
SPE Multidrop Enhancements Mixing Segment Considerations

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Background

- Measurement configuration results for LTspice model validation demonstrated.
https://www.ieee802.org/3/da/public/051921/diminico_SPMD_01_0521.pdf
- Transient analysis for RX eye
- New cable model developed to use with transient analysis for RX eye
 - Cable model transmission characteristics consistent with cable model developed.
https://www.ieee802.org/3/da/public/0721/diminico_SPMD_01_0721.pdf
- New cable model developed consider Link Segment Node Distribution with transient analysis for RX eye
 - Cable model transmission characteristics consistent with prior 18 AWG cable model
 - Transient analysis of 75 m node distributions
https://grouper.ieee.org/groups/802/3/SPMD/usecase/SPMD_Usecase_Library.pdf

Purpose

- New cable model developed to consider Link Segment Node Distribution with transient analysis for RX eye
- Clumped distribution transient analysis for RX eye

Cable Model – 75 m – Panduit

- Cable model transmission characteristics consistent with referenced cable model



Link Segment Node Characteristics

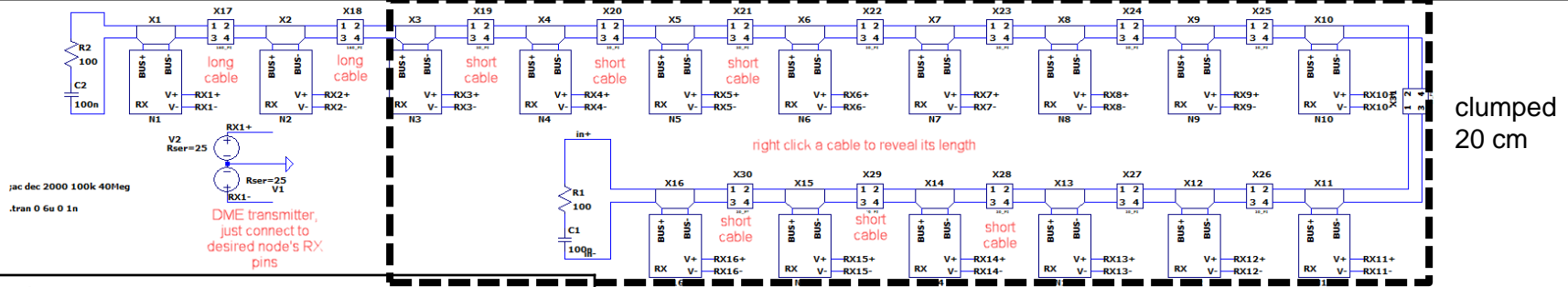
- **802.3cg - backward compatibility**

-MDI impedance limit parameters

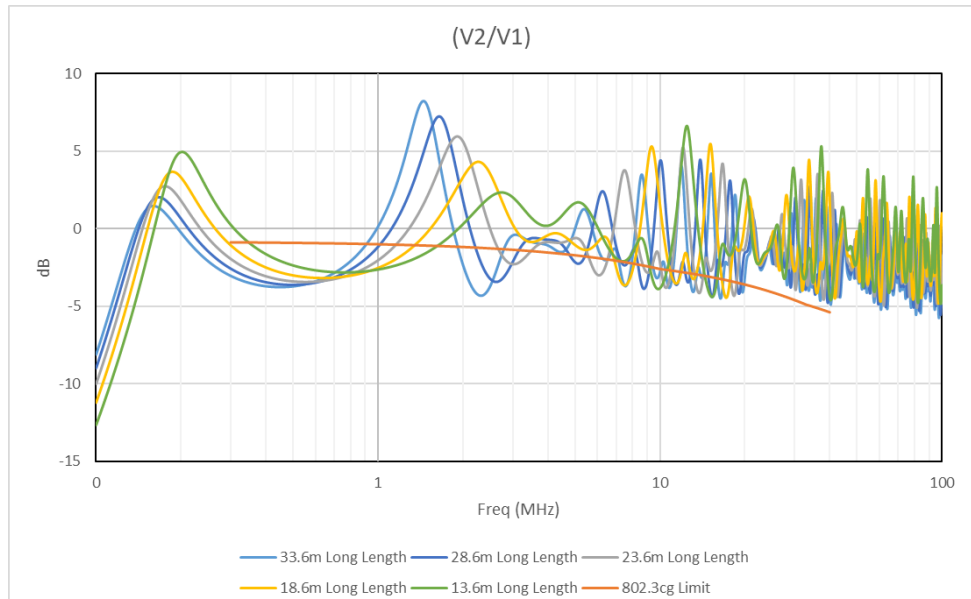
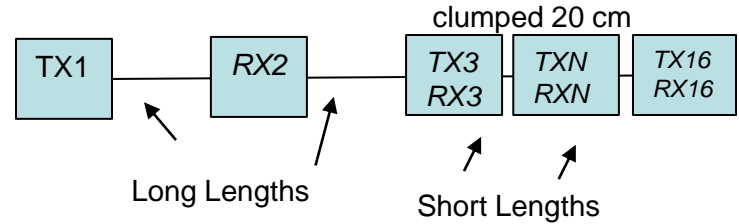
| Parameter name | Unit of measure | Minimum value | Maximum value |
|-------------------|-----------------|---------------|---------------|
| R | k Ω | 10 | — |
| L | μ H | 80 | — |
| C_{tot} | pF | — | 180 |
| C_{node} | pF | — | 15 |

Source: IEEE Std 802.3cg™-2019

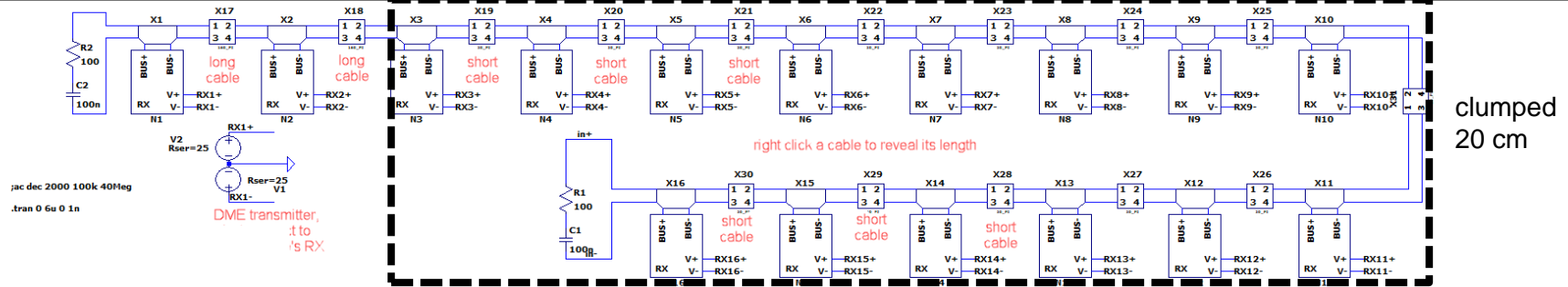
Clumped Distribution Analyzed



| | |
|-----------------------|-------|
| Long Length | 13.6m |
| Short Length (2xstub) | 20cm |
| Total Channel Length | 30m |
| | |
| Long Length | 18.6m |
| Short Length (2xstub) | 20cm |
| Total Channel Length | 40m |
| | |
| Long Length | 23.6m |
| Short Length (2xstub) | 20cm |
| Total Channel Length | 50m |
| | |
| Long Length | 28.6m |
| Short Length (2xstub) | 20cm |
| Total Channel Length | 60m |
| | |
| Long Length | 33.6m |
| Short Length (2xstub) | 20cm |
| Total Channel Length | 70m |

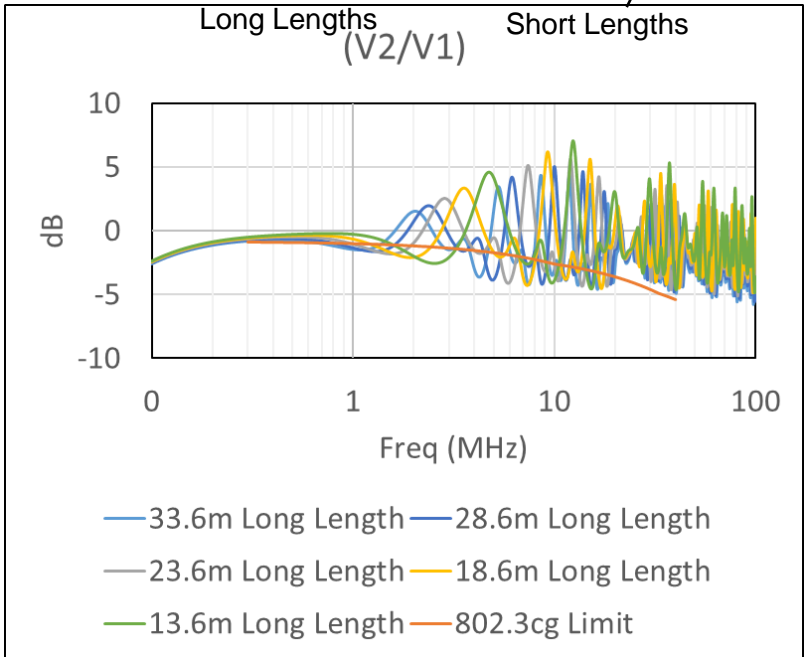
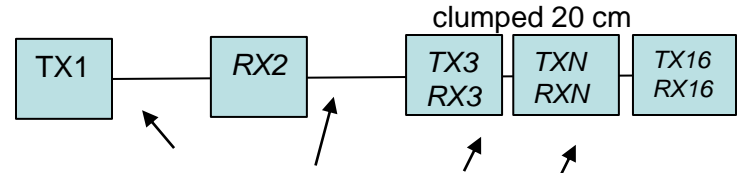


Clumped Distribution Analyzed (no PoDL)



