Neutralization of multidrop MDI capacitance impact

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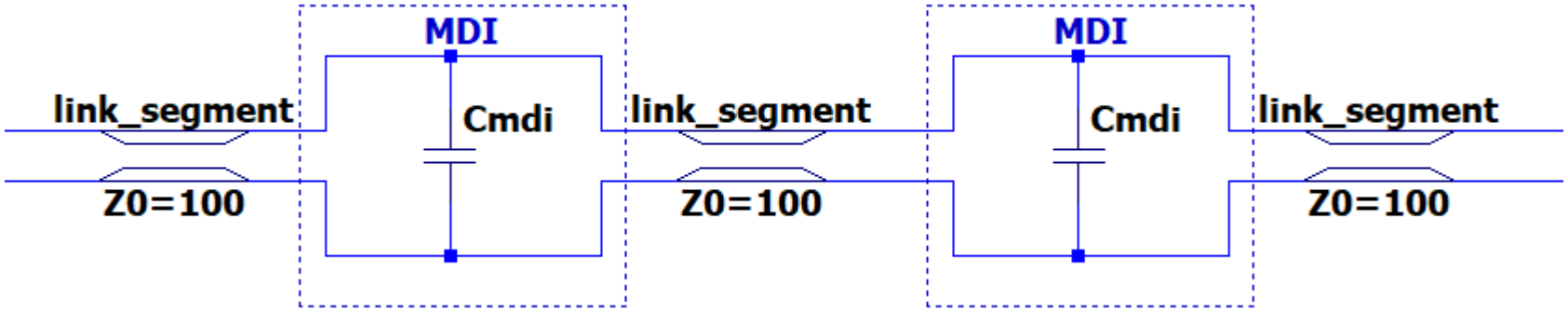
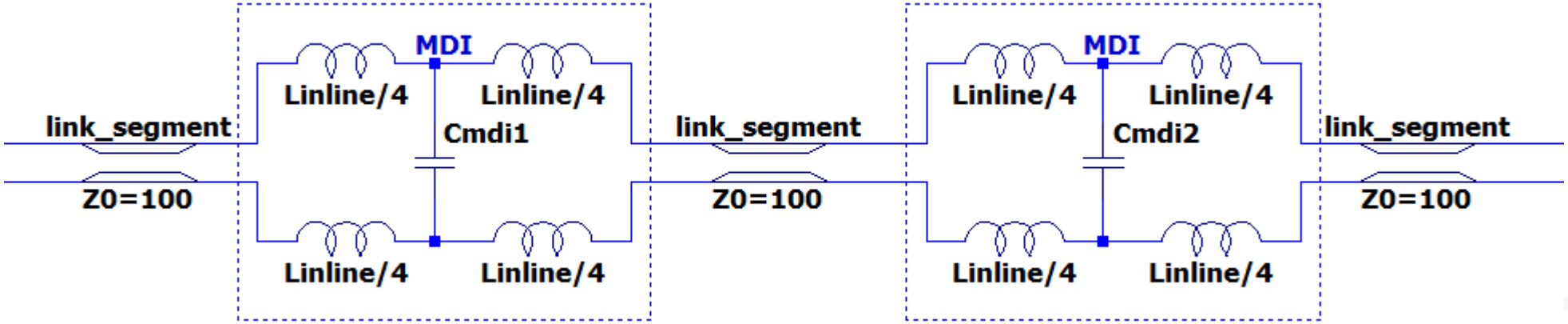
Standard 802.3cg MDI equivalent circuit (simplified)



- With multiple standard connectors in proximity, node capacitance adds to the transmission line capacitance
- Link segment $Z_0 = \sqrt{\frac{L}{C}}$ decreases to $Z_0 = \sqrt{\frac{L}{C+CMDI}} < 100\ \Omega$
- For MDIs electrically close to each other, connectors' capacitance adds to link capacitance which lowers transmission line characteristic impedance locally

