
SPE Multidrop Enhancements Mixing Segment Considerations with RX Model

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Contributors

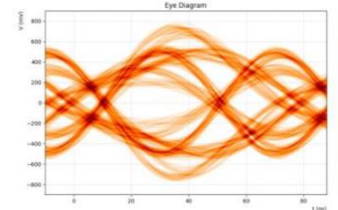
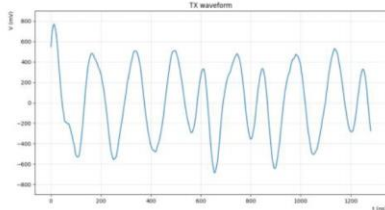
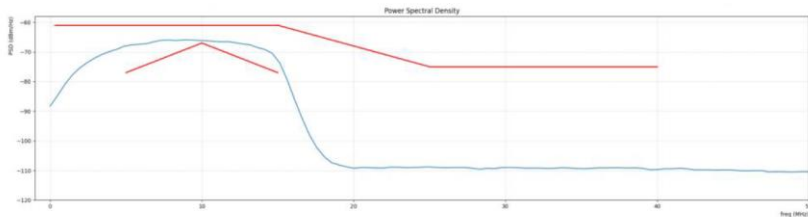
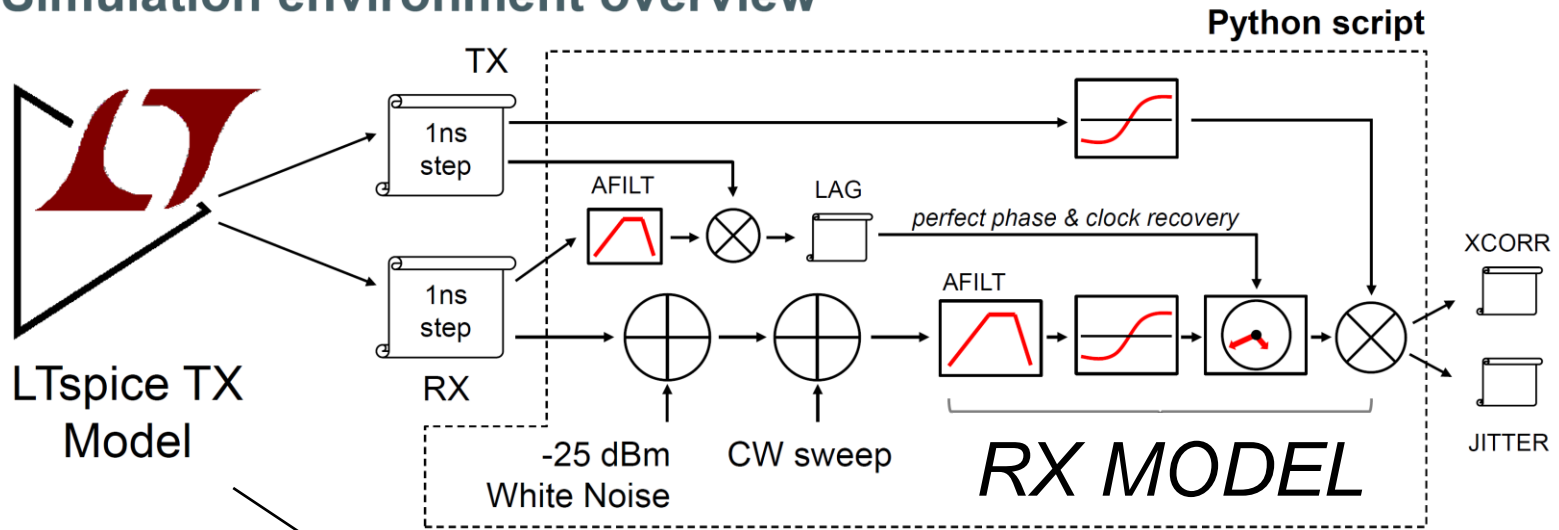
- Bob Voss/Paul Wachtel - Panduit
- Piergiorgio Beruto - Onsemi

Purpose

- Mixing segment modeling updated with integration of TX and RX Models
 - Source Mixing Segment Model:
https://www.ieee802.org/3/da/public/0122/diminico_SPM D_01_0122.pdf
 - Source TX Model:
https://www.ieee802.org/3/da/public/050422/beruto_3da_20220502_tx_model.pdf
 - Source RX Model:
https://www.ieee802.org/3/da/public/0722/beruto_3da_20220711_rx_model.pdf

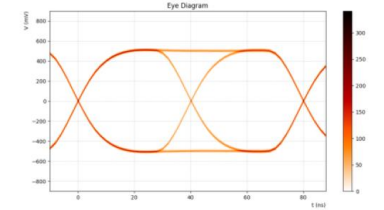
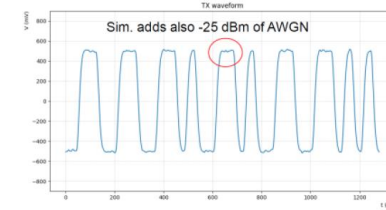
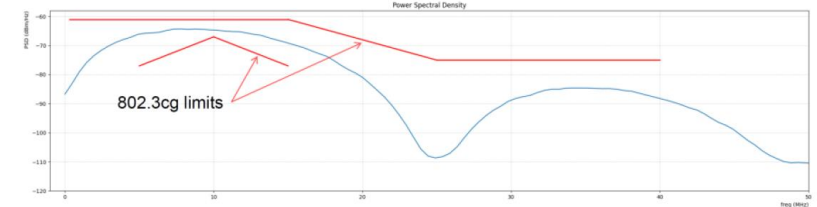
Multidrop Topology - TX/RX models

Simulation environment overview



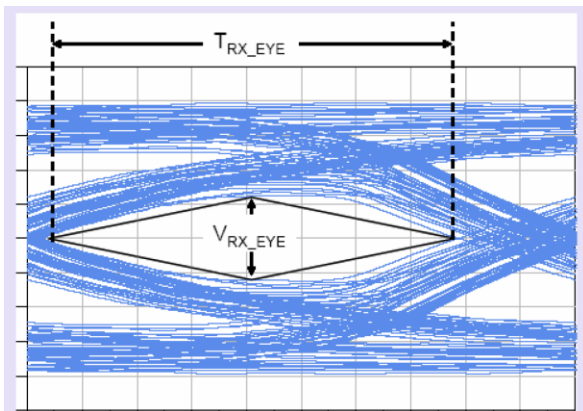
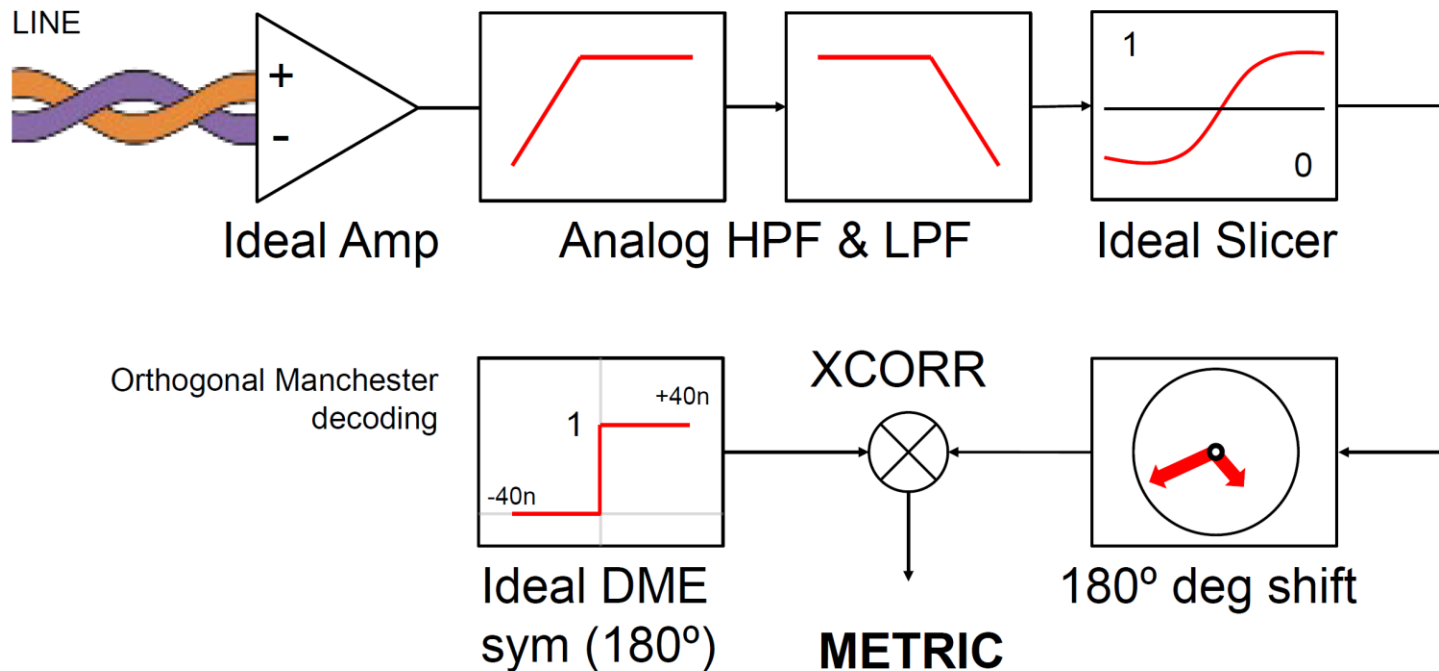
Still not Very good! But allowed