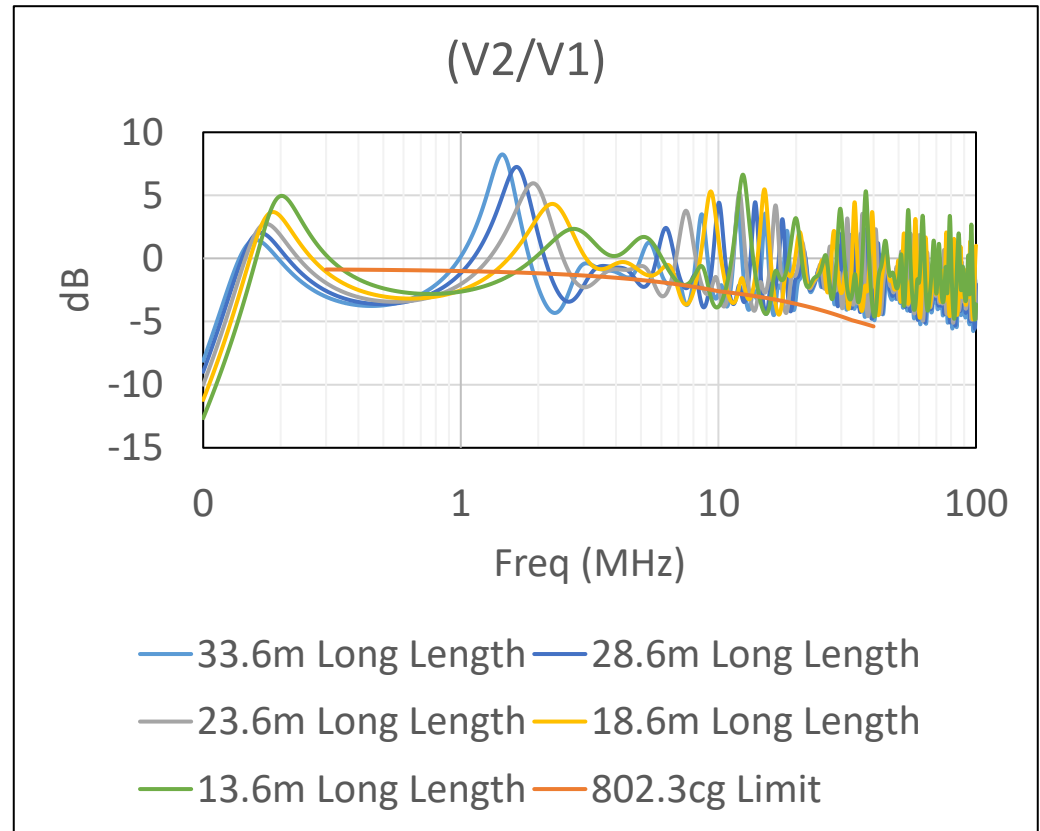
clumped
20 cm

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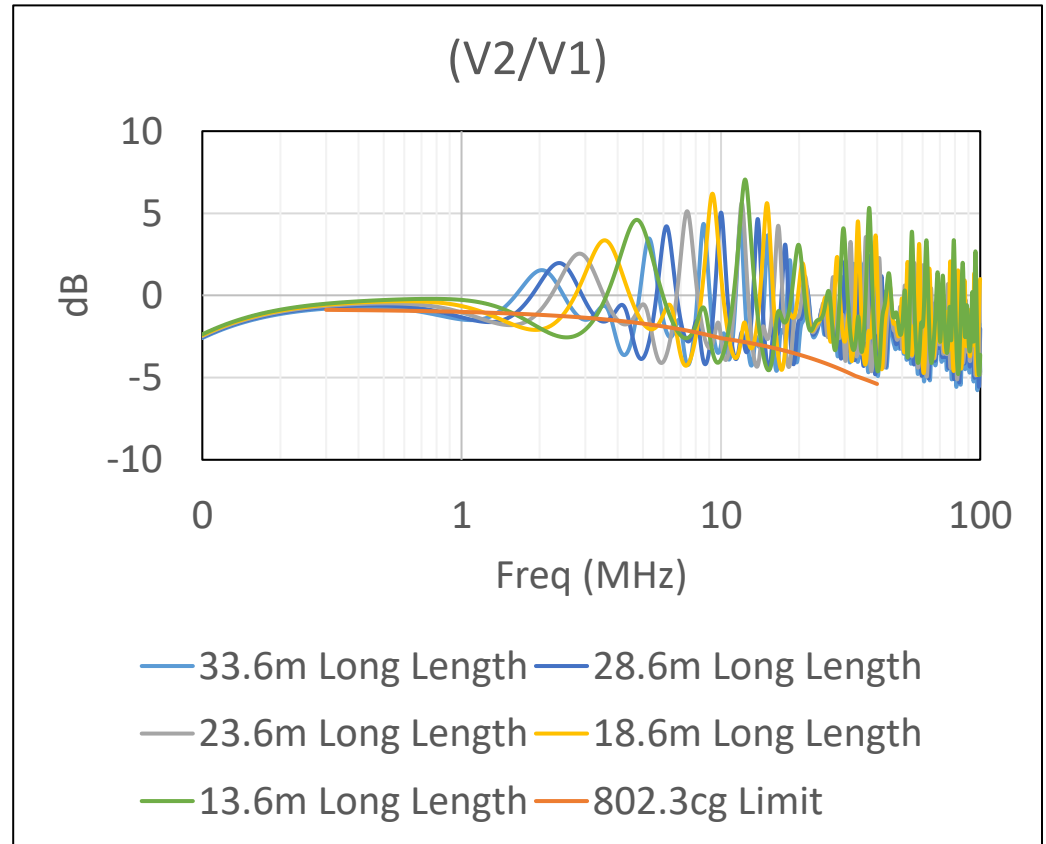
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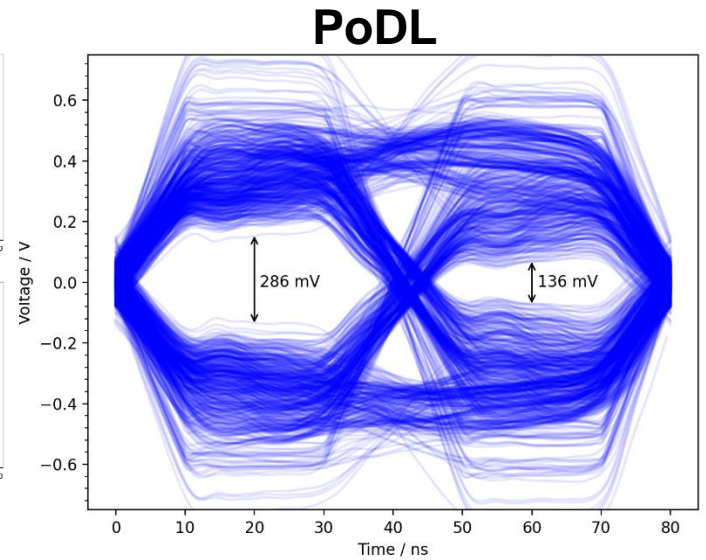
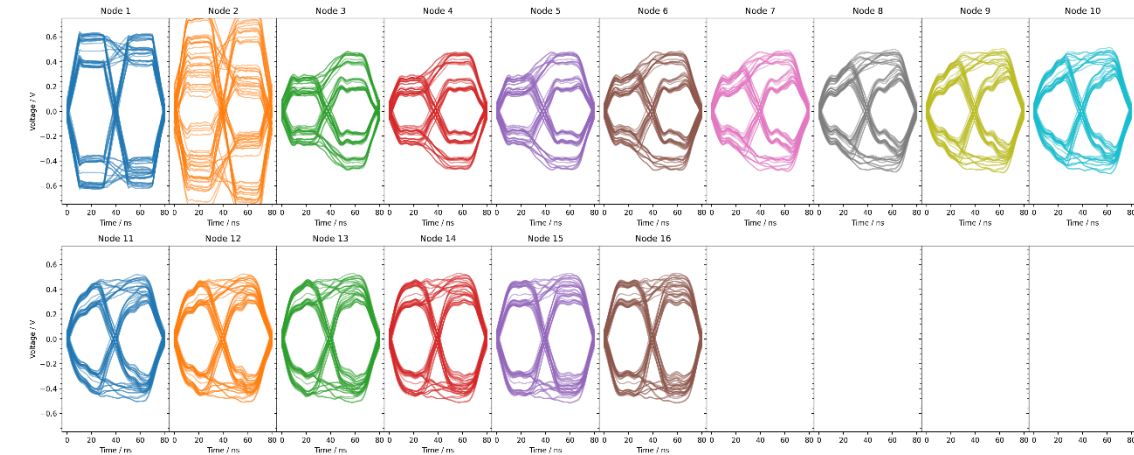
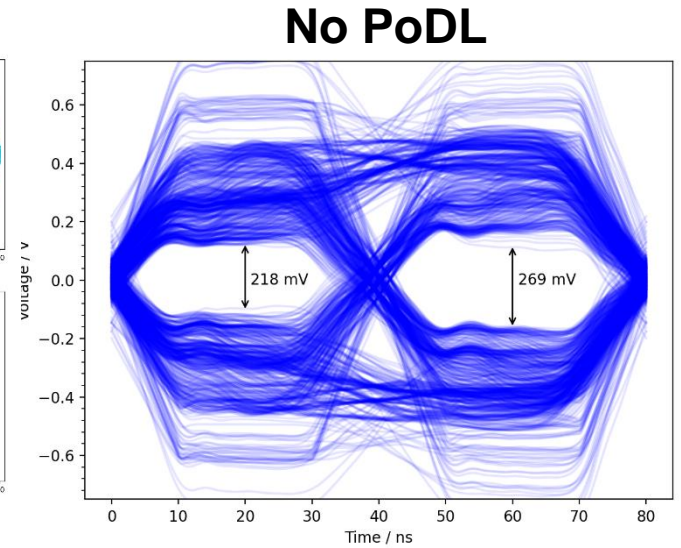
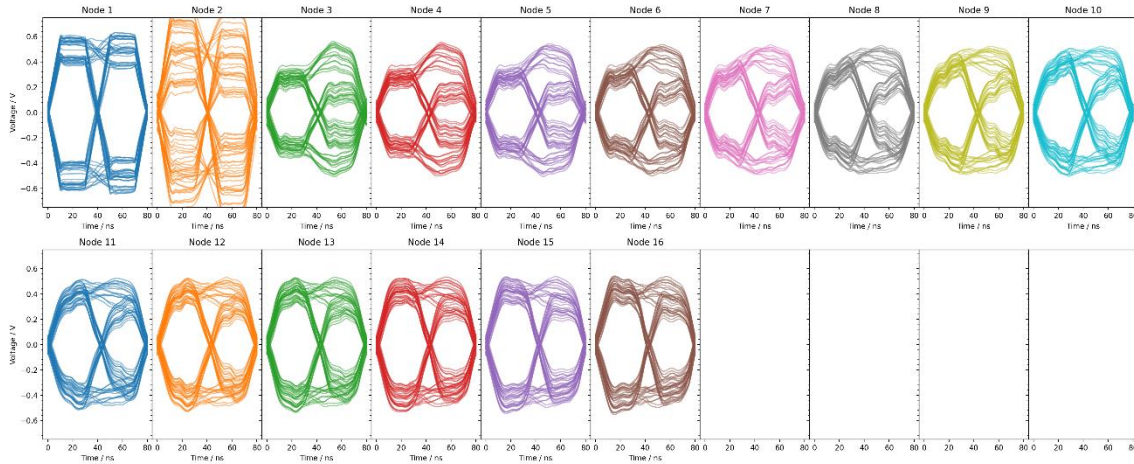