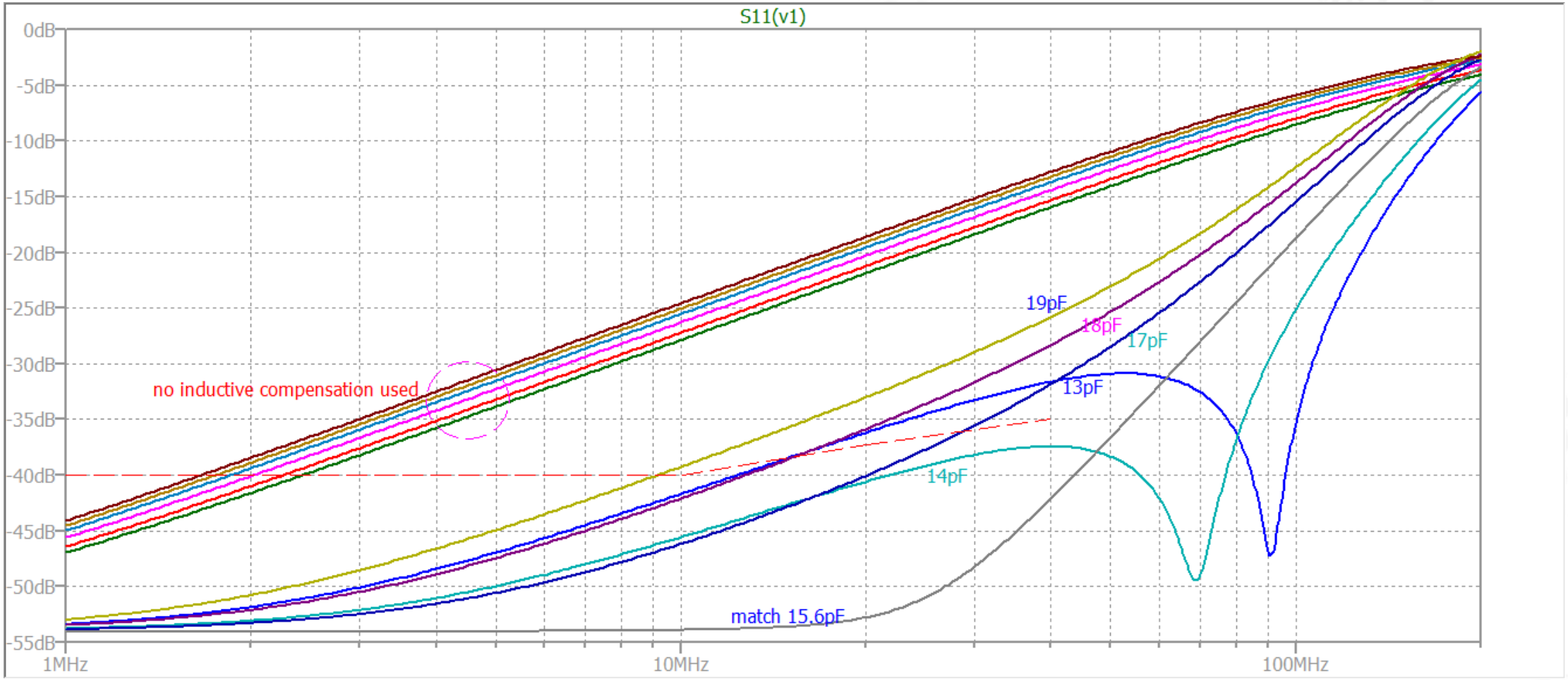
Connector with inline inductors



- Link segment Z_0 is restored to $Z_0 = \sqrt{\frac{L+Linl_{ine}}{C+CMDI}} = \mathbf{100\ \Omega}$
- L_{inline} is chosen to be 10k * C_{MDI} i.e. we need 10nH to offset each 1pF
- Inductors work with the MDI capacitance and **make the MDI look like a natural piece of link segment**