minimally compliant TX



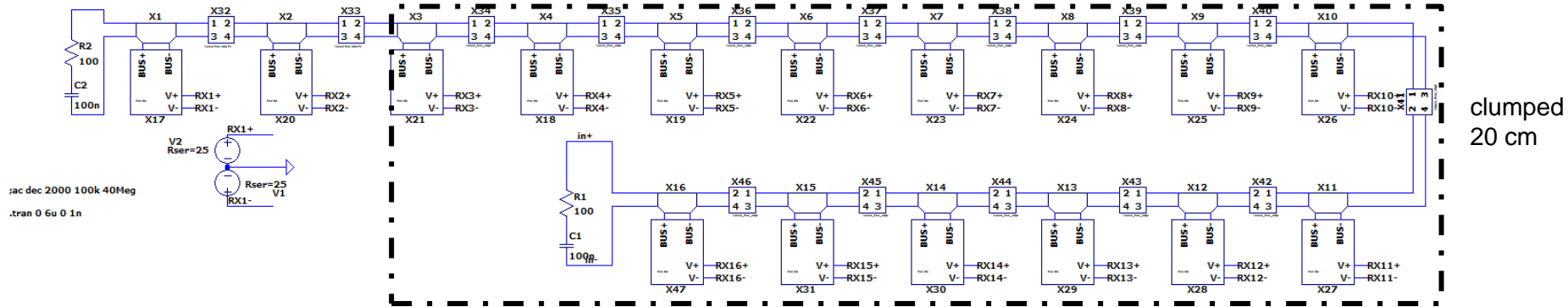
Typical TX

Minimal Architecture Model Overview

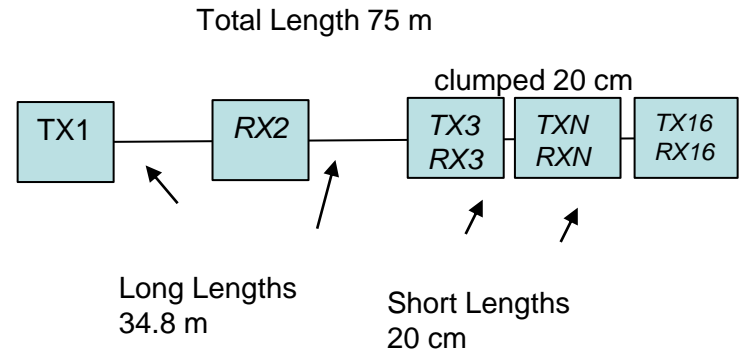


Eye diagram - vertical and horizontal closure

Multidrop Topology - clumped uncompensated

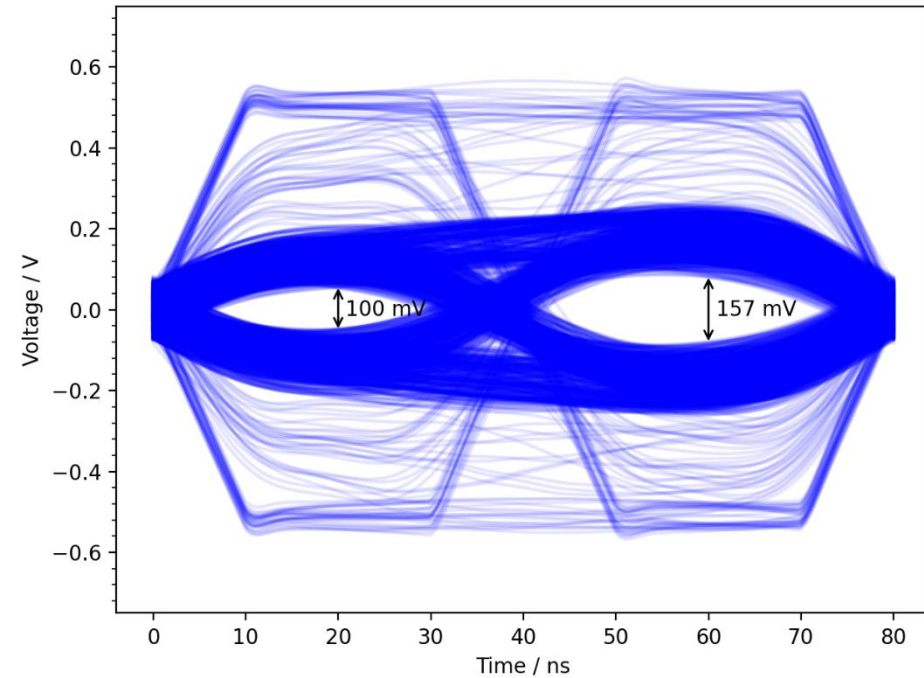


- 75 m, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths

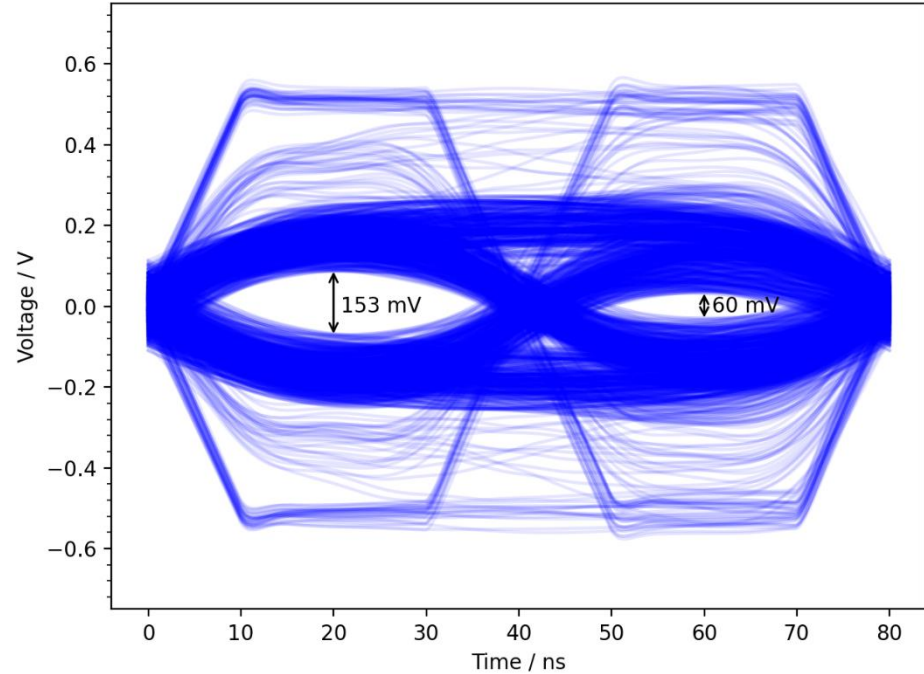


