

400GBASE-LR4 DGD Penalty

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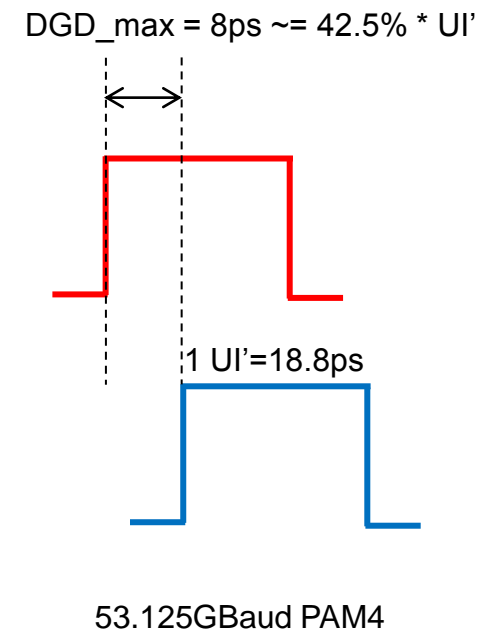
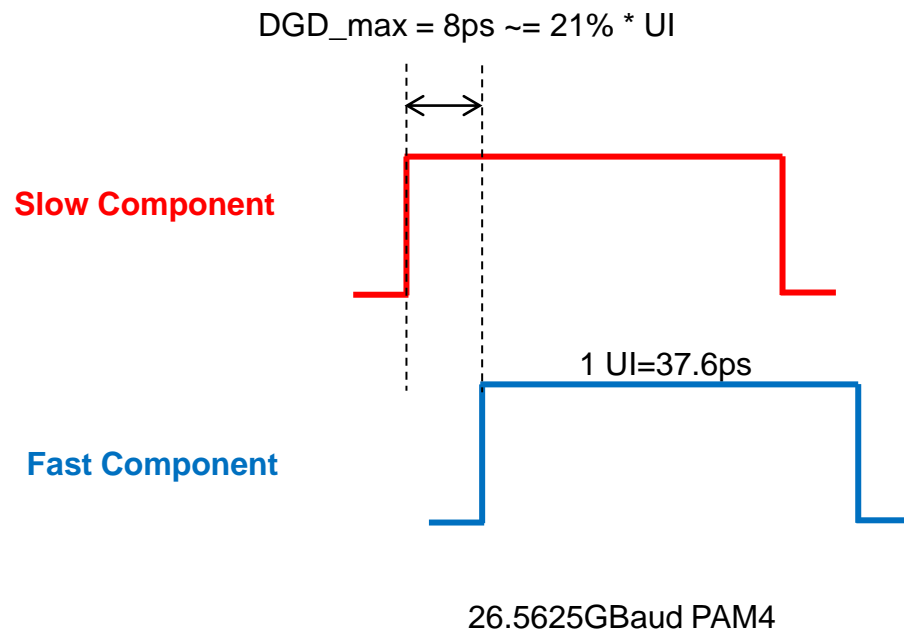
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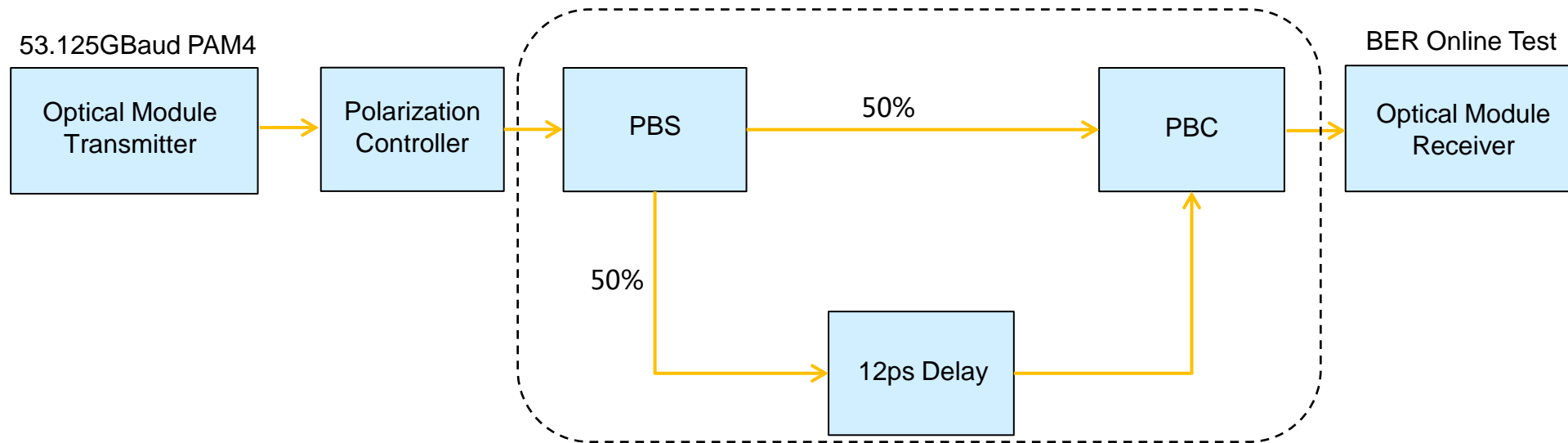
IEEE P802.3cu Task Force ad hoc call 1st May 2019