Clumped Distribution Analyzed (no PoDL)

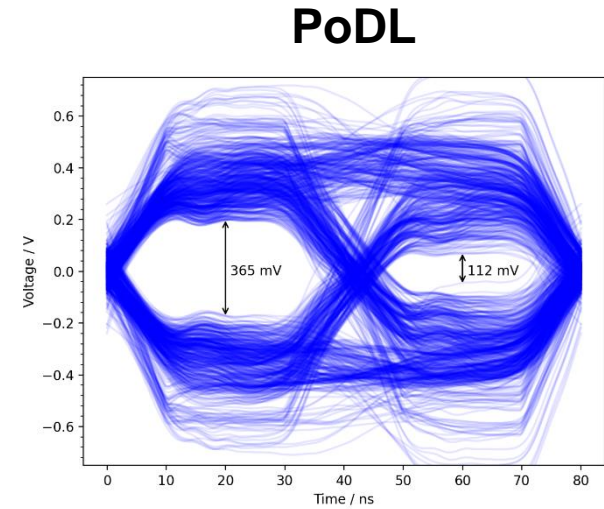
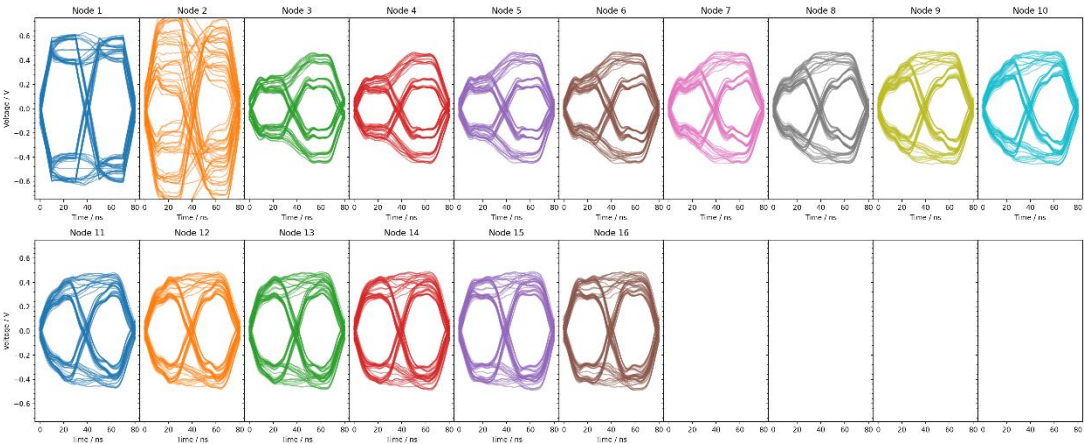
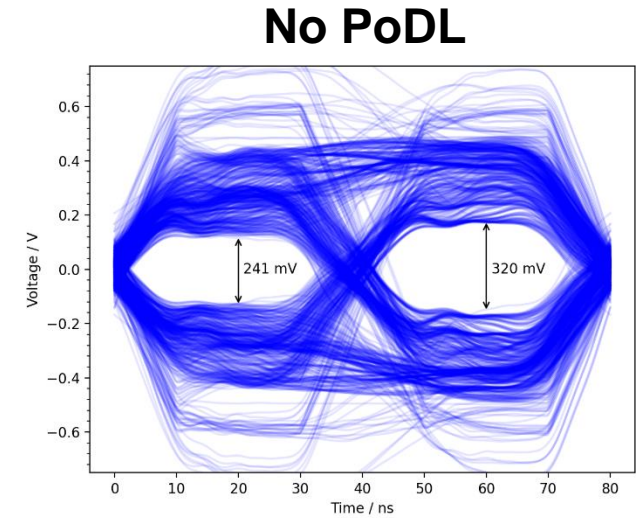
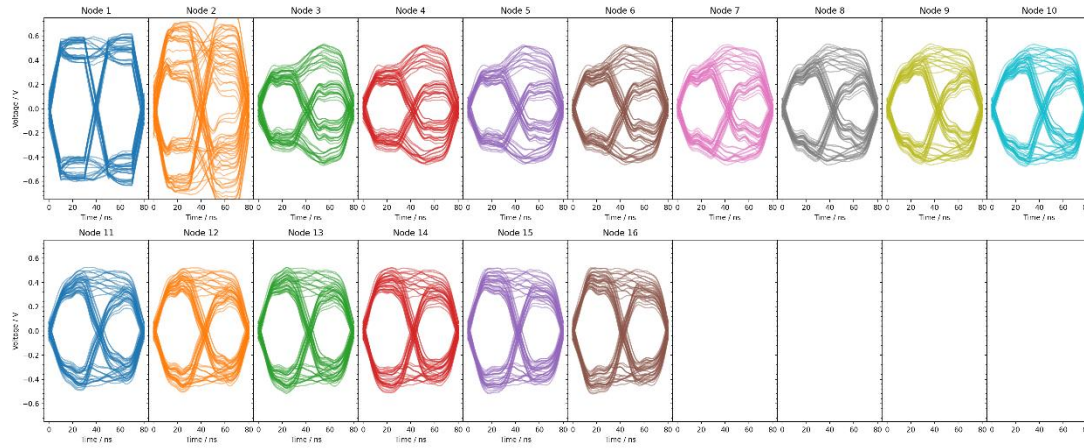
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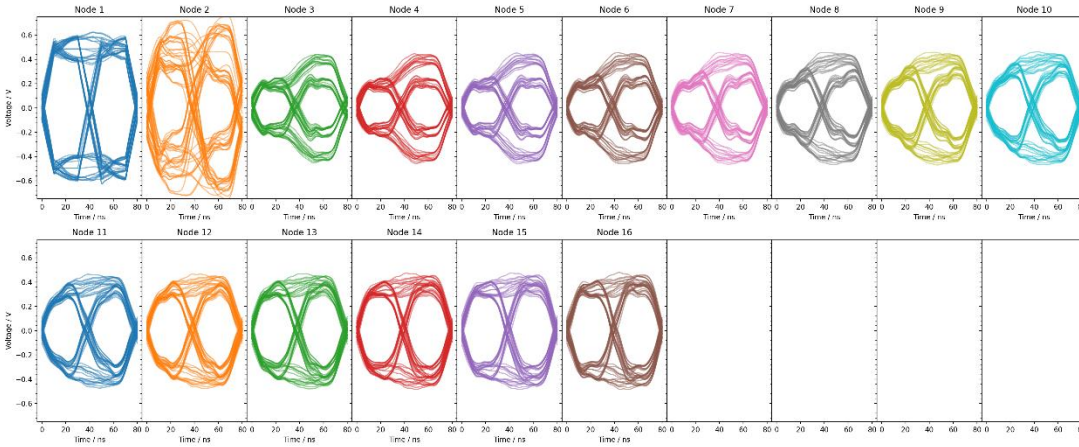
Clumped Distribution Analyzed (30 m)



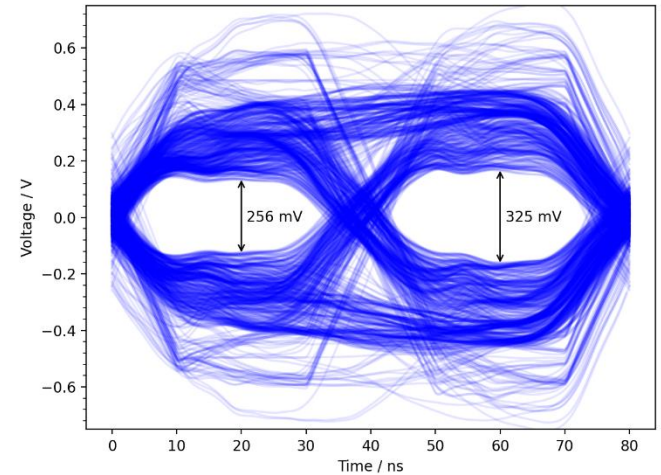
Clumped Distribution Analyzed (40 m)