Multidrop Topology - 75 m, 30 node, clumped uncompensated

vertical eye closure illustrated

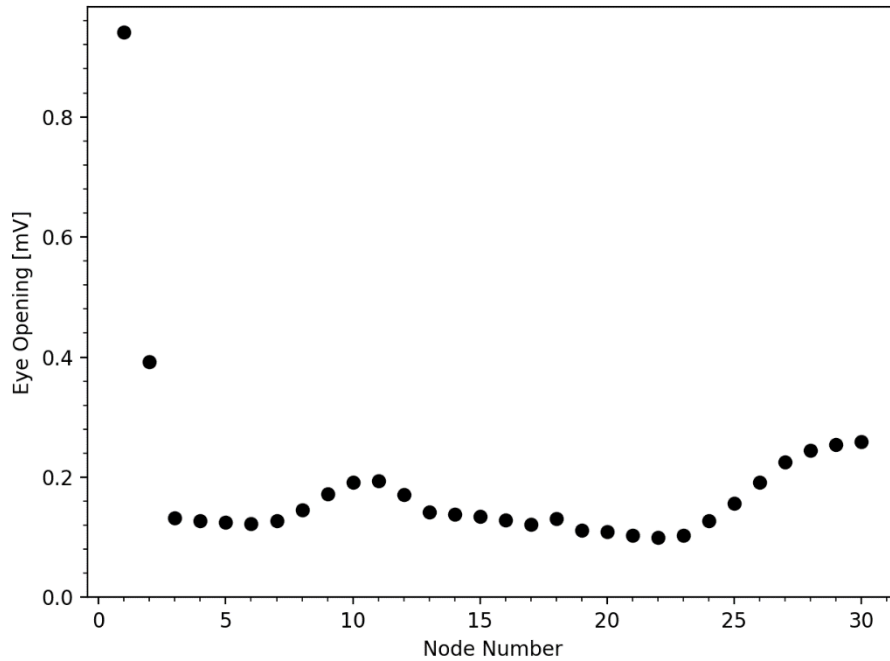


NO PoDL

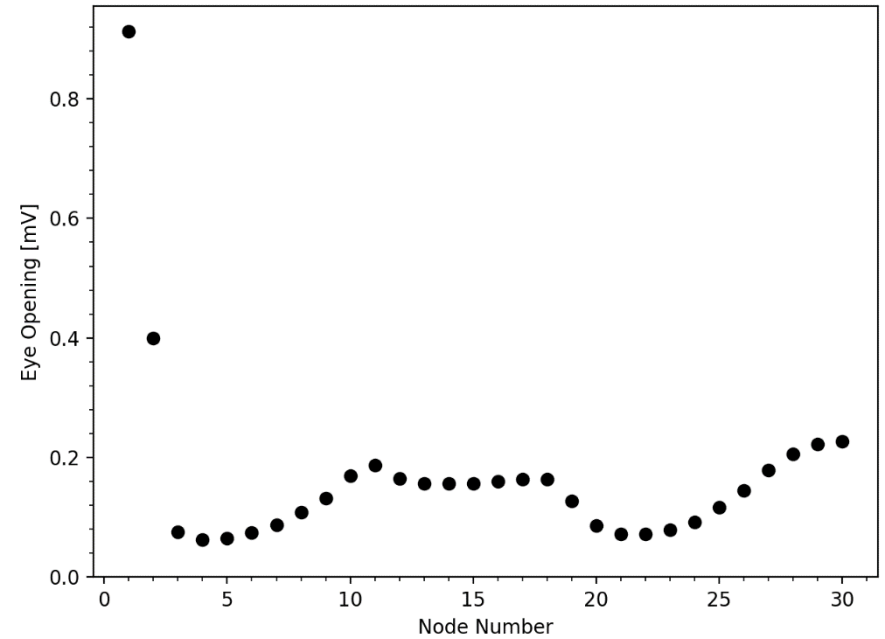


PoDL

Multidrop Topology - 75 m, 30 node, clumped uncompensated

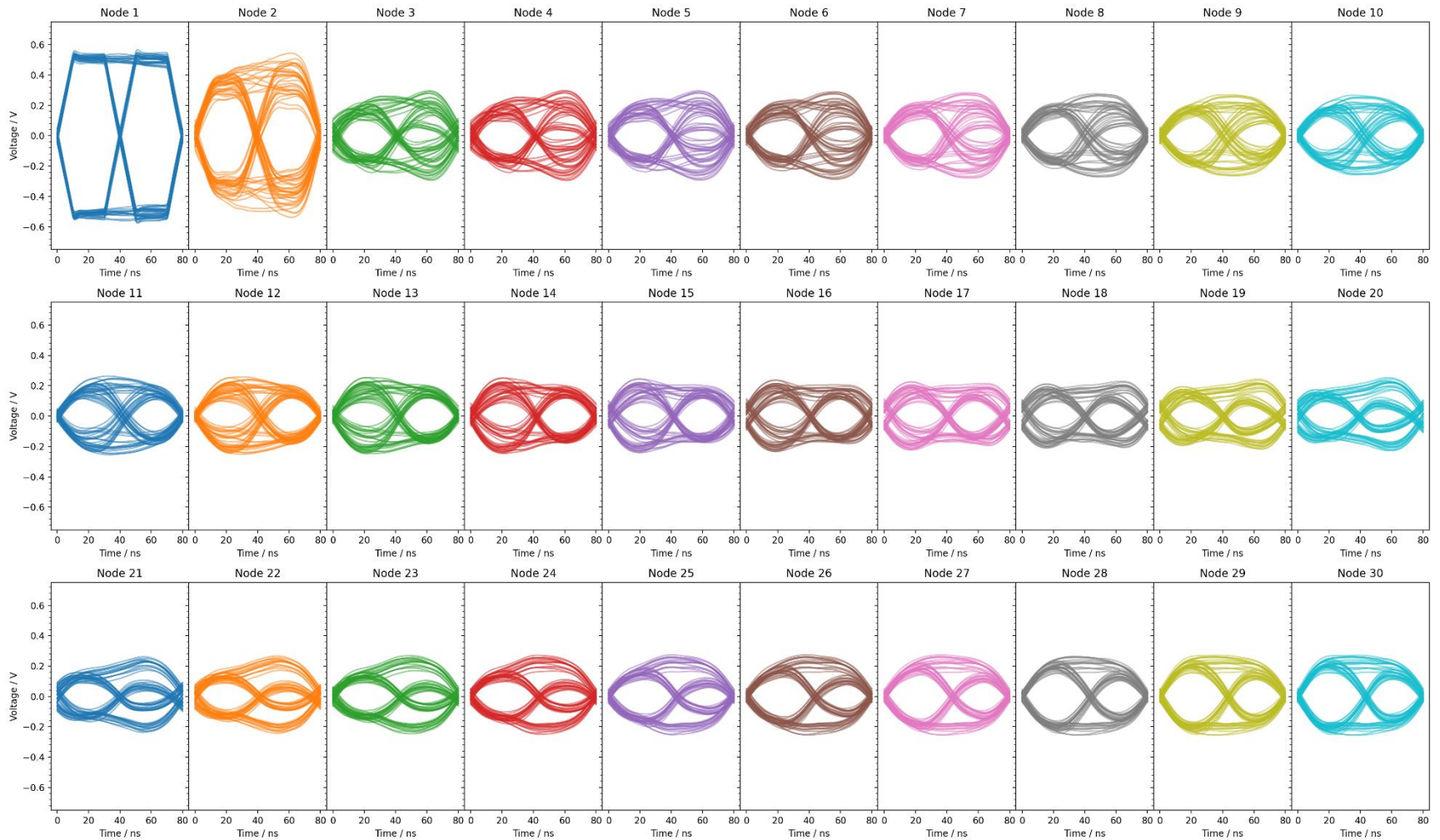


PoDL



NO PoDL

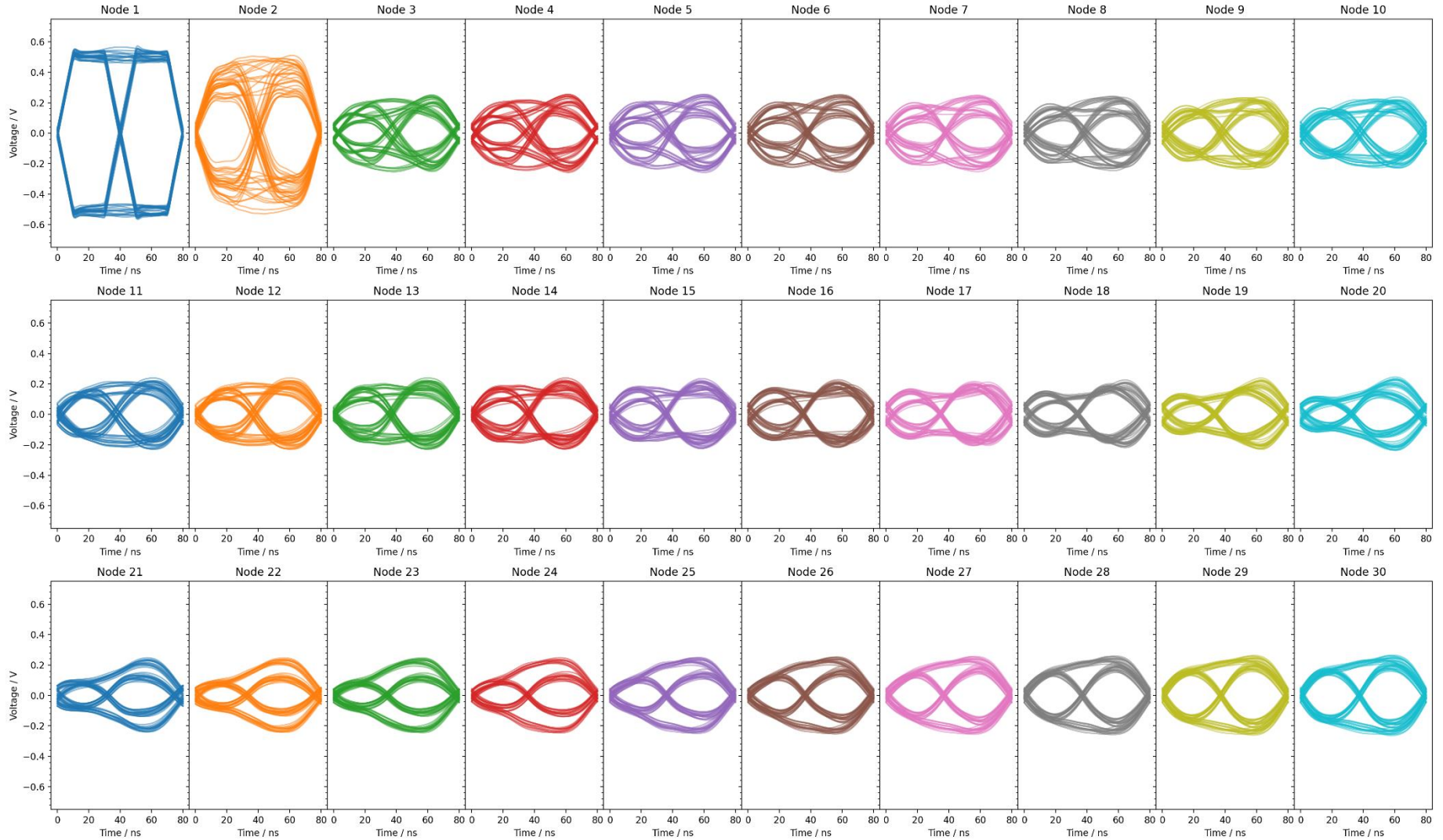
Multidrop Topology - 75 m, 30 node, clumped uncompensated



