
SPE Multidrop Enhancements Mixing Segment Considerations

April 2022

Chris DiMinico/PHY-SI LLC/SenTekse
cdiminico@ieee.org
Bob Voss/Paul Wachtel/Panduit

Background

- Measurement configuration results for LTspice model validation demonstrated.
 - Transient analysis for RX eye
https://www.ieee802.org/3/da/public/051921/diminico_SPMD_01_0521.pdf
- 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 to 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
- Clumped distribution transient analysis for RX eye
https://www.ieee802.org/3/da/public/100621/diminico_SPMD_01b_100621.pdf
- Capacitive compensation via inductance(s)
https://www.ieee802.org/3/da/public/1121/diminico_SPMD_01_1121.pdf
- 802.3da desired use cases with capacitive compensation via inductance(s)
https://www.ieee802.org/3/da/public/1121/diminico_SPMD_01_1121.pdf

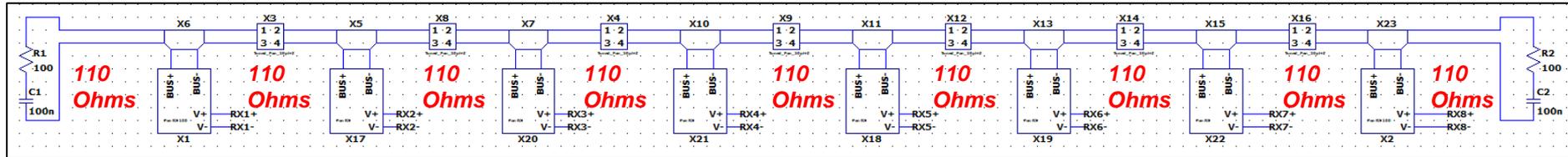
Purpose

- A mixing segment is a medium that may be connected to more than two Medium Dependent Interfaces (MDIs).
- Analysis presented to date have considered the mixing segment "medium" as a homogeneous cable between MDIs, that is cable sections with same impedance between MDIs.
- The mixing segment will be considered here consisting of cable sections between MDIs with variation on cable impedances of 10 ohms.
- Reference mixing segment cable slide 7.
https://www.ieee802.org/3/da/public/jul20/diminico_SPMD_01_0720.pdf

Mixing segment topologies - LT-spice model

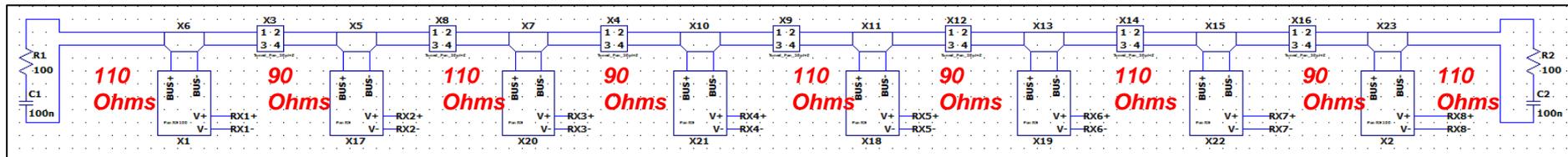
- Reference 110 ohm mixing segment; 8 nodes equally spaced 3.543 m.