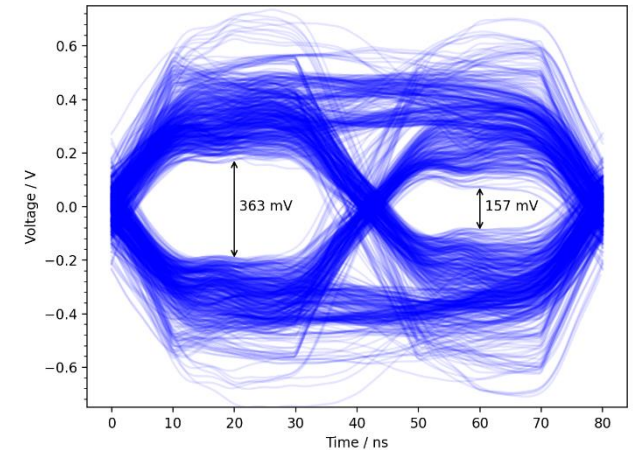
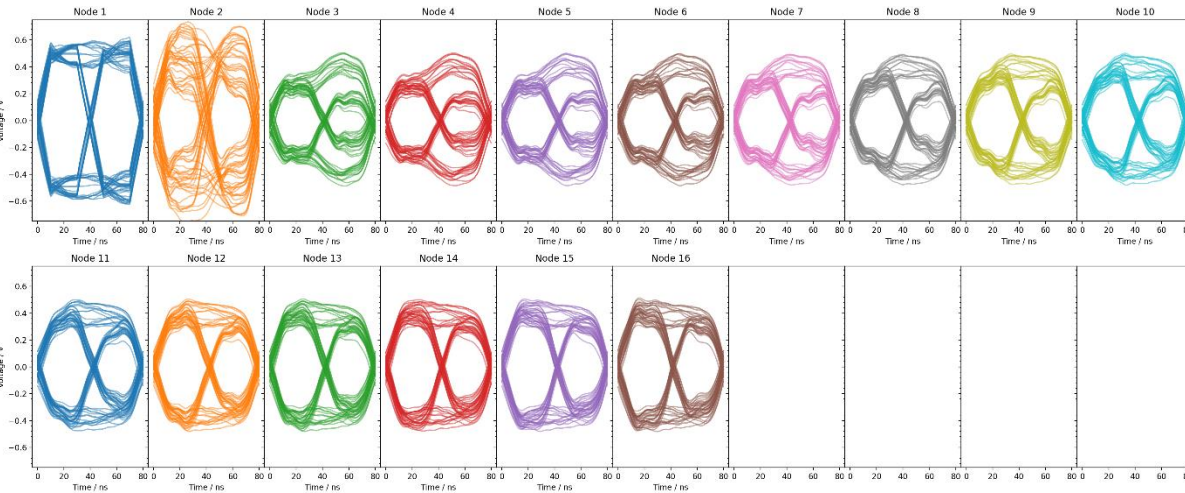
Clumped Distribution Analyzed (50 m)



No PoDL

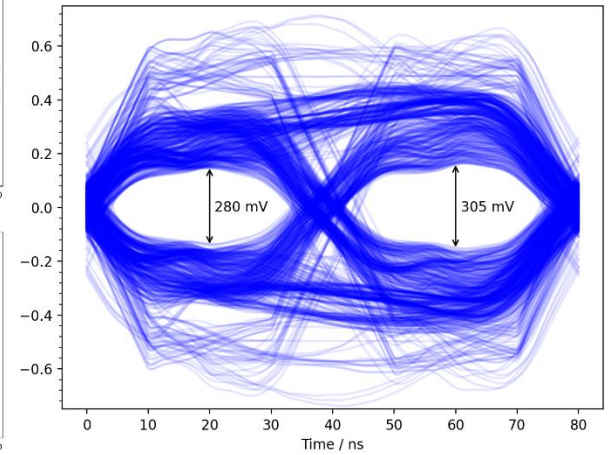
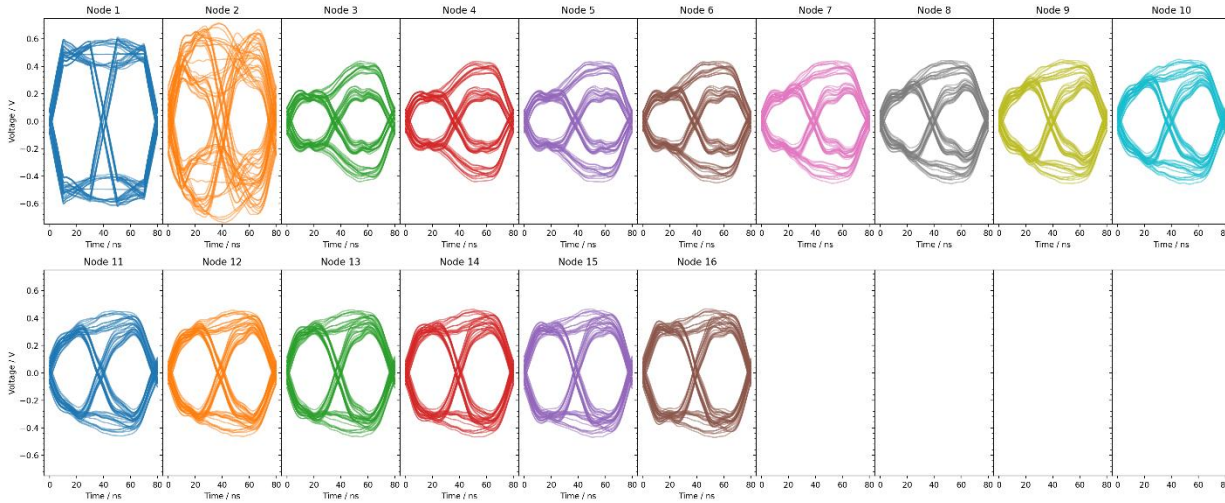


PoDL

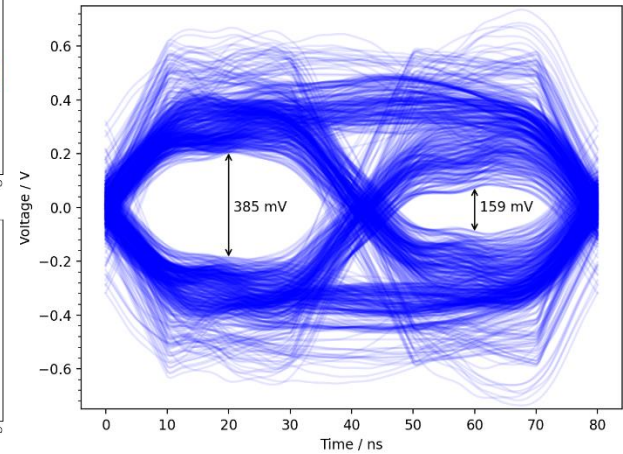
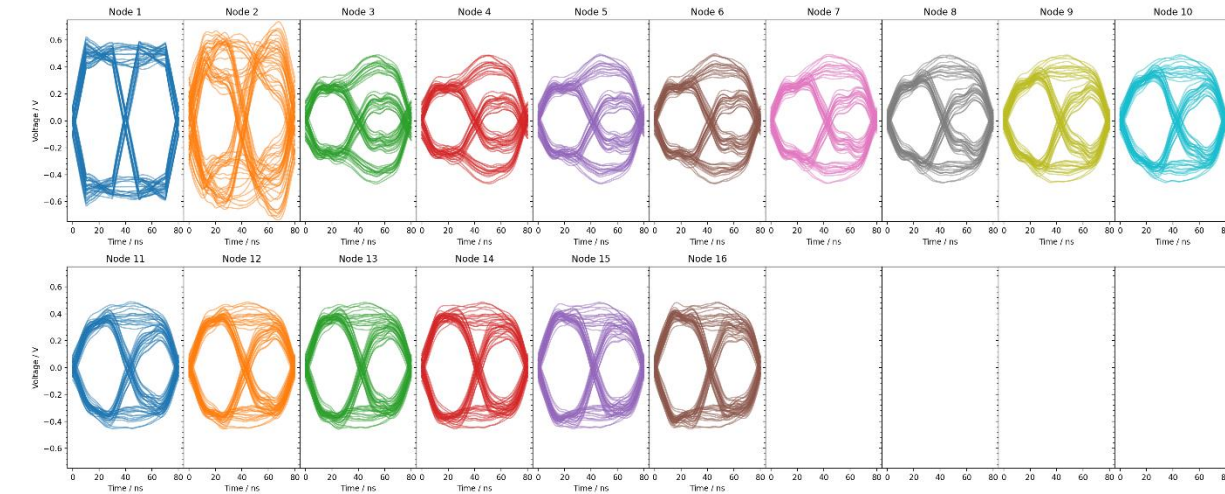


Clumped Distribution Analyzed (60 m)

No PoDL

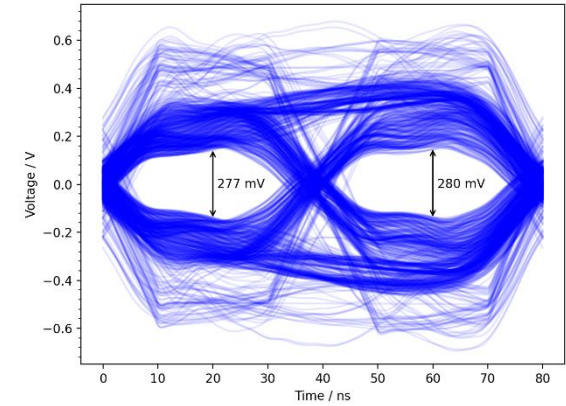
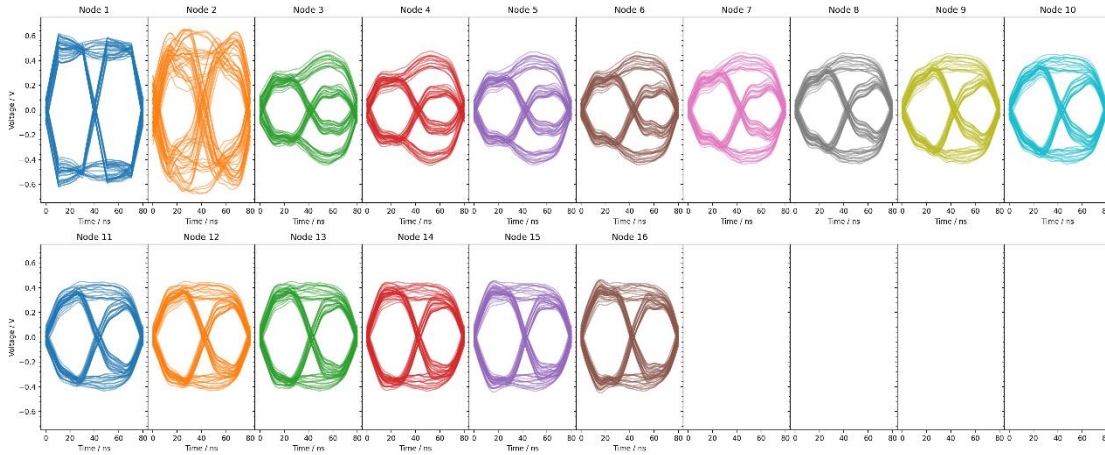