NO PoDL

10 Mb/s SPMD Enhancement TG

Multidrop Topology - 75 m, 30 node, clumped uncompensated

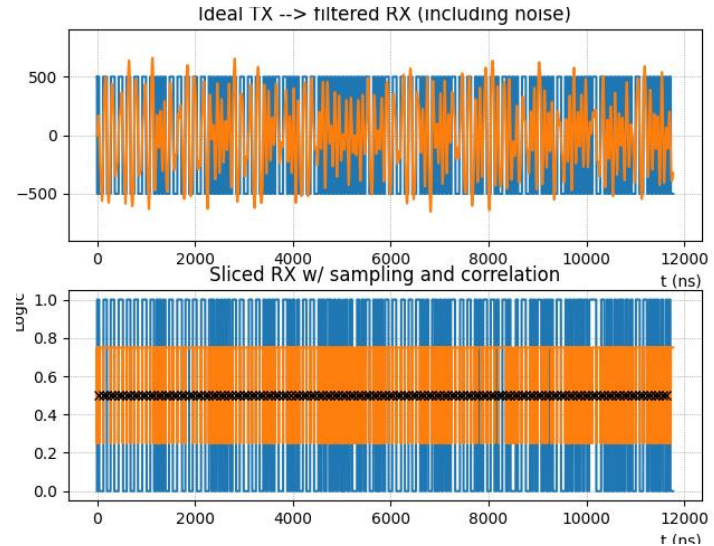
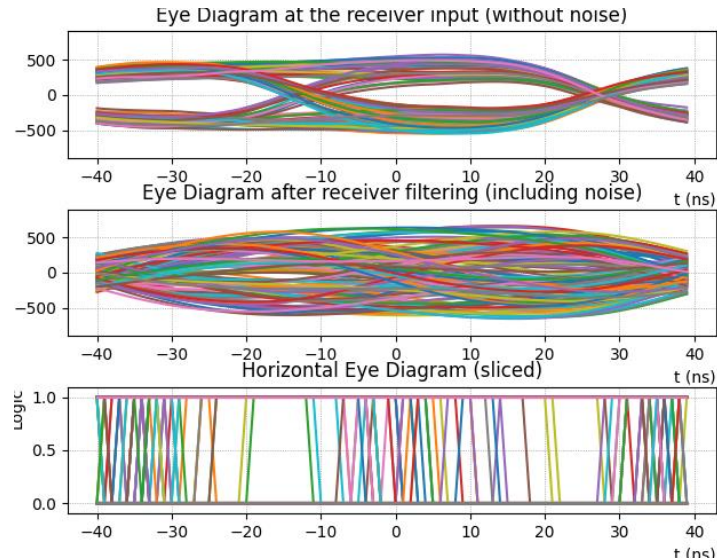


PoDL

10 Mb/s SPMD Enhancement TG

Multidrop Topology - 75 m, 30 node, clumped uncompensated

- Node RX2 with typical TX Model

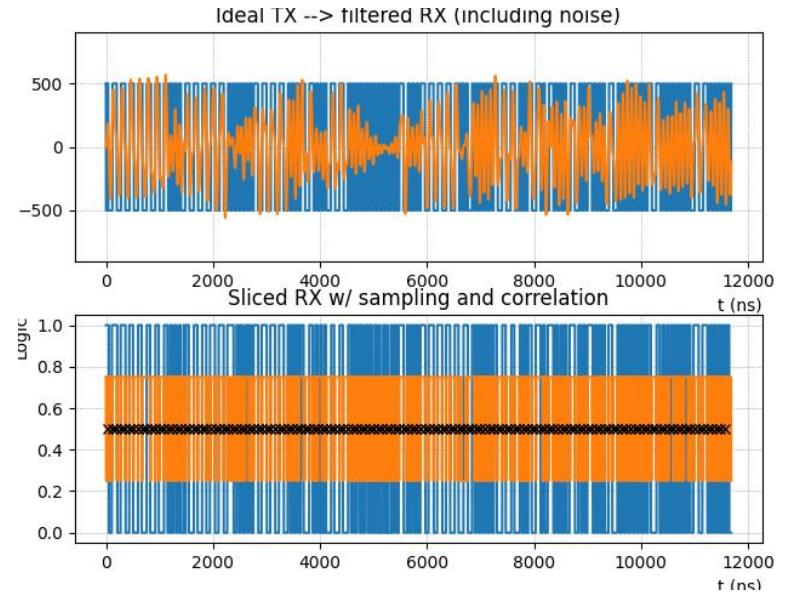
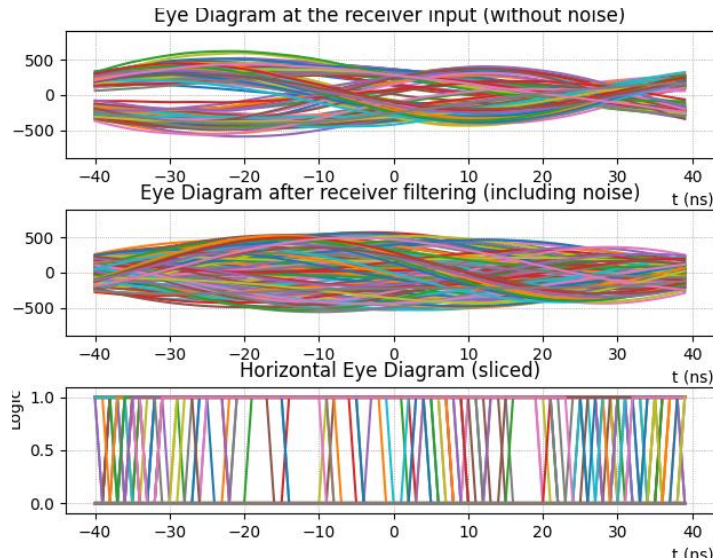