3.543 m
↔



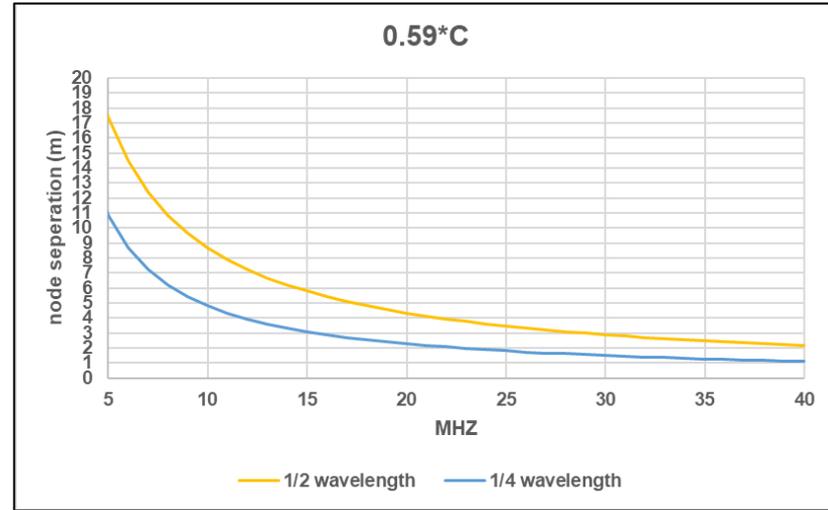
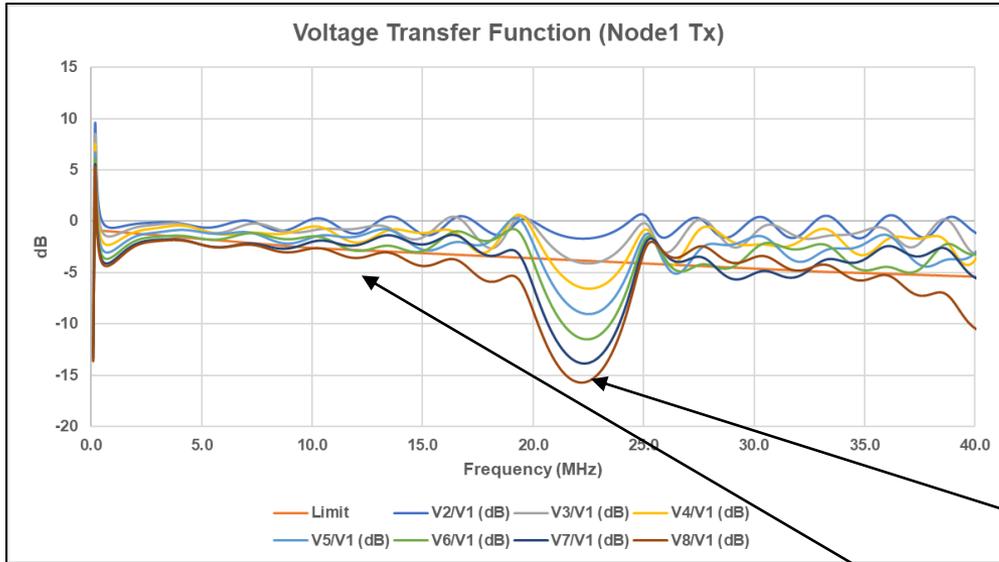
- Mixing segment considered consisting of cable sections between MDIs with variation on cable impedances of 10 ohms; 8 nodes equally spaced 3.543 m.

3.543 m
↔

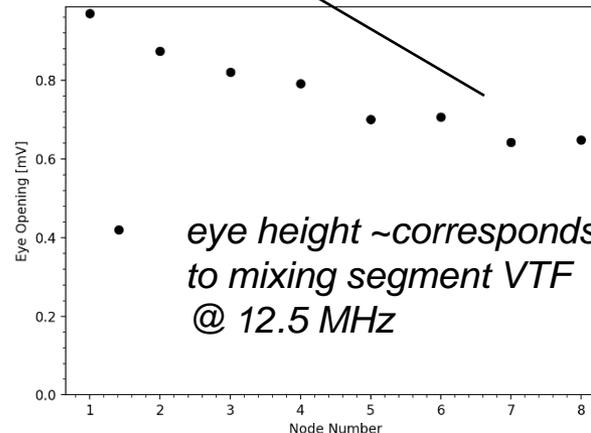
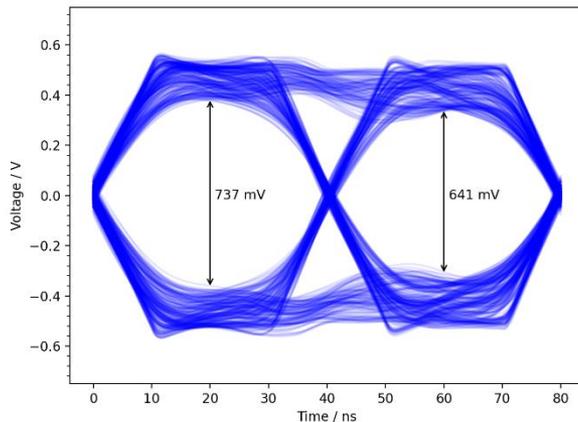


Mixing segment topologies - LT-spice model

- Reference 110 ohm mixing segment; 8 nodes equally spaced 3.543 m.