PoDL

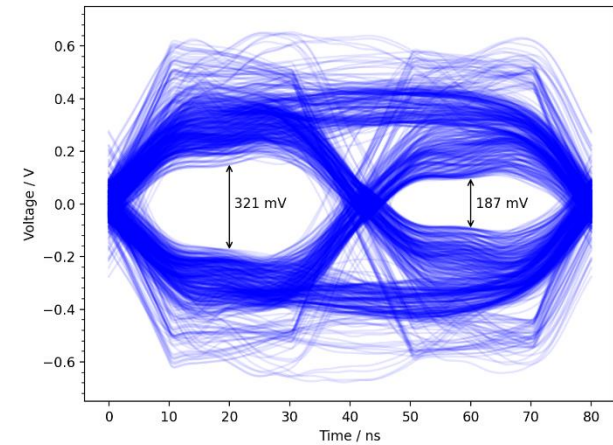
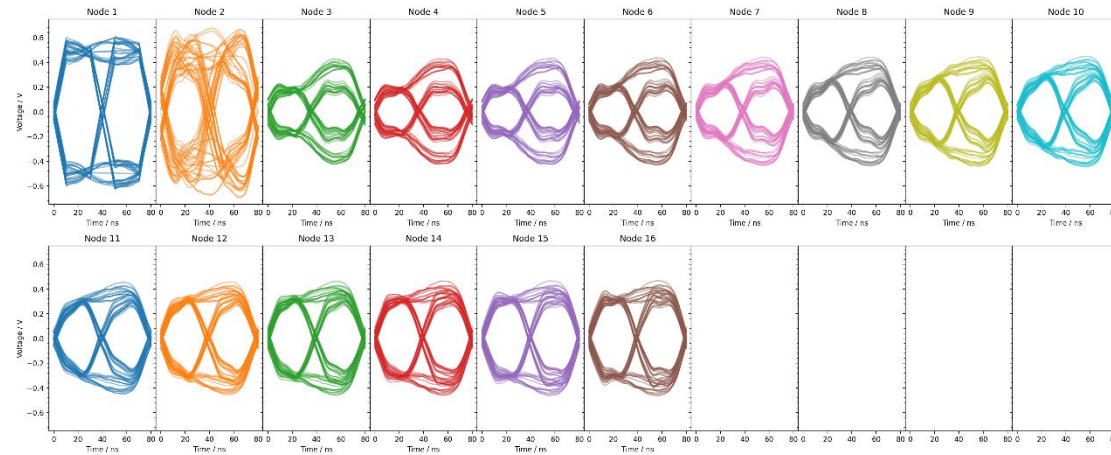


Clumped Distribution Analyzed (70 m)

No PoDL

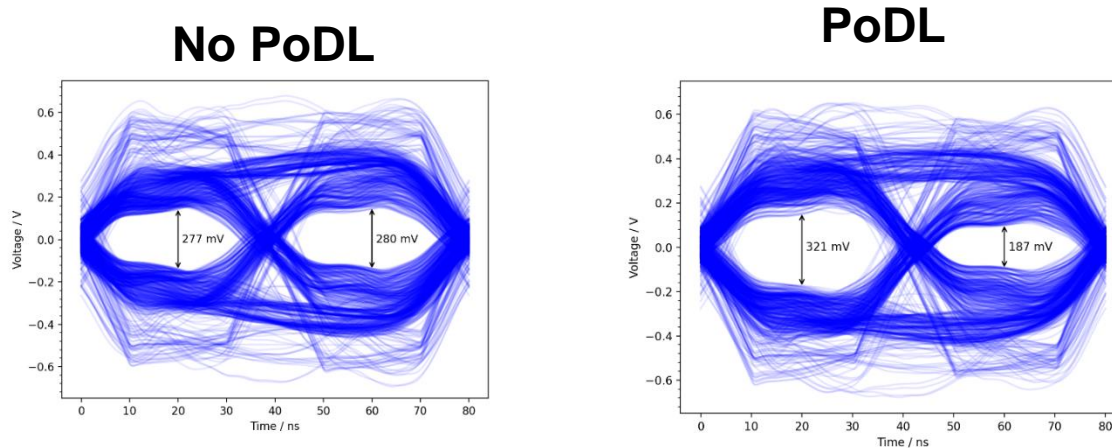


PoDL



Summary/Next Steps

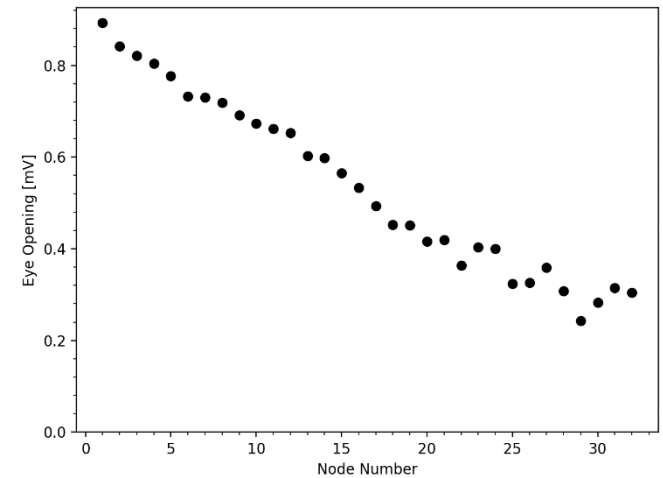
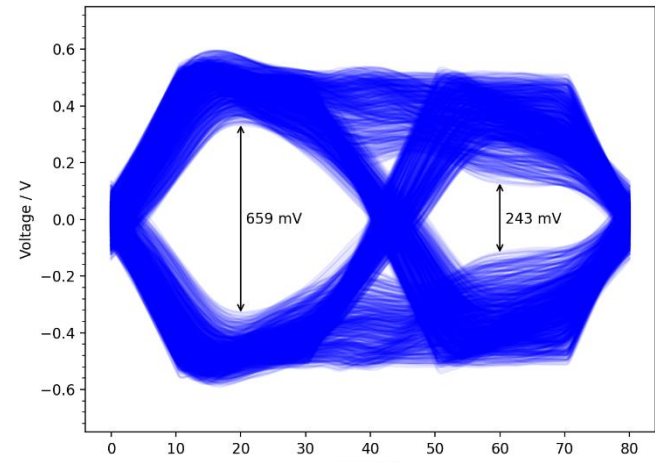
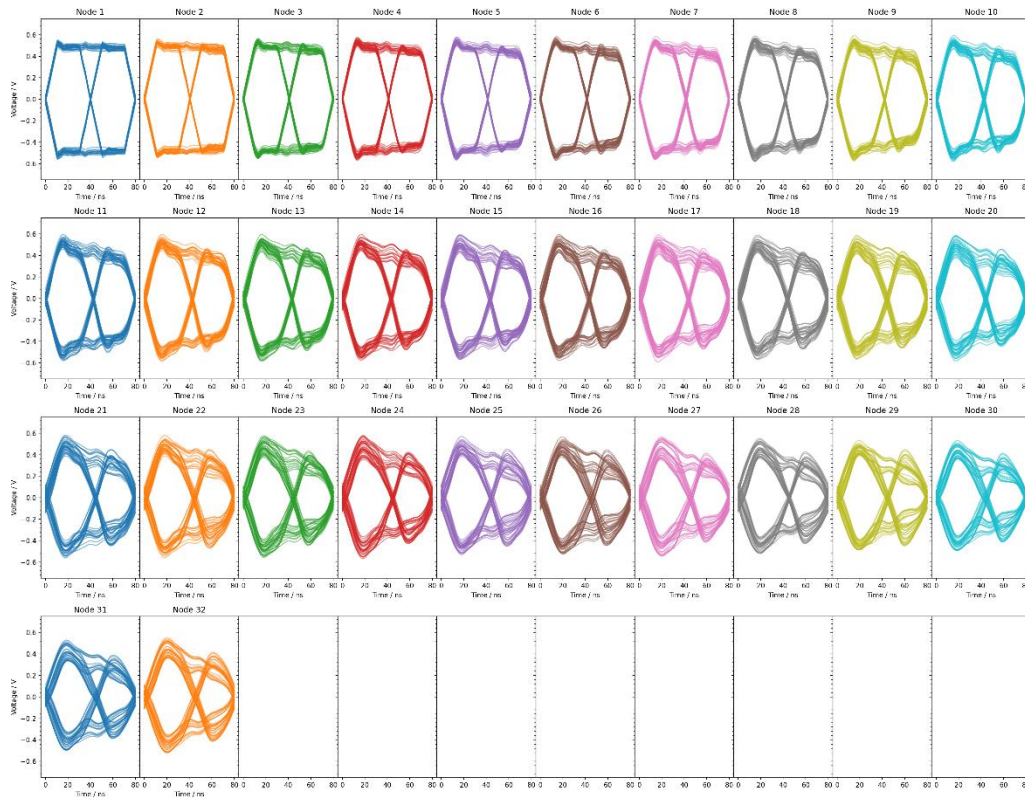
- New cable model developed to consider Link Segment Node Distribution with transient analysis for RX eye
- Clumped distribution transient analysis for RX eye
- Next Steps - Mixing segment RX eye metrics
 - Backward compatible - 802.3cg Mixing segment and MDI impedances
 - 802.3da specific