S11 of MDI, with and without 4*39nH inline inductors

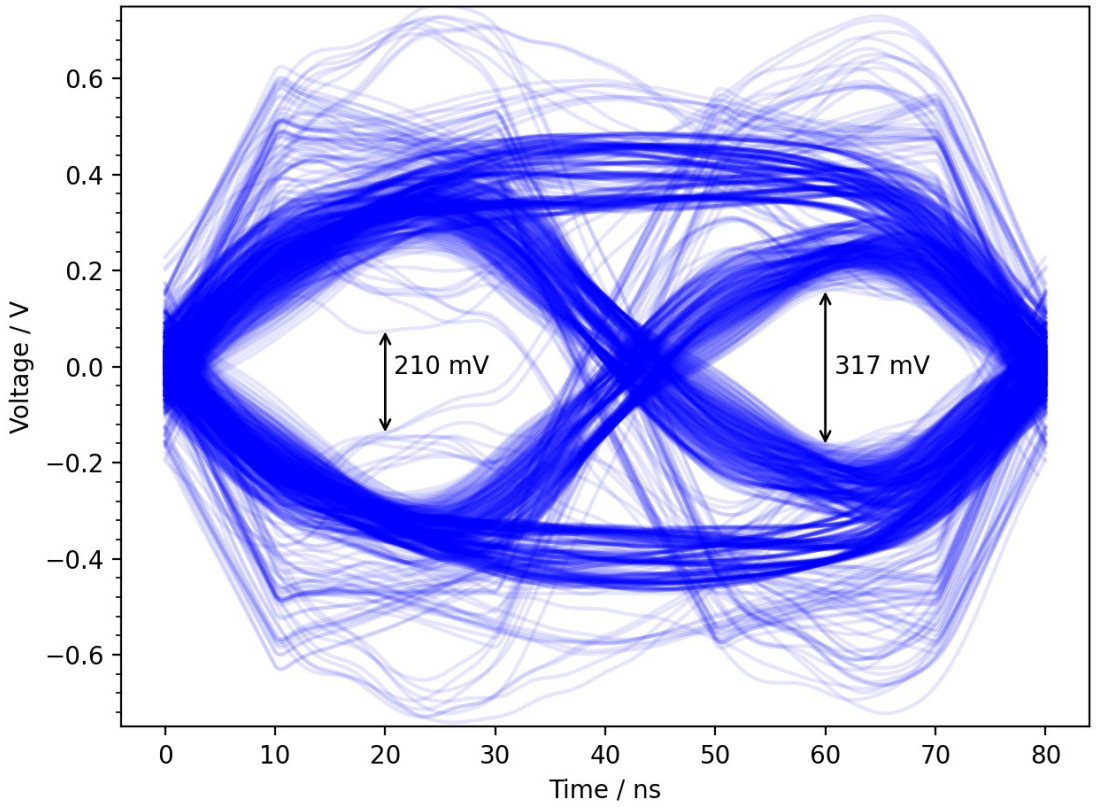
Rphy=10k, Cphy = 13/14/15.6/17/18/19pF. No PoDL.