CWA (V)	CORR_AVG	CORR_MAX	CORR_MIN	JITTER (ns)	JITTER_MAX (ns)
0	0.960677	1	0.8	1.968523	5
0.05	0.959662	1	0.7625	2.071869	7
0.1	0.956632	1	0.7125	2.303408	9
0.15	0.952067	1	0.65	2.654554	11
0.2	0.945999	1	0.5625	3.105251	13
0.25	0.938646	1	0.4875	3.732132	39
0.3	0.930347	1	0.425	4.686661	39
0.35	0.921262	1	0.4125	5.684006	39
0.4	0.911575	1	0.3875	6.723002	39
0.45	0.90126	1	0.3625	7.974711	39

CORR_MIN < 0.65

Multidrop Topology - 75 m, 30 node, clumped uncompensated

- Node RX2 with minimally compliant TX Model

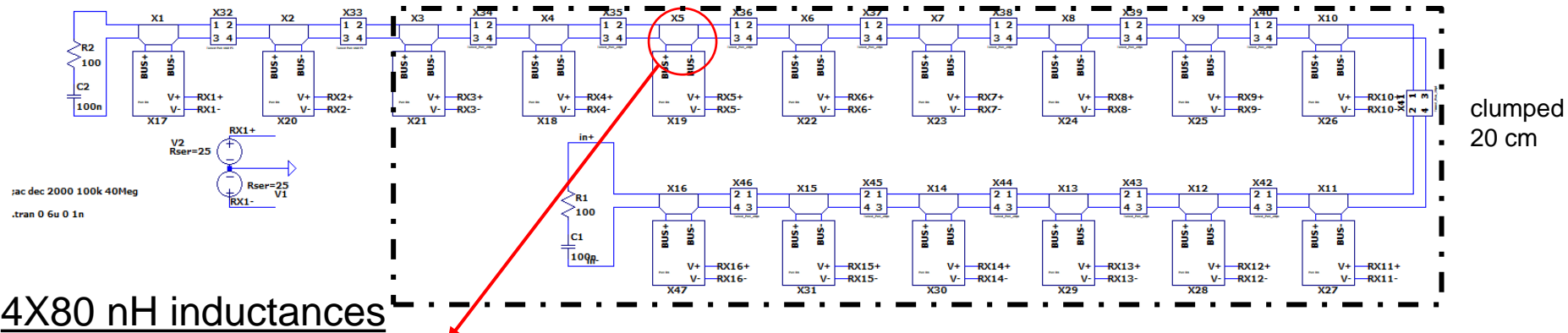


CWA (V)	CORR_AVG	CORR_MAX	CORR_MIN	JITTER (ns)	JITTER_MAX (ns)
0	0.909003	1	0.7625	5.339578	17
0.05	0.90852	1	0.725	5.387112	19
0.1	0.906522	1	0.6875	5.577323	21
0.15	0.902907	1	0.5	5.912733	39
0.2	0.897306	1	0.5	6.477401	39
0.25	0.889591	1	0.425	7.342015	39
0.3	0.880288	1	0.4125	8.303739	39
0.35	0.869299	1	0.275	9.420159	39
0.4	0.857338	1	0.0875	10.720963	39
0.45	0.845064	1	0.025	12.02262	39

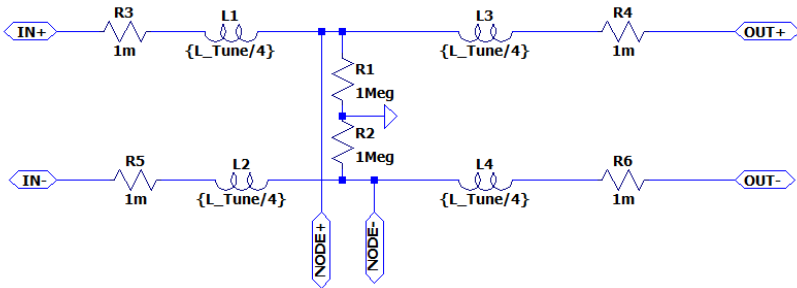
CORR_MIN < 0.65

Multidrop Topology - clumped compensated

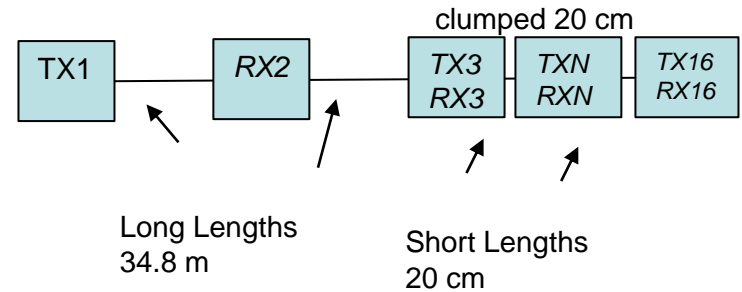
inductances incorporated in stub connectors



4X80 nH inductances



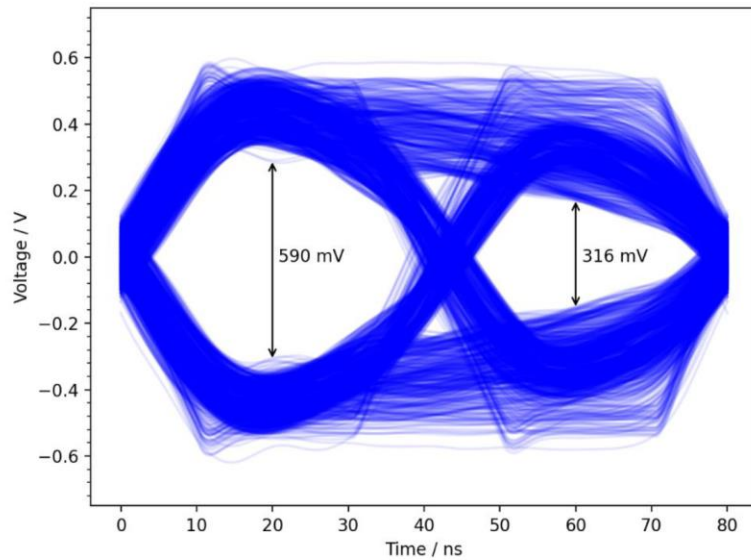
Total Length 75 m



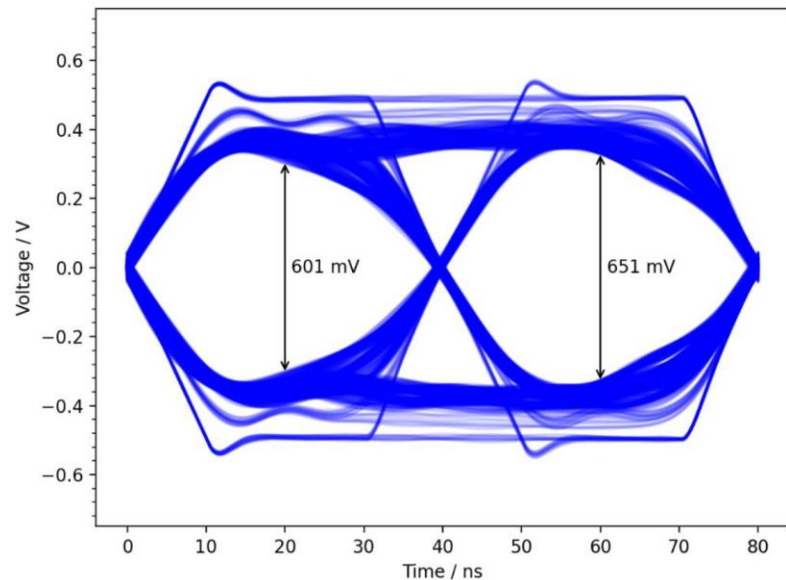
- 75 m, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths
- 4X80 nH inductances