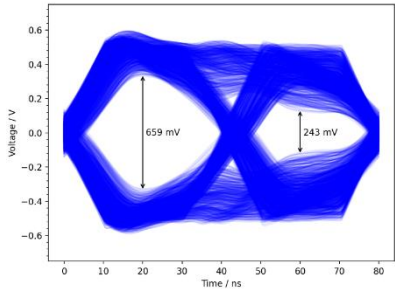
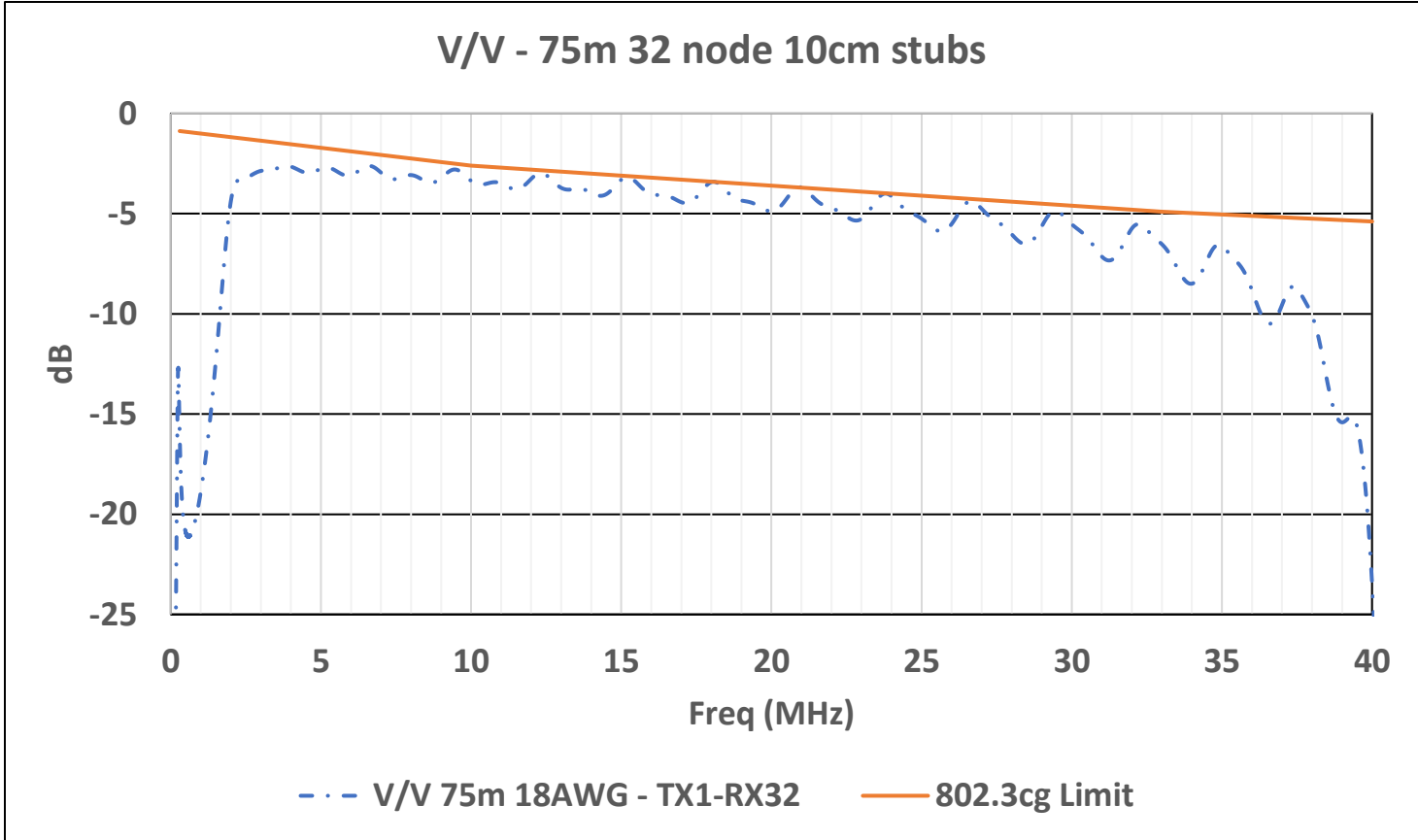
Backup

Link Segment Node Distribution

- 75m 18AWG cable, 32 nodes, 10 cm stub lengths, 80 uH, 15 pF, evenly spaced (2.419 m)

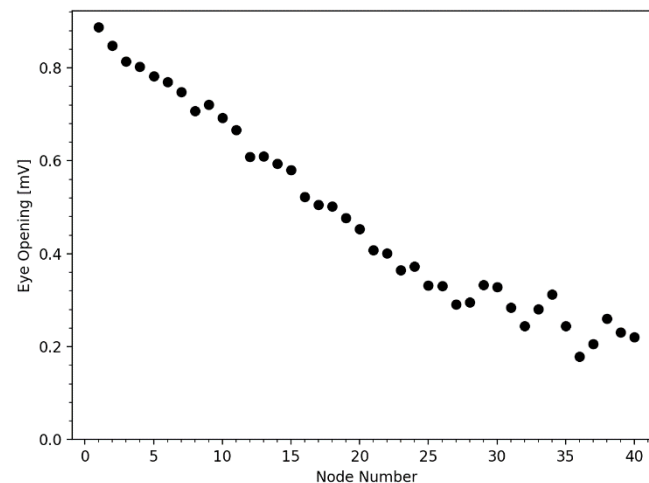
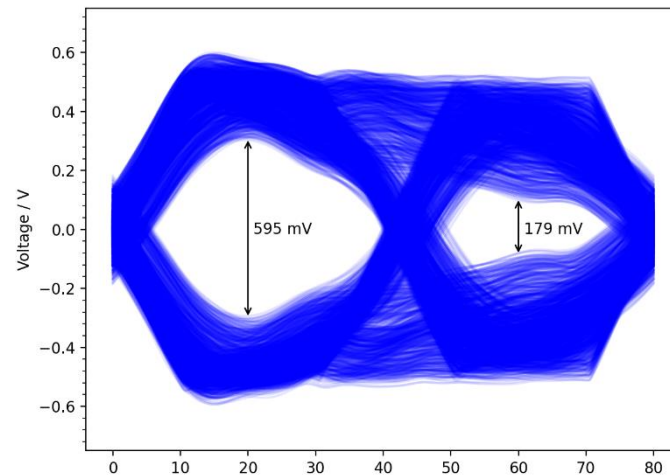
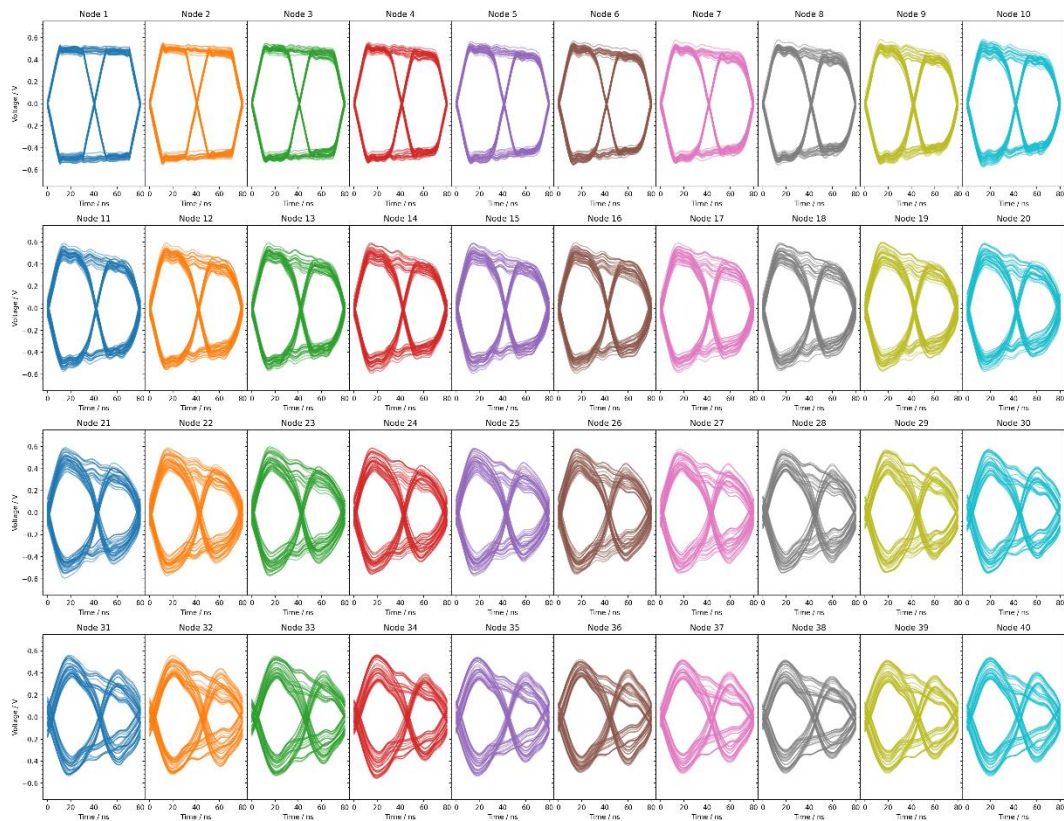