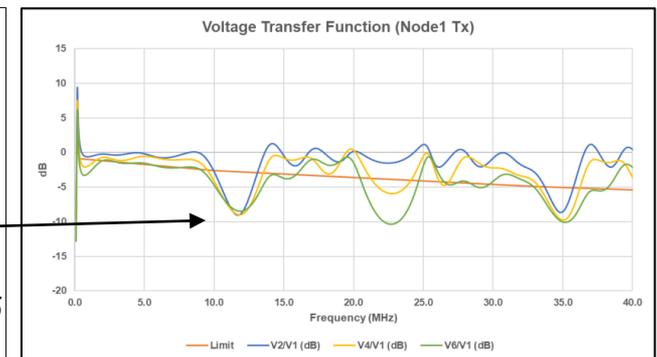
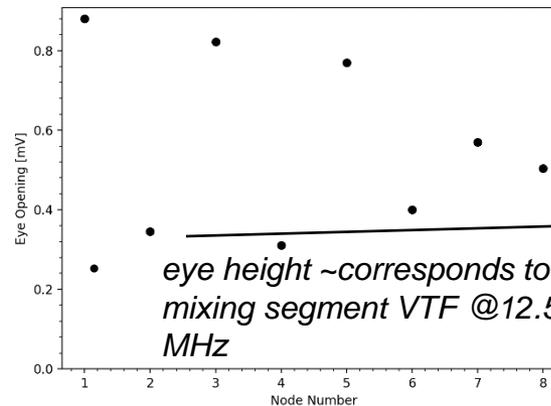
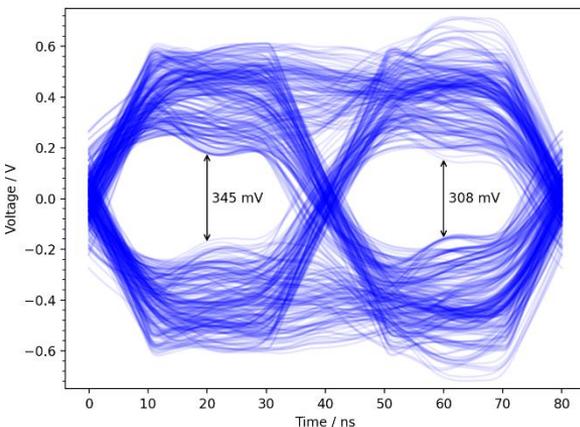
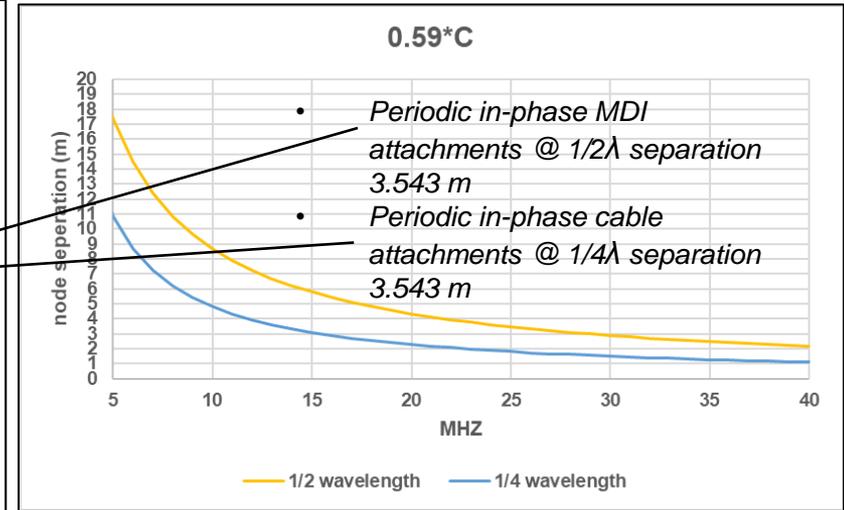
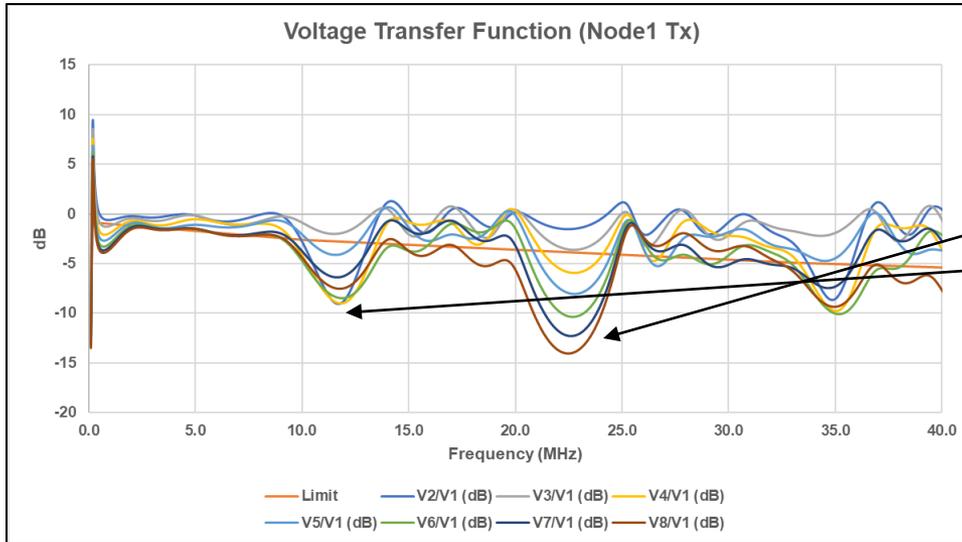