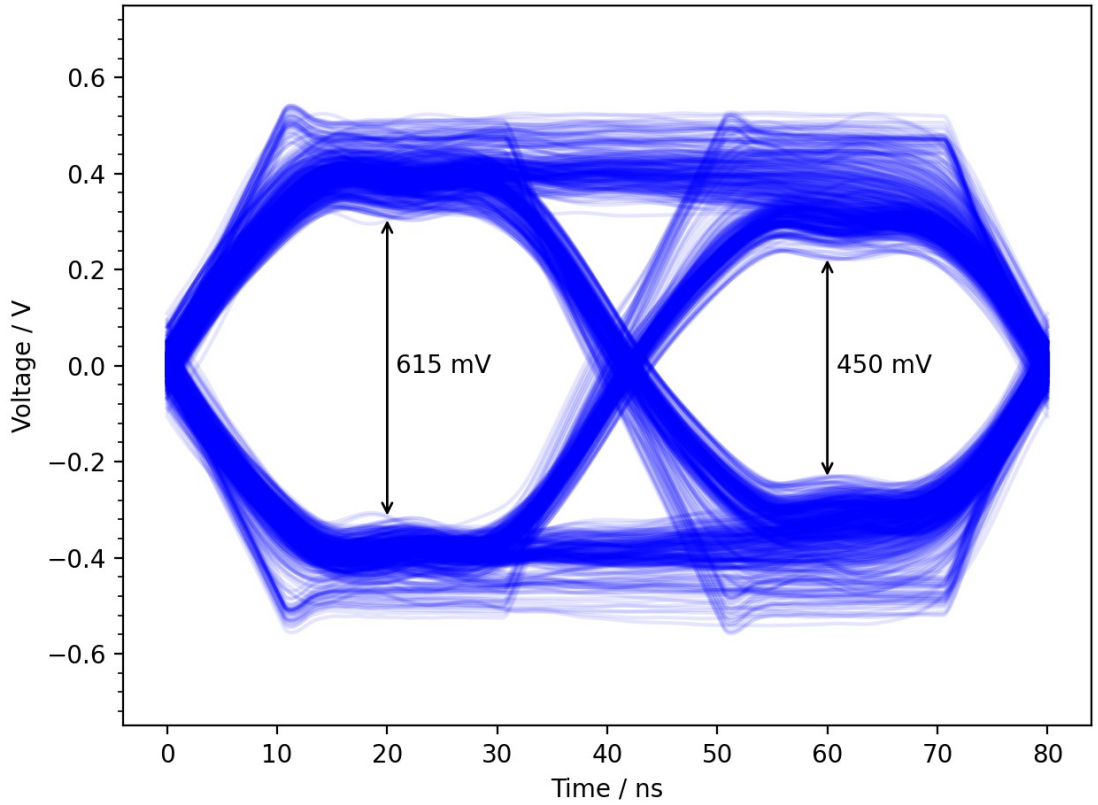
Eye diagrams, clumped distribution

R=10kΩ, C=15pF, L=80µH (with PoDL)