Link Segment Node Distribution



Link Segment Node Distribution

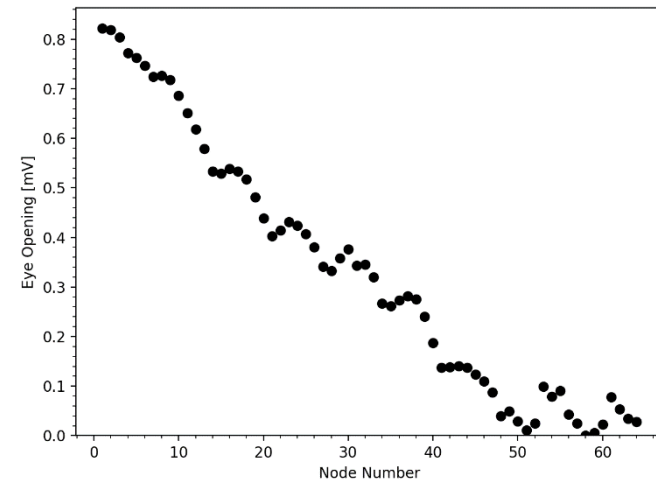
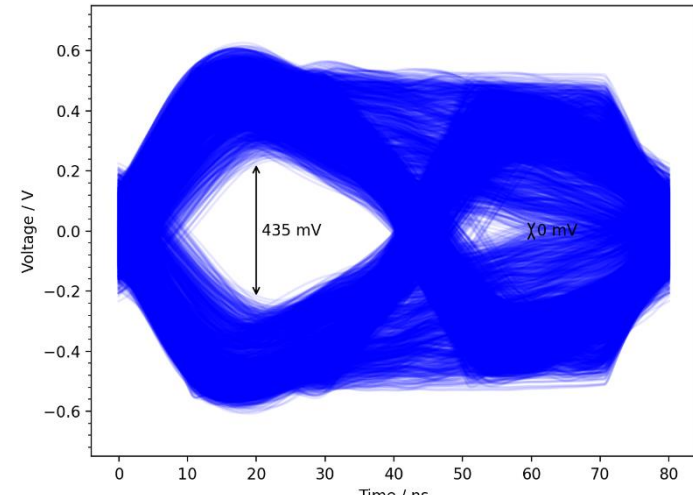
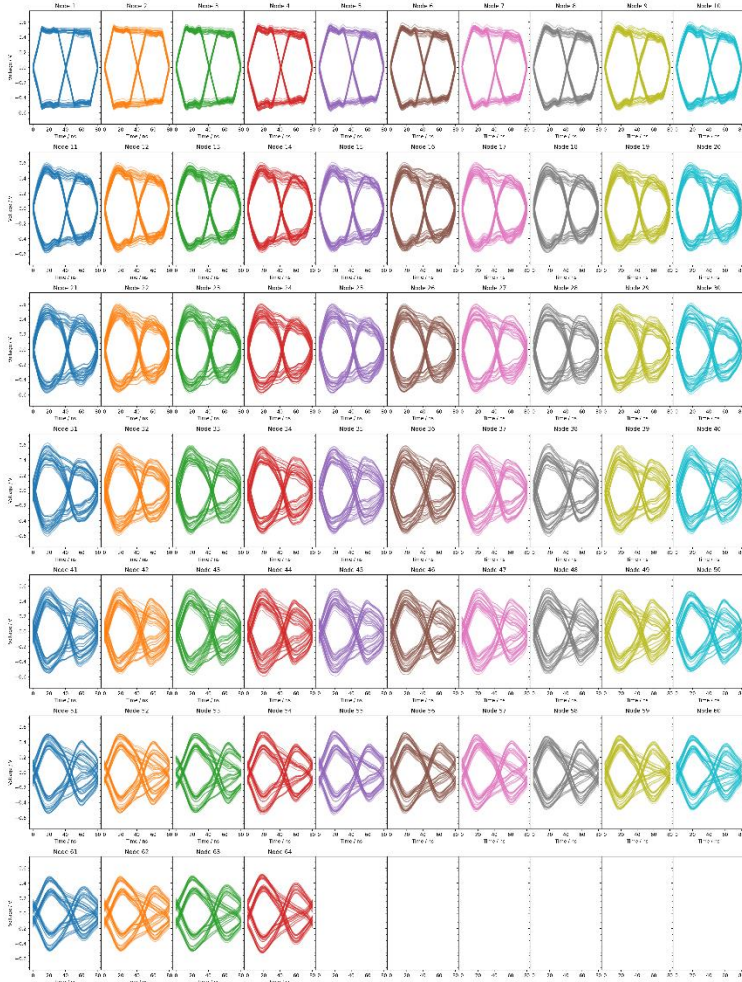
- 75m 18AWG cable, 40 nodes, 10 cm stub lengths, 80 uH, 15 pF, evenly spaced 1.923 m



10 Mb/s SPMD Enhancement TG

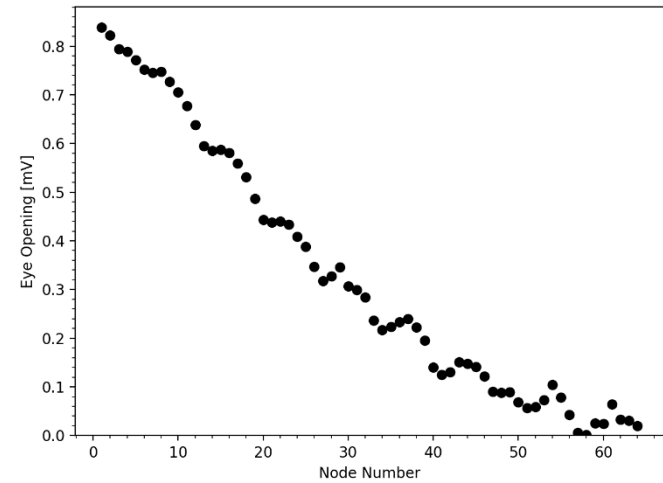
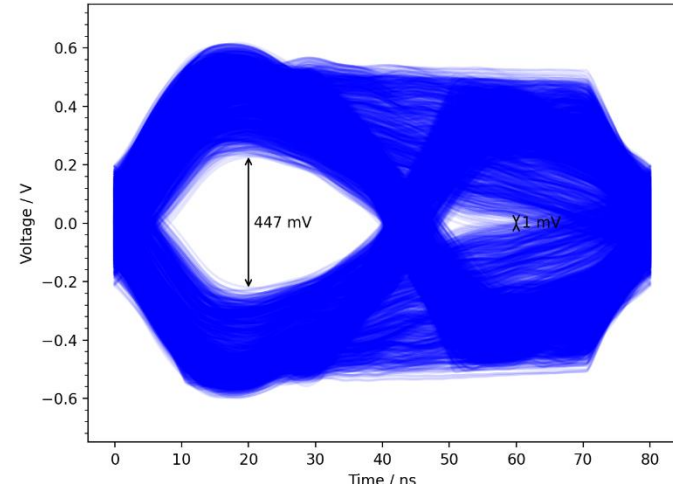
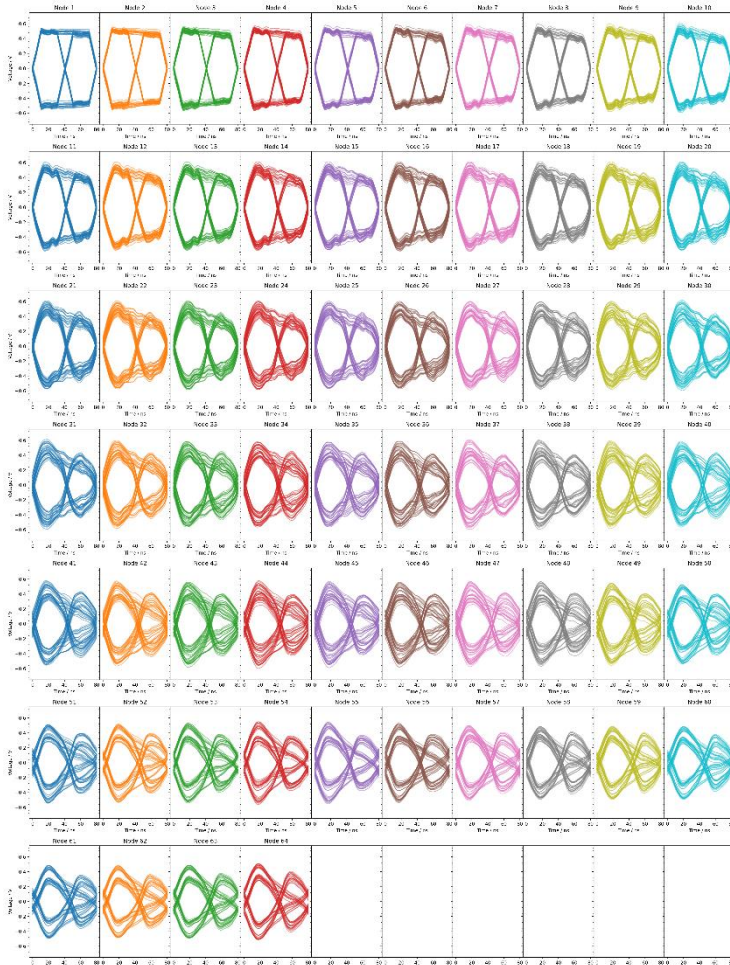
Link Segment Node Distribution

- 75m 18AWG cable, 64 nodes, 10 cm stub lengths, 80 uH, 15 pF, evenly spaced 1.91 m



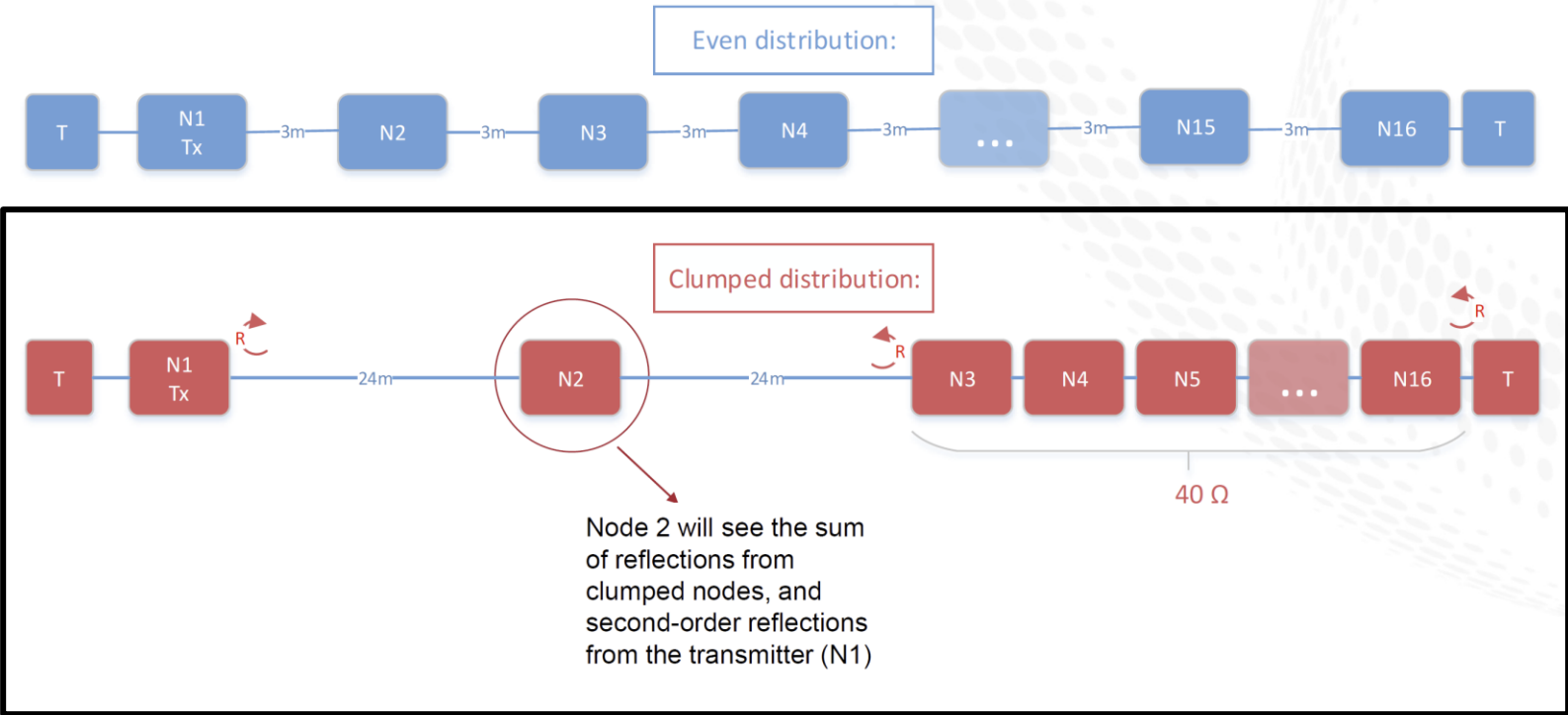
Link Segment Node Distribution

- 75m 18AWG cable, 64 nodes, **5 cm stub** lengths, 80 uH, 15 pF, evenly spaced 1.91 m