- Periodic in-phase MDI attachments @ $1/2\lambda$ separation 3.543 m



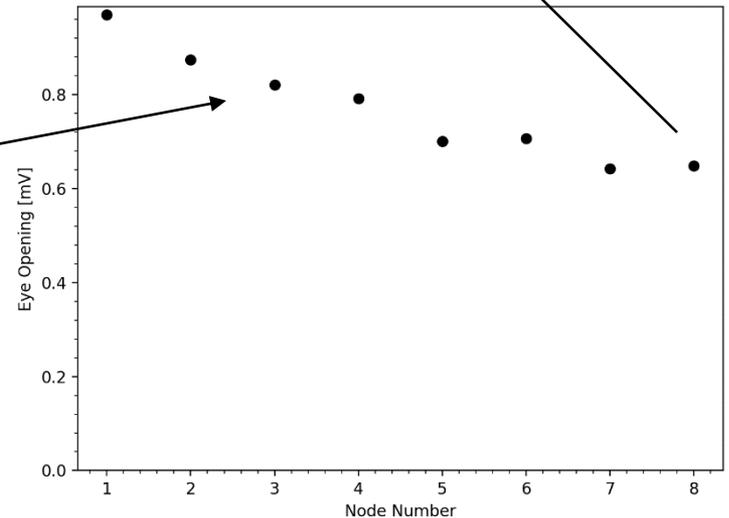
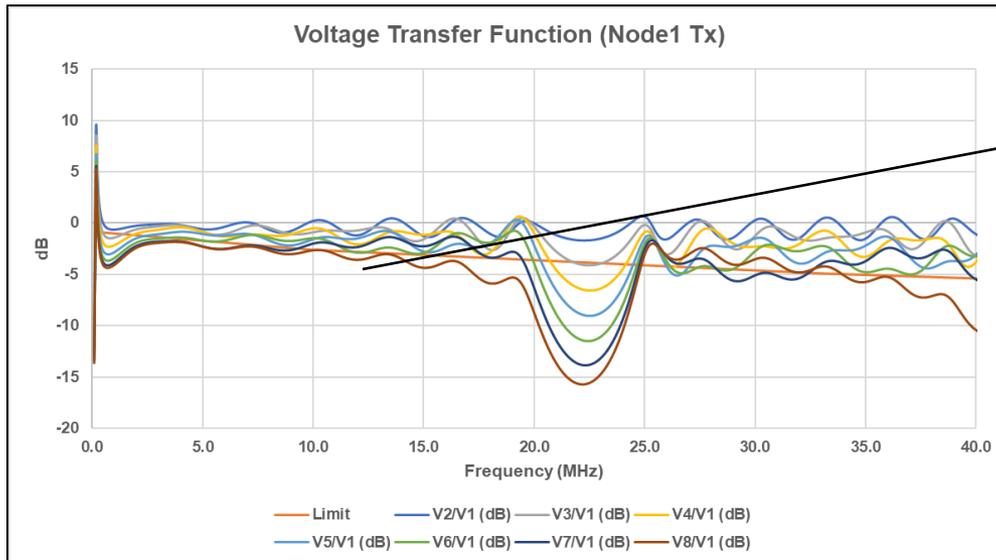
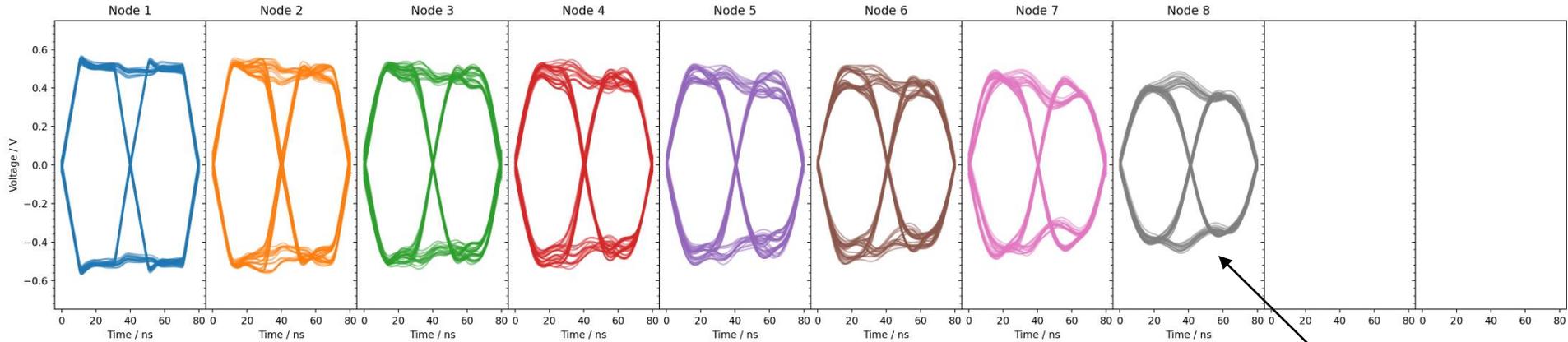
Mixing segment topologies - LT-spice model

