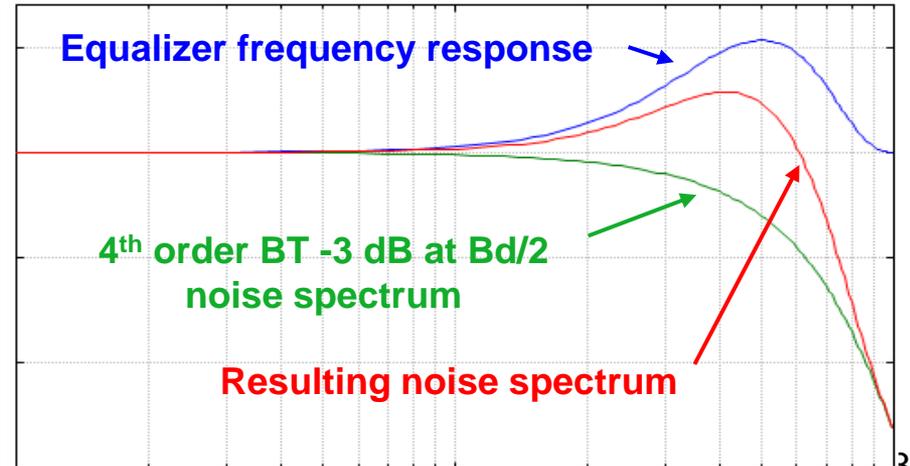


SECQ = 3.32 dB  
0.64 dB DGD penalty

Equalizer frequency response 0ps DGD



Equalizer frequency response 10.3ps DGD



# Conclusion

For a nearly ideal transmitter, the effective bandwidth reduction due to 10.3 ps DGD can be compensated for by the TDECQ equaliser so that the increase in penalty due to the DGD remains within the 0.25 dB budget. Note that this assumes that the real receiver equaliser can adapt fast enough to follow the fastest change in polarisation state due to the link.

However, for a transmitter with 0.5 x symbol rate bandwidth and a significant amount of un-equalisable penalty (e.g. noise) such that the TDECQ was around 2.7 dB, the additional penalty due to 10.3 ps of DGD rose to above 0.6 dB

This result suggests that further work is needed to establish how much penalty should be allocated in the budget to ensure that the target FLR is met for a transmitter with near worst case TDECQ together with 10.3 ps of DGD.

Thanks!