Background

- The max DGD for 10km transmission is given as 8ps for all PMDs with lane rates of 25G or 50G in the in-force IEEE 802.3 spec.
- This presentation looks at the DGD penalty of 400GBASE-LR4 by measurement and simulation.
- More introductions about what is polarization mode dispersion (PMD) and Differential Group Delay (DGD) can be found at [anslow_01_0308](#).



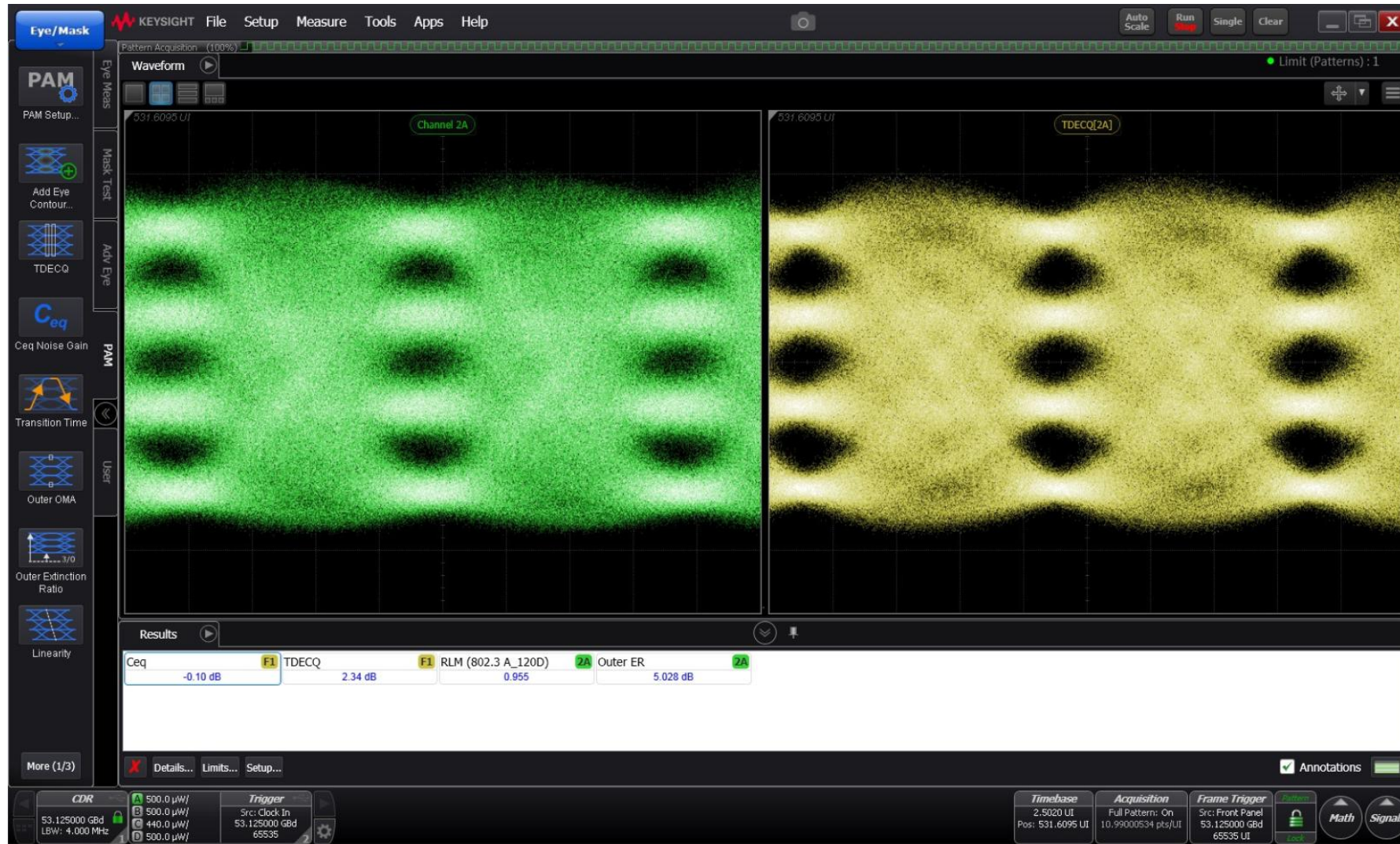
Experimental Configuration



This module can only introduce 12ps of time delay by the components with fixed size .

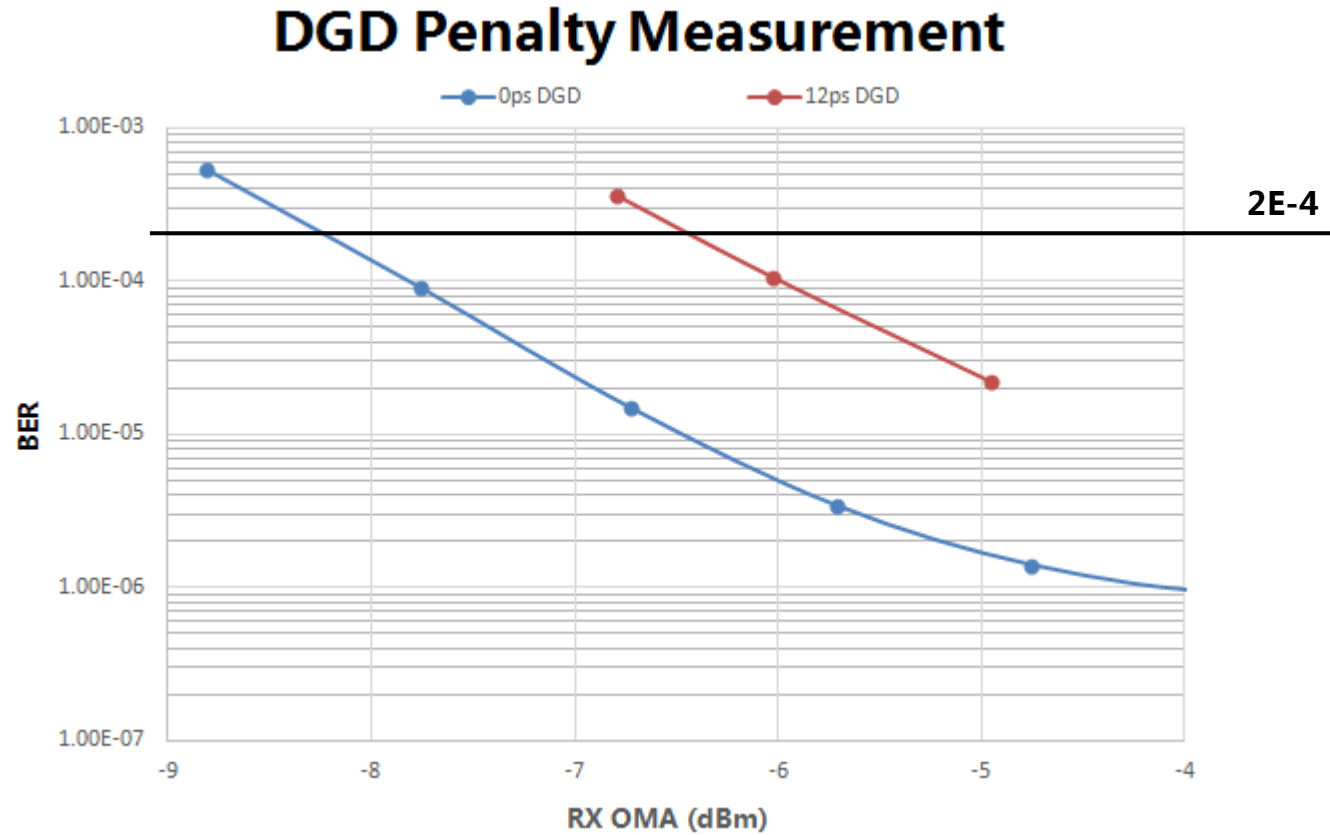
Transmitter

- A Transmitter Sample with SECQ=2.3dB.