- Mixing segment cable sections between MDIs with variation on cable impedances of 10 ohms; 8 nodes equally spaced 3.543 m.



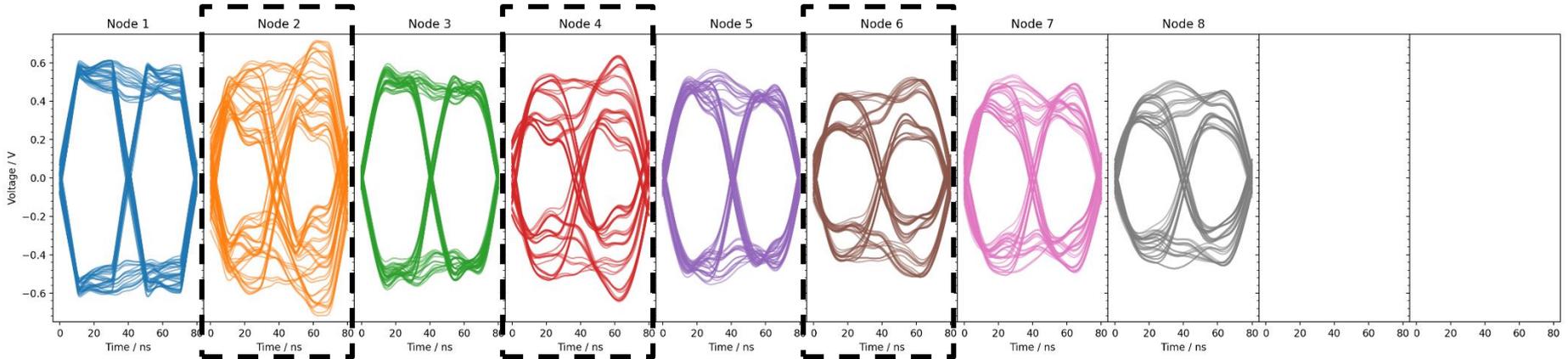
Mixing segment topologies - LT-spice model

- Eye height ~corresponds to mixing segment VTF @ 12.5 MHz.