Multidrop Topology - 75 m, 30 node, clumped compensated

vertical eye closure illustrated



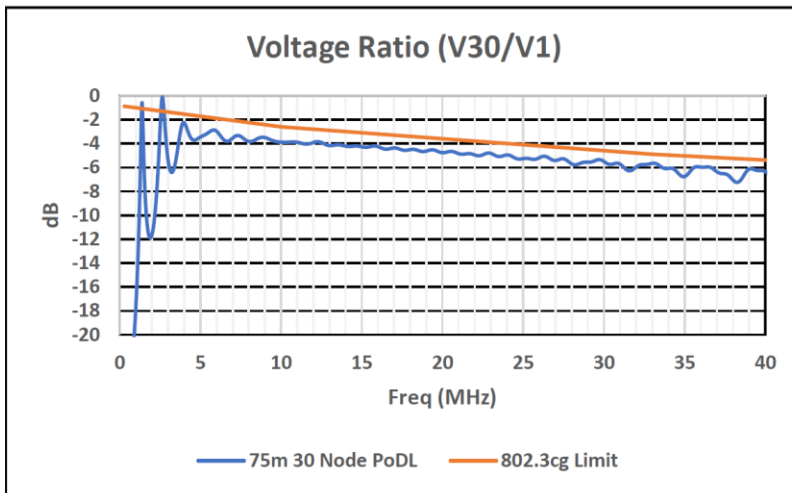
PoDL



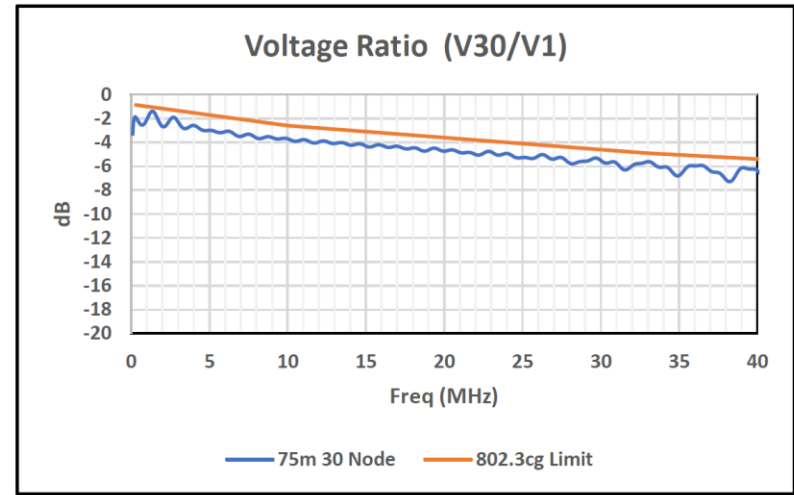
No PoDL

- 75 m, 30 node, clumped topology
- 80 μ H, 30 pF node parasitics
- 10 cm stub lengths
- 4X80 nH inductances

Multidrop Topology - 75 m, 30 node, clumped compensated



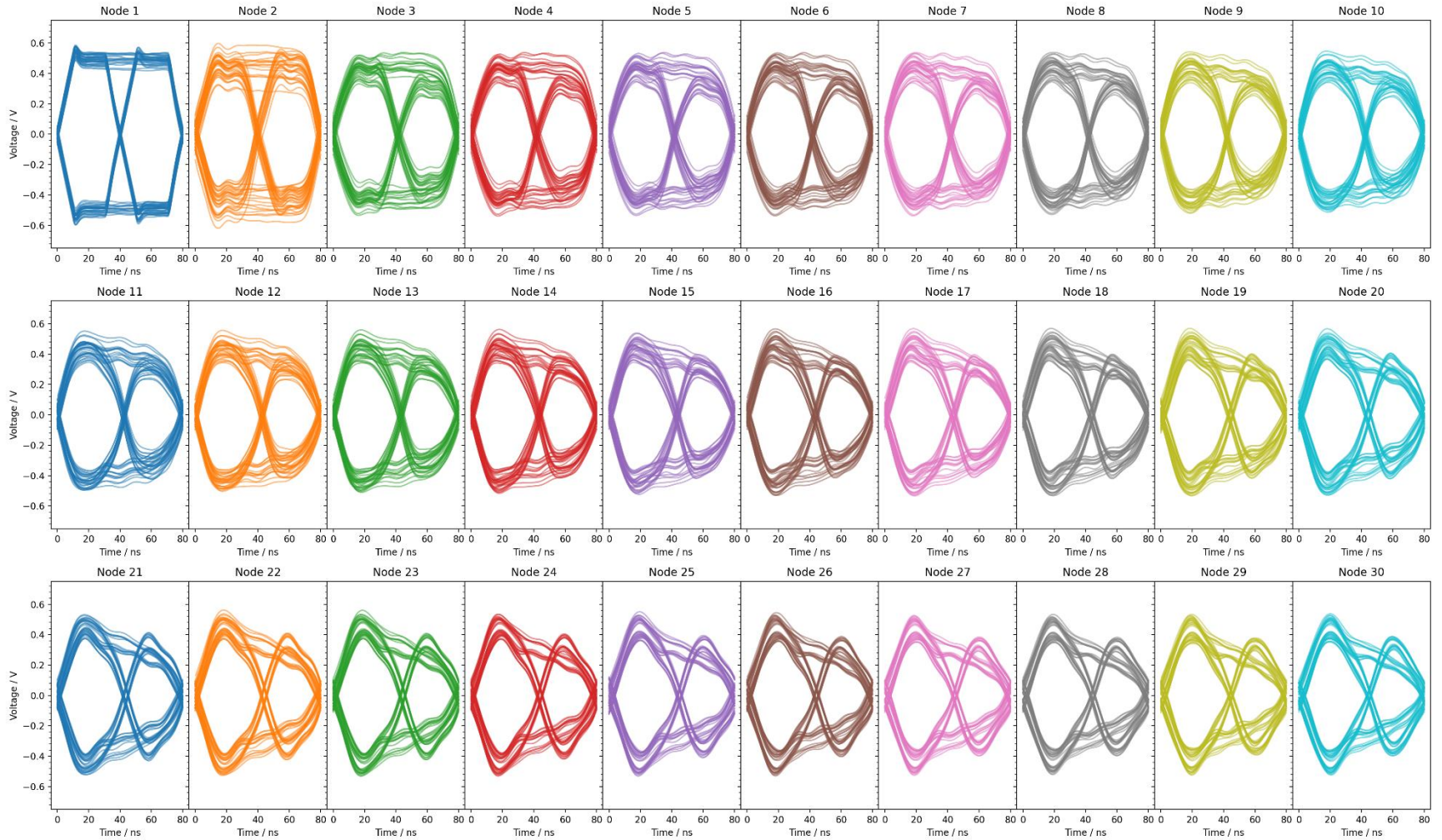
PoDL



No PoDL

- 75 m, 30 node, clumped topology
- 80 μ H, 30 pF node parasitics
- 10 cm stub lengths
- 4X80 nH inductances