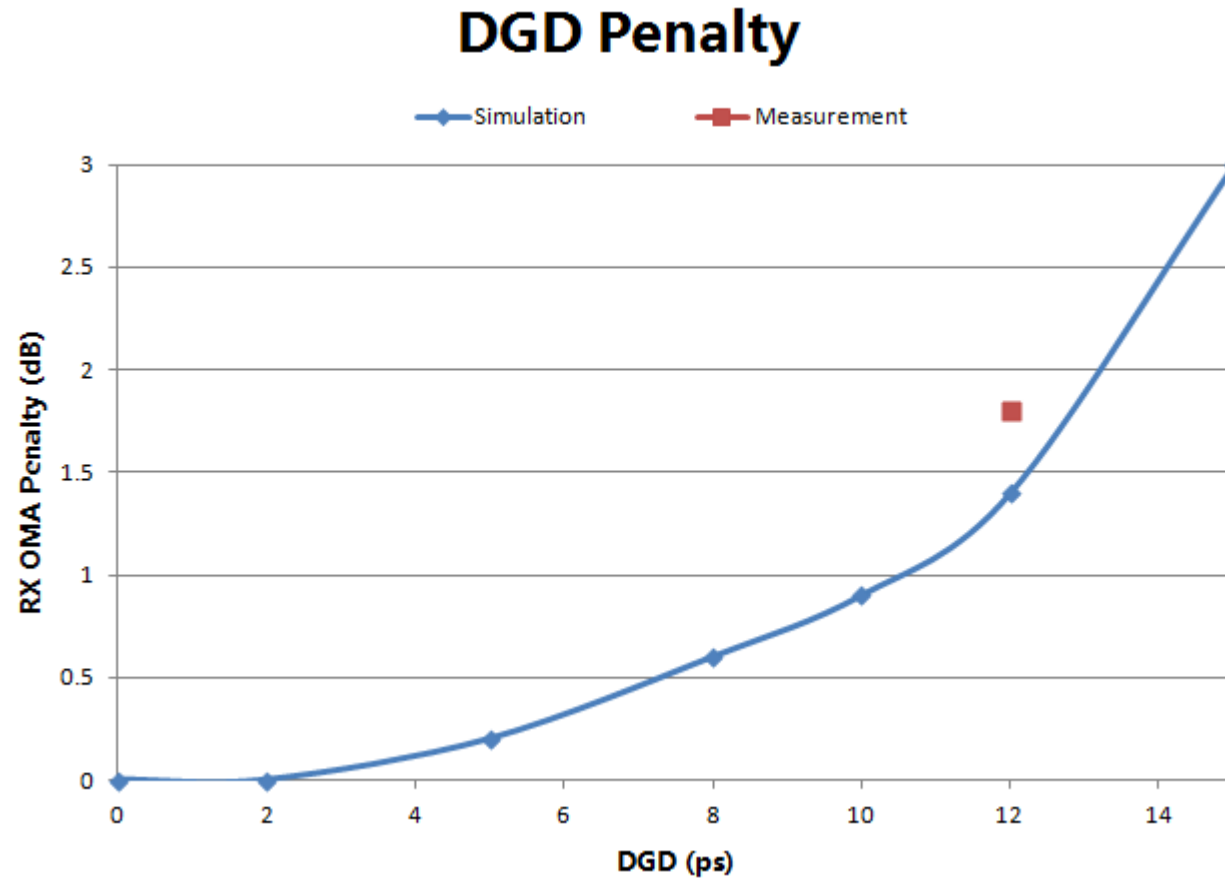
BER Measurement Result

- The measured RX OMA penalty is about 1.8dB due to 12ps of DGD.



DGD Penalty Simulation

- The measured penalty at 12ps of DGD is similar to the simulation result.
- The simulated RX OMA penalty is about 0.6dB due to 8ps of DGD.



Observations & Suggestions

- The measurement and simulation suggested that the additional penalty due to 8ps of DGD is above 0.6dB.
- If a DGD penalty of around 0.6 dB is reconfirmed, we need to address how to take account of it, by either improving the power budget to maintain a channel loss of 6.3 dB or alternatively reduce the target distance.
- Further work is needed to analyze how much penalty should be allocated in 400GBASE-LR4 link budget.

Further Thoughts

- DGD brings extra penalty to 400GBASE-LR4 link budget, which should be included in a worst case baseline proposal.
- Based on the current study, it would be very challenging for both the transmitter and receiver components to meet the worst case budget for 10km transmission on a CWDM grid.
- A slightly shorter transmission distance could end up with a cost saving solution and satisfy a potential market, which should be considered as one of the topics in the future.