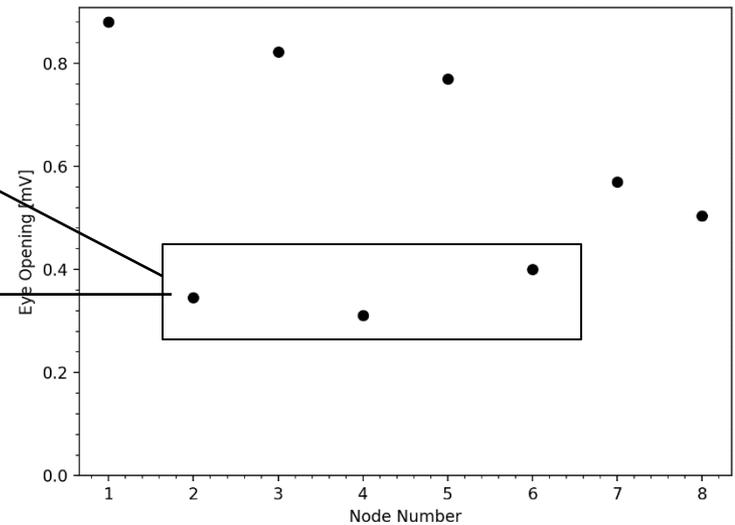
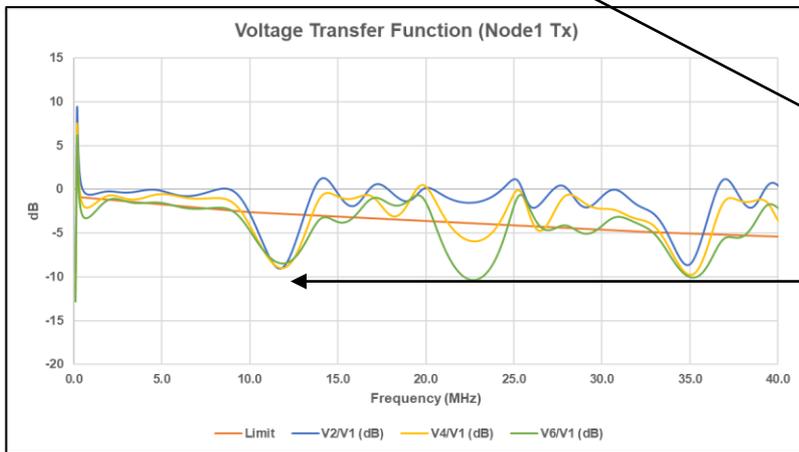


Mixing segment topologies - LT-spice model

- Eye height ~corresponds to mixing segment VTF @12.5 MHz.



- Nodes 2, 4, and 6

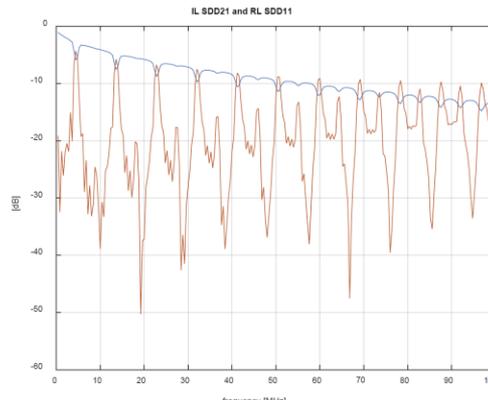
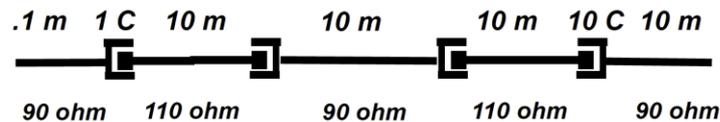


Point-to-point topologies

- Point-to-point link segments may consist of cable sections with different impedances between inline connectors as considered in developing 10BASE-T1L return loss specifications.
- Link Segment Baseline Proposal Industrial Applications IEEE 802.3 10 Mb/s Single Twisted Pair Ethernet Task Force
https://www.ieee802.org/3/cg/public/Mar2017/diminico_01_0317.pdf

Link Segment RL Model

- 10 connectors separated by 10 meters
- Cables +/- 10%



Slide 21

Summary

- Mixing segments considered consisting of cable sections between MDIs with variation on cable impedances of 10 ohms.
- LT-spice eye height ~corresponds to mixing segment voltage transfer function @ 12.5 MHz.