16 nodes, 50m cable, 45mm clumped section spacing, 10cm stubs



no inline inductors

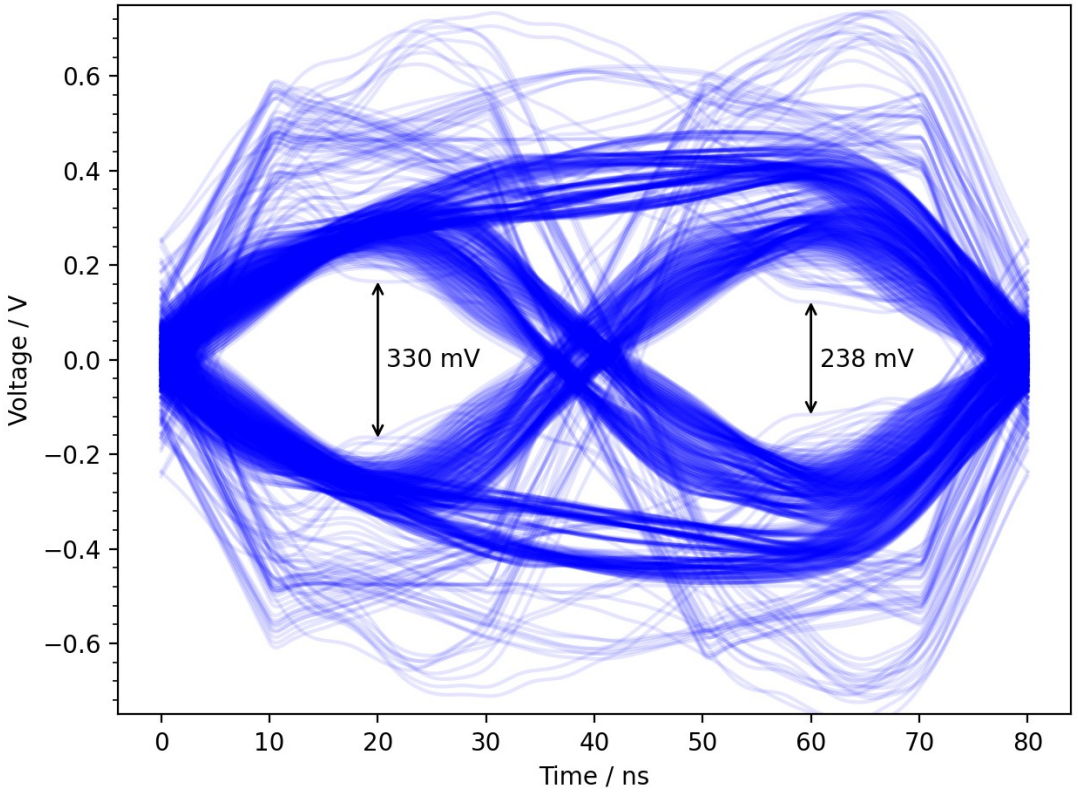


with inline inductors

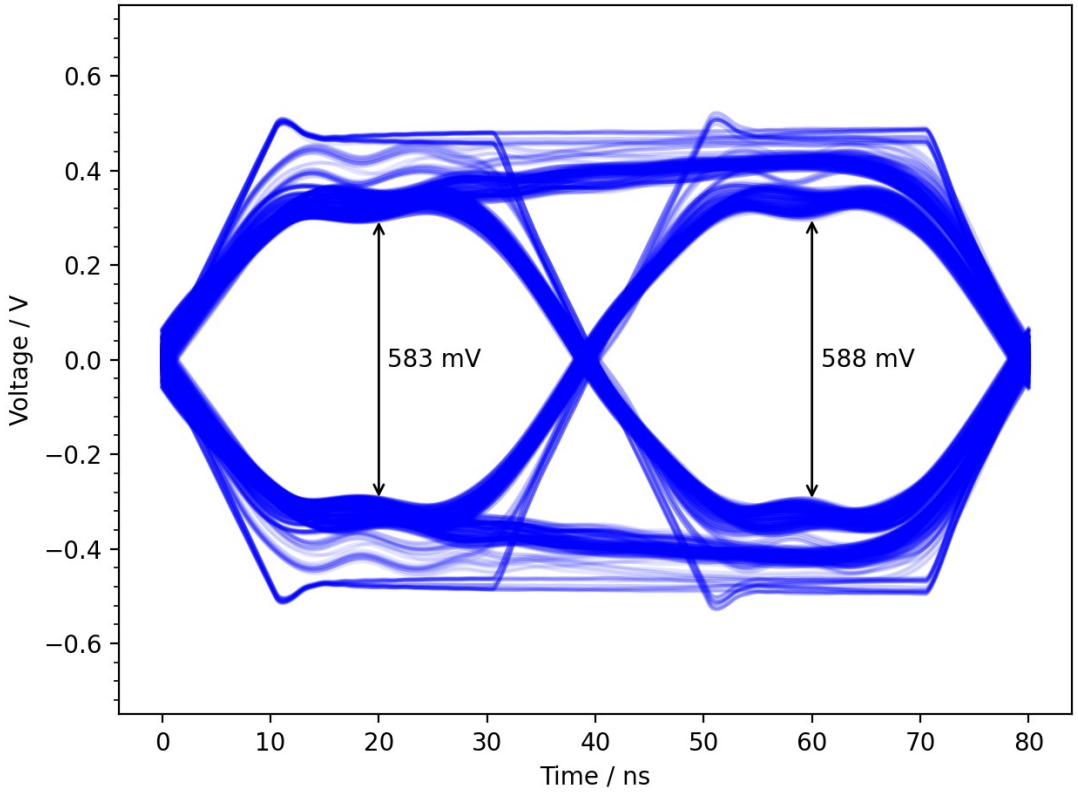
Eye diagrams, clumped distribution

R=10kΩ, C=15pF, L=N/A (without PoDL)