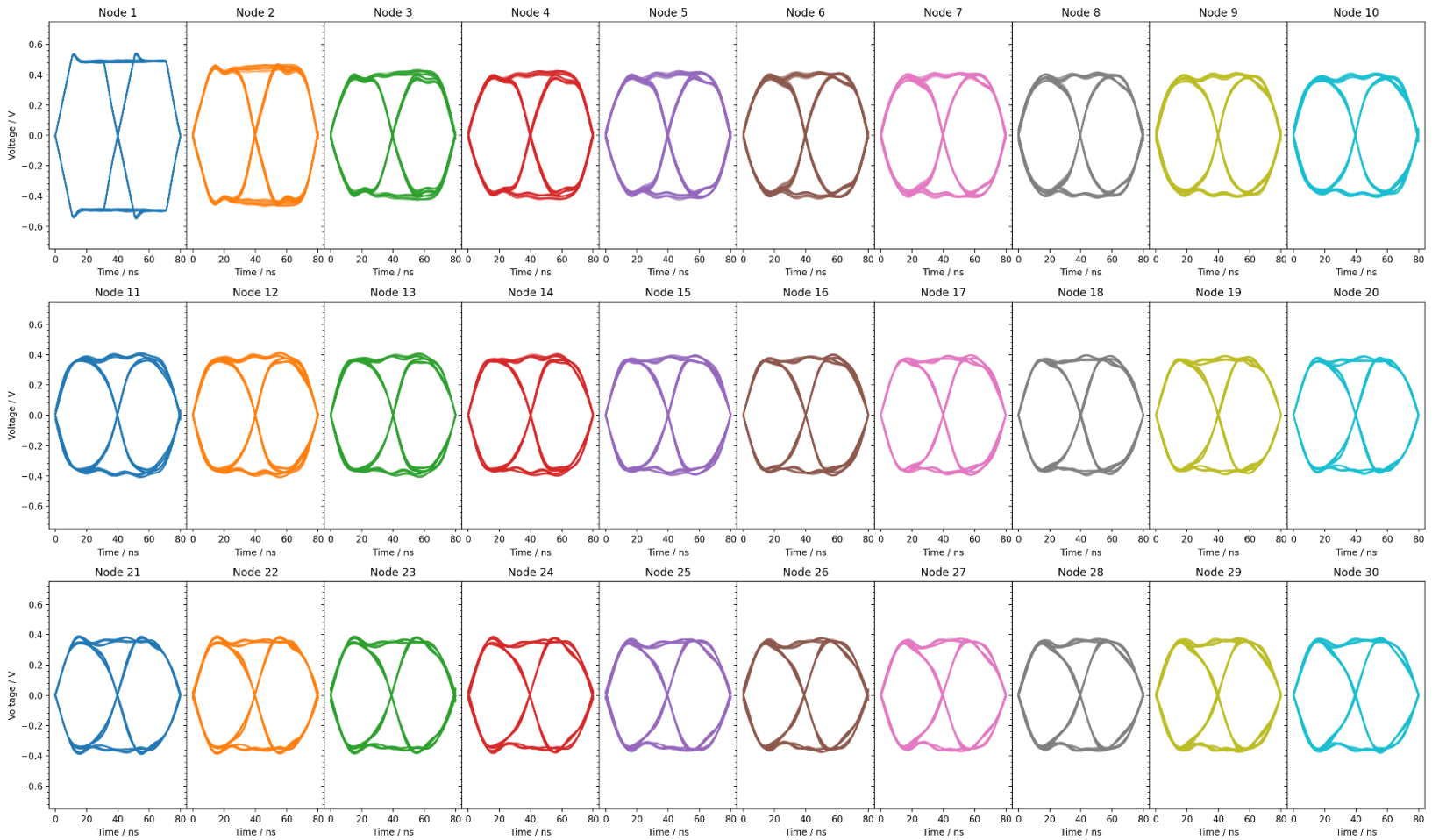
Multidrop Topology - 75 m, 30 node, clumped compensated