Clumped Distribution Analyzed

Node distribution – time domain simulation

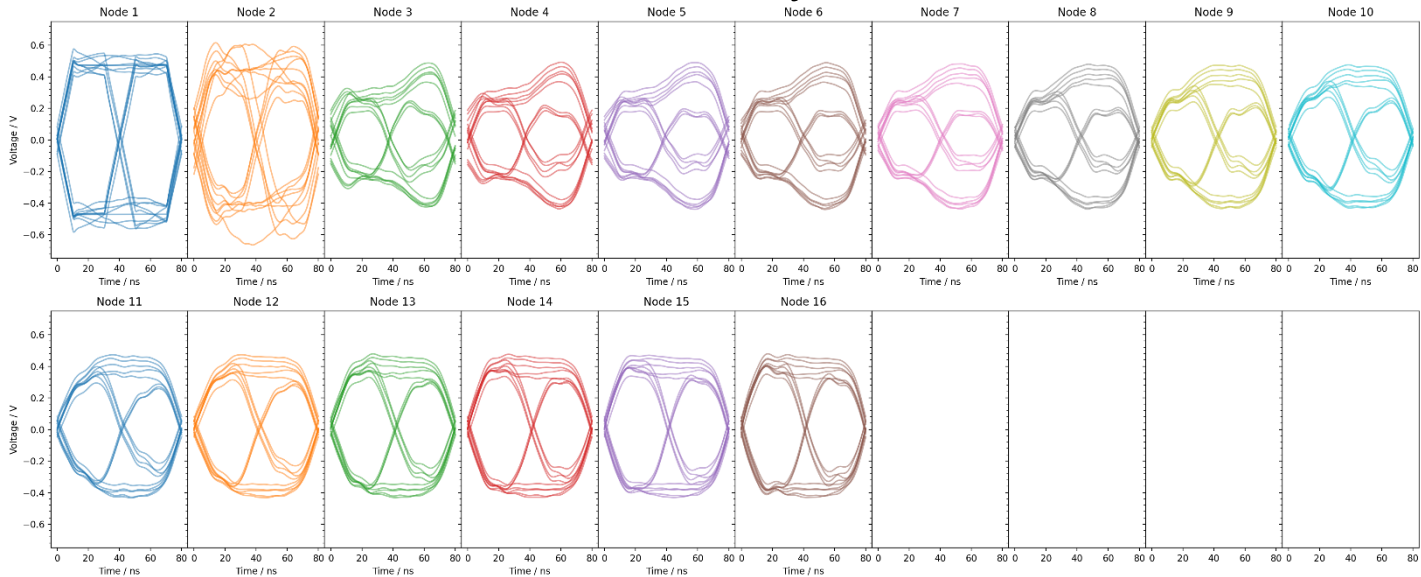


Source:

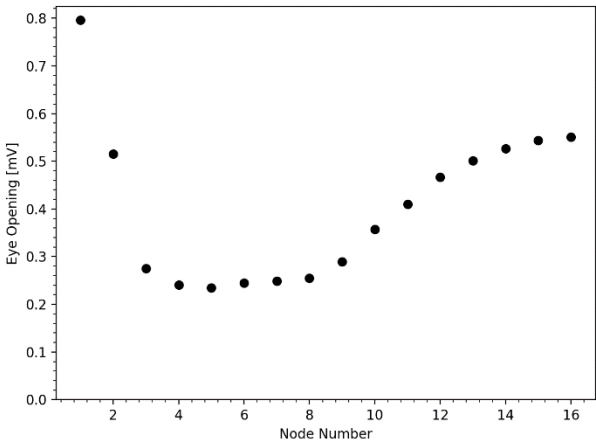
Koczvara_Griffiths_Brandt_MultidropNodeDistributionChallenges_20201202_v1.1.pdf

Clumped Distribution Transient results – 50 m Limit Cable

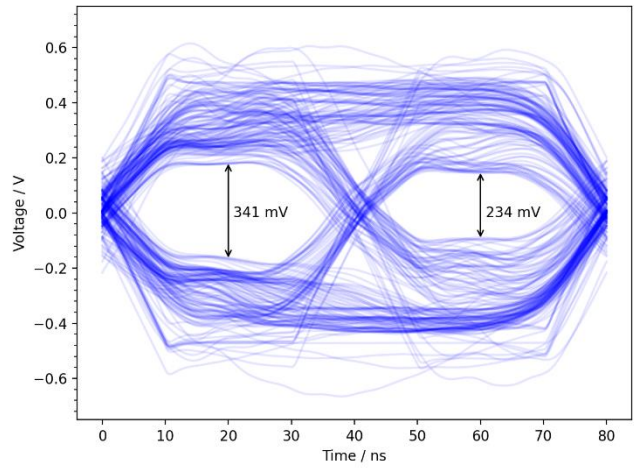
Multi-eye



Multi-eye distribution

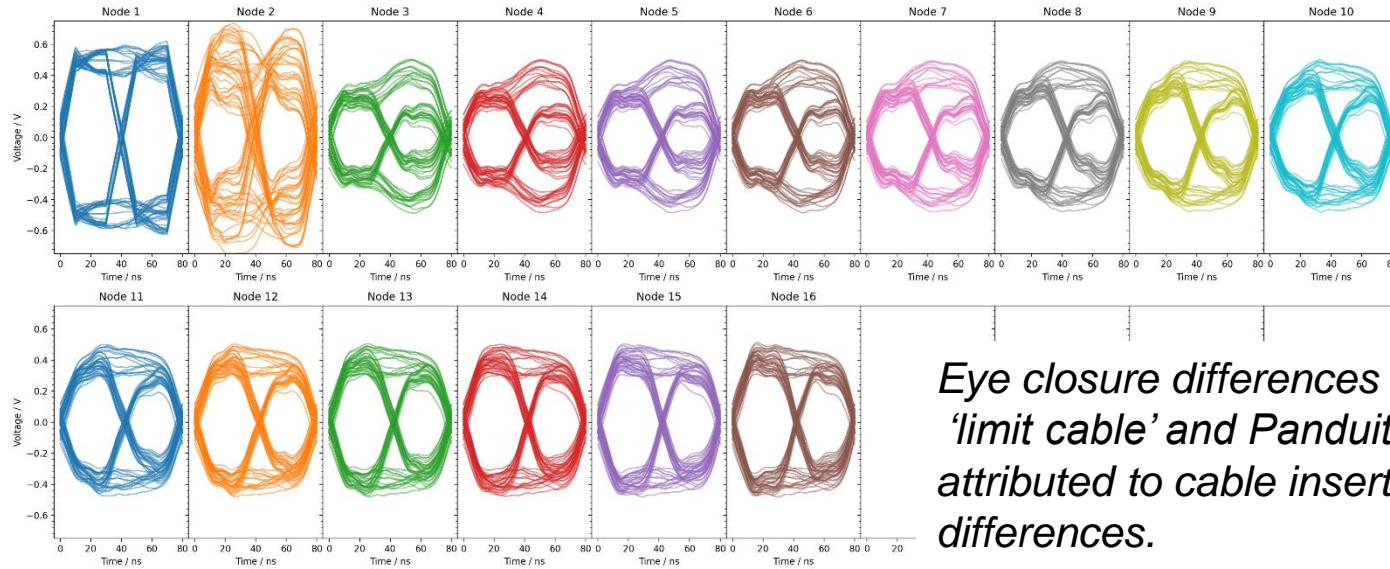


Combined-eye



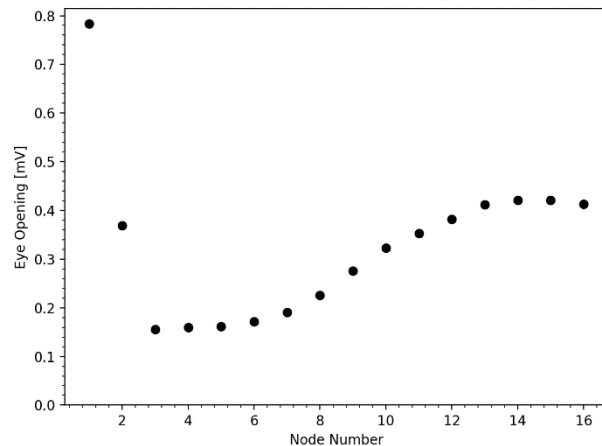
Clumped Distribution Transient results – 50 m Panduit Cable

Multi-eye

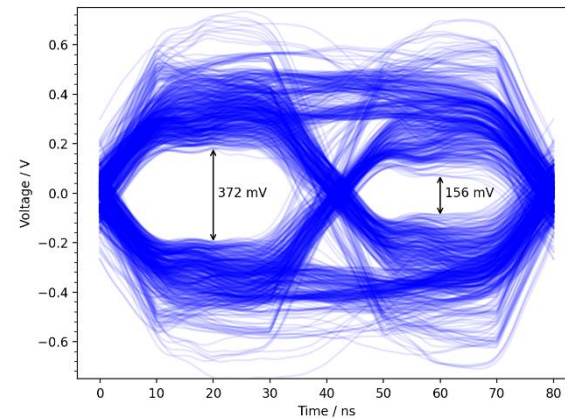


Eye closure differences between 'limit cable' and Panduit cable attributed to cable insertion loss differences.

Multi-eye distribution



Combined-eye



Summary

- New cable model developed to use with transient analysis for RX eye
 - Cable model transmission characteristics consistent with prior cable model
- Eye closure differences between 'limit cable' and Panduit cable attributed to cable insertion loss differences.
- Validated cable models with transient results to be applied to mixing segment proposal(s)