16 nodes, 50m cable, 45mm clumped section spacing, 10cm stubs



no inline inductors

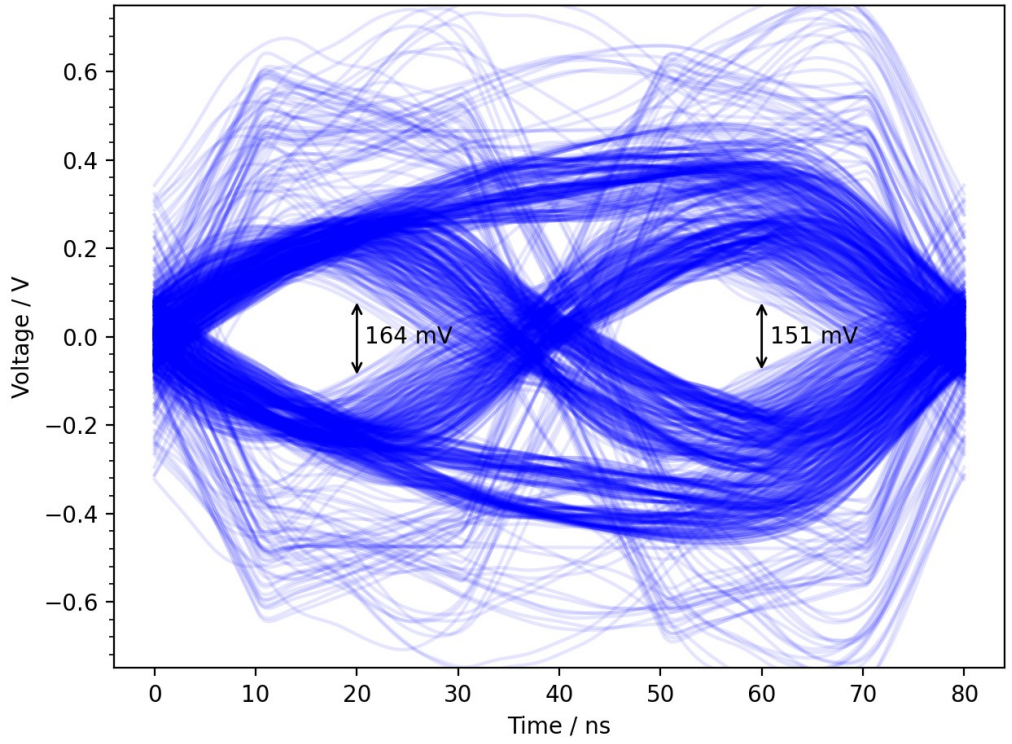


with inline inductors

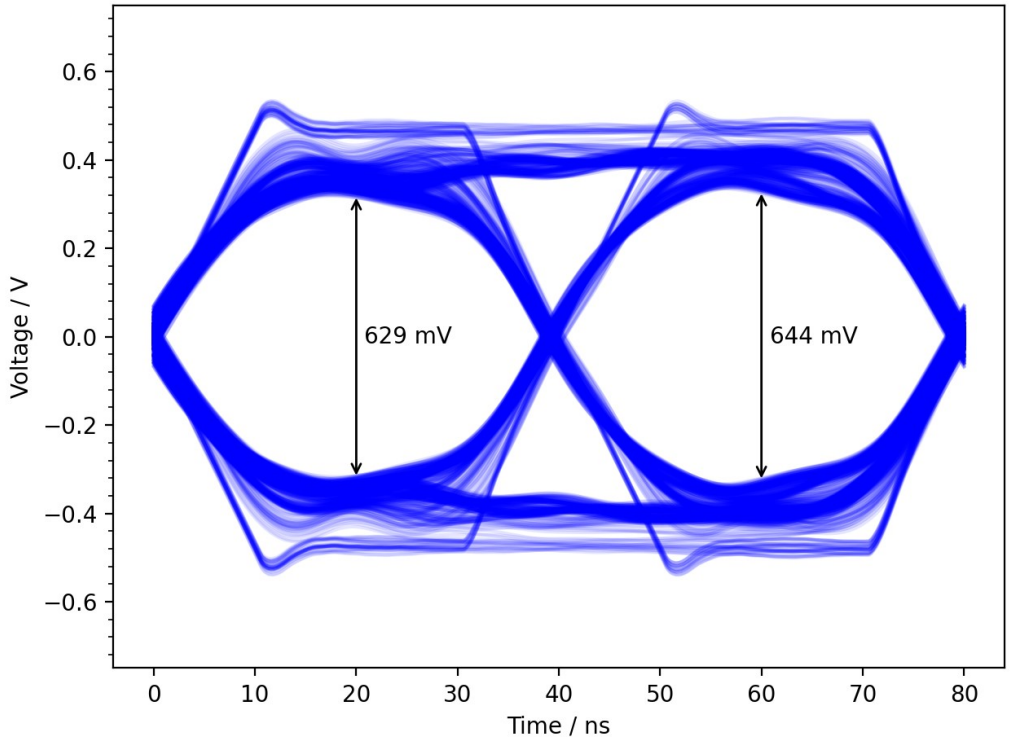
Eye diagrams, clumped distribution

R=10kΩ, C=25pF (Lind=4*65nH), L=N/A (without PoDL)

16 nodes, 50m cable, 45mm clumped section spacing, 10cm stubs



no inline inductors



with inline inductors

Thank you

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