PoDL

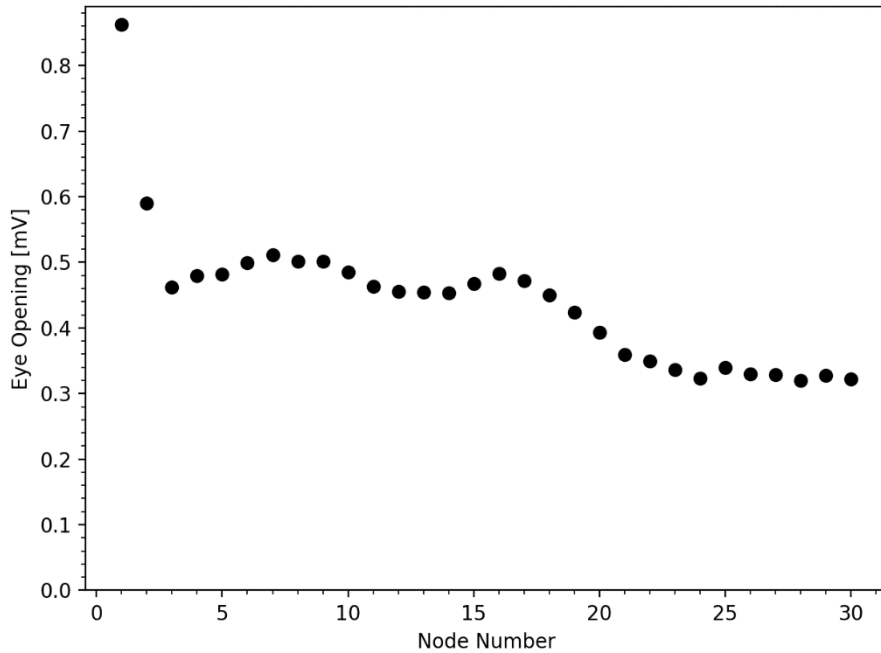
10 Mb/s SPMD Enhancement TG

Multidrop Topology - 75 m, 30 node, clumped compensated

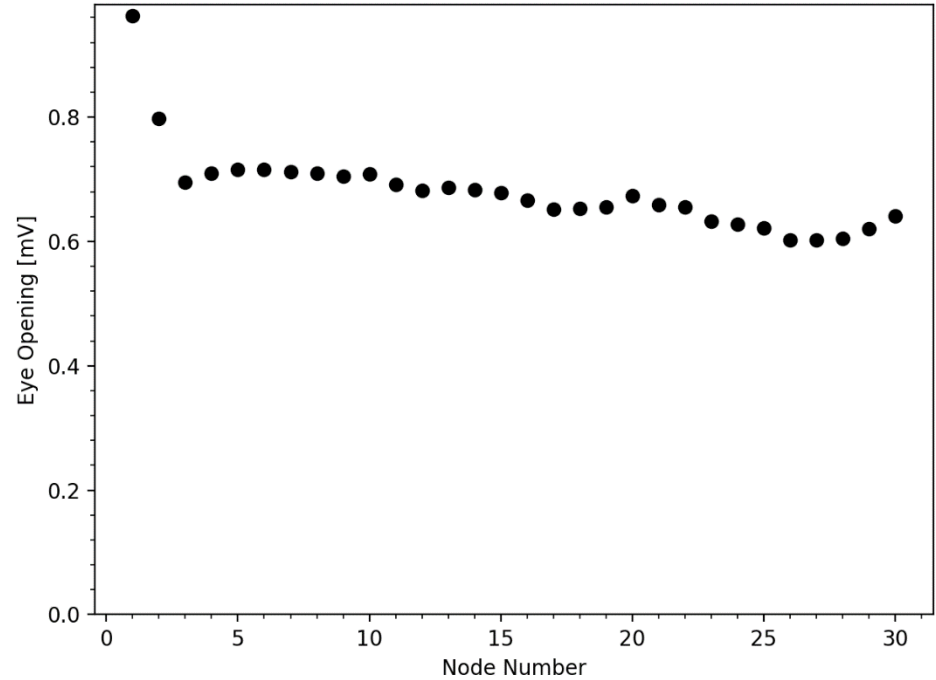


No PoDL

Multidrop Topology - 75 m, 30 node, clumped compensated



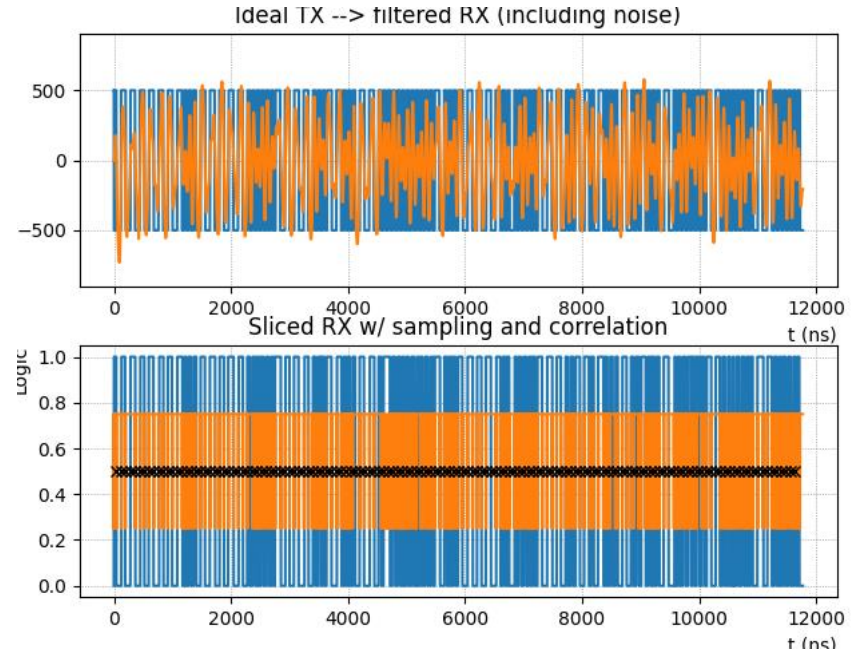
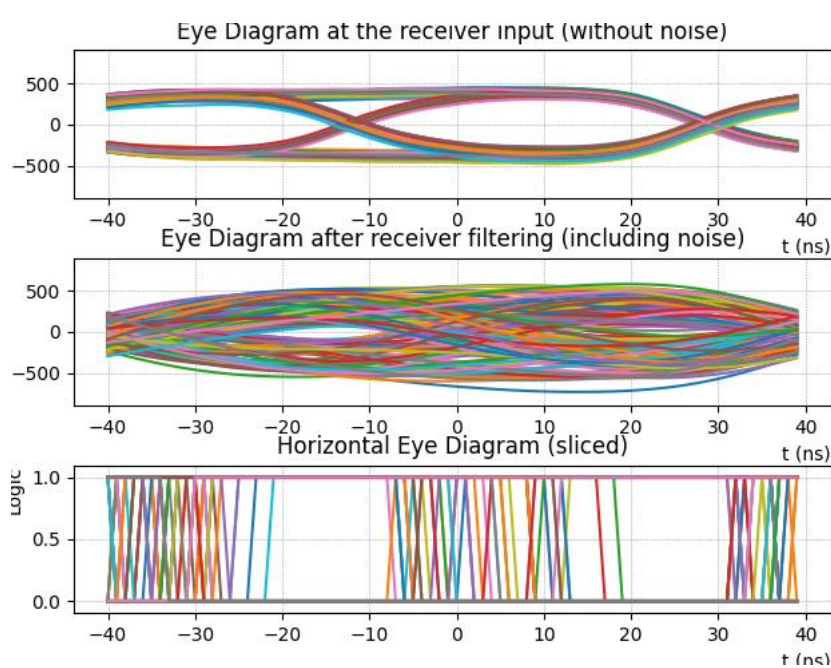
PoDL



NO PoDL

Multidrop Topology - 75 m, 30 node, clumped compensated

- Node RX2 with typical TX Model

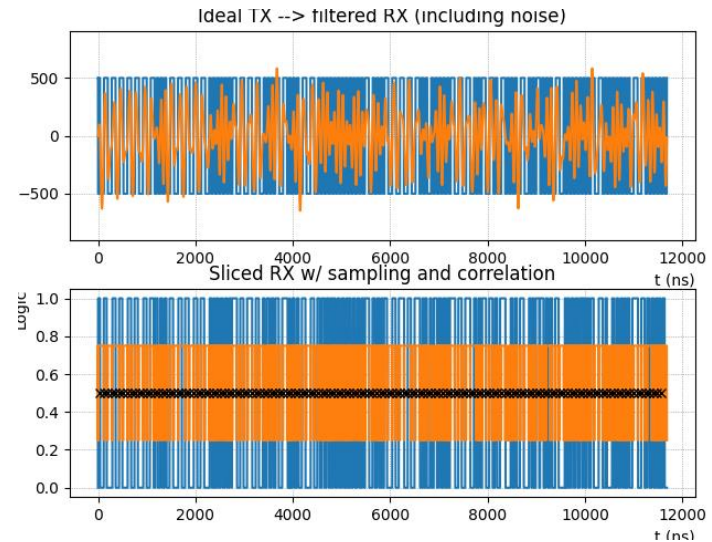
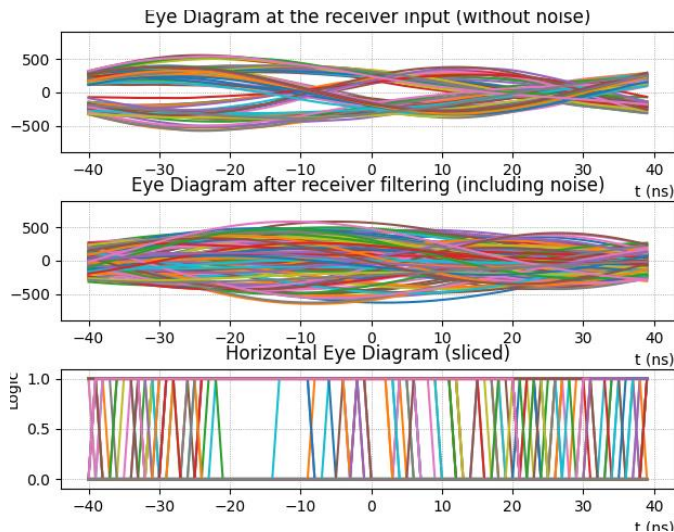


CWA (V)	CORR_AVG	CORR_MAX	CORR_MIN	JITTER (ns)	JITTER_MAX (ns)
0	0.975174	1	0.8875	1.964992	6
0.05	0.973562	1	0.8625	2.03217	7
0.1	0.969372	1	0.825	2.241924	9
0.15	0.963706	1	0.775	2.545944	11
0.2	0.956932	1	0.75	2.935691	13
0.25	0.949302	1	0.7	3.388988	16
0.3	0.941119	1	0.65	3.902001	19
0.35	0.932468	1	0.55	4.465008	24
0.4	0.923128	1	0.4875	5.143244	39
0.45	0.913067	1	0.4625	6.092328	39

CORR_MIN < 0.65

Multidrop Topology - 75 m, 30 node, clumped compensated

- Node RX2 with minimally compliant TX Model



CWA (V)	CORR_AVG	CORR_MAX	CORR_MIN	JITTER (ns)	JITTER_MAX (ns)
0	0.915559	0.9875	0.8125	4.993755	13
0.05	0.915168	1	0.7875	5.055468	15
0.1	0.913388	1	0.7625	5.272124	17
0.15	0.909936	1	0.675	5.615945	19
0.2	0.90459	1	0.5	6.116213	39
0.25	0.897178	1	0.4875	6.737445	39
0.3	0.887655	1	0.375	7.613861	39
0.35	0.876735	1	0.3625	8.609507	39
0.4	0.864568	1	0.3	9.853669	39
0.45	0.851462	1	0.2625	11.256325	39

CORR_MIN < 0.65

Summary

- **TX condition/Compensation - CORR_MIN >0.6**
- **Noise tolerance with and without compensation**

TX/Compensation	CWA (V)	CORR_AVG	CORR_MAX	CORR_MIN >0.65	JITTER (ns)	JITTER_MAX (ns)
MIN TX UNCOMPANSATED	0.1	0.906522	1	0.6875	5.577323	21
TYP TX UNCOMPANSATED	0.15	0.952067	1	0.65	2.654554	11
MIN TX COMPANSATED	0.15	0.909936	1	0.675	5.615945	19
TYP TX COMPANSATED	0.3	0.941119	1	0.65	3.902001	19