
802.3da Mixing Segment Specifications

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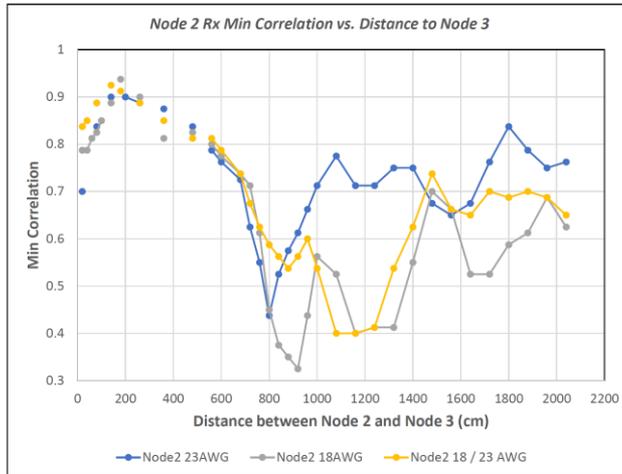
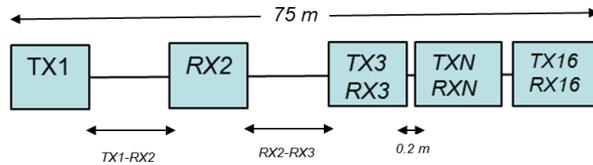
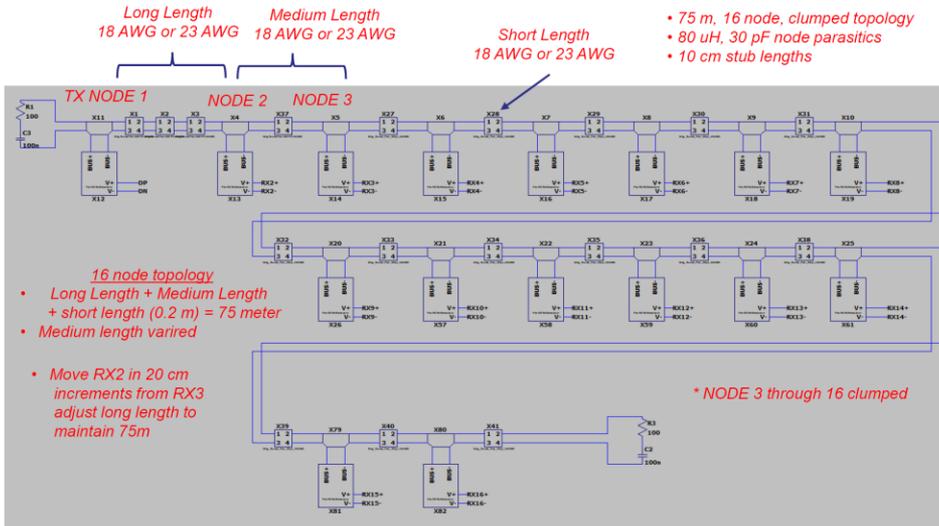
Contributors

- Bob Voss/Paul Wachtel - Panduit

Purpose

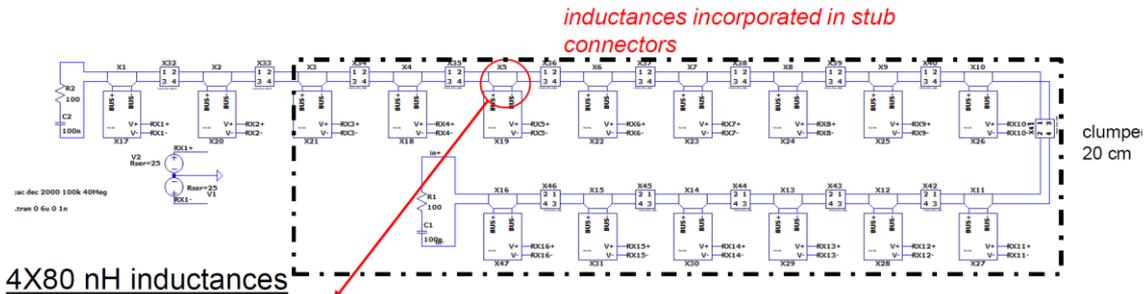
- Follow-on - Mixing Segment Specifications
- Simulation Environment
 - LT-spice output post processed for RX correlation with Piergiorgio python script

Mixing Segment Review - Uncompensated - 18/24 AWG

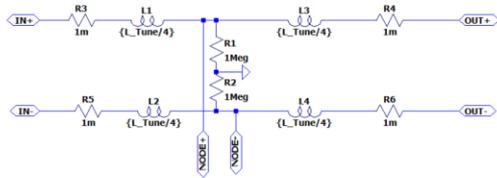


Tx1 to Rx2 (m)	Rx2 to Rx3 (cm)	Total Length (m)	Node 2 RX Min Correlation
72	20	75	0.7875
71.8	40	75	0.7875
71.6	60	75	0.8125
71.4	80	75	0.825
71.2	100	75	0.85
71	120	75	
70.8	140	75	0.8875
70.6	160	75	
70.4	180	75	0.9375
70.2	200	75	
69.6	260	75	0.9
69	320	75	
68.6	360	75	0.8125
68.2	400	75	
67.8	440	75	
67.4	480	75	0.825
67	520	75	
66.6	560	75	0.8
66.2	600	75	0.775
65.4	680	75	0.7375
65	720	75	0.7125
64.6	760	75	0.6125
64.2	800	75	0.45
63.8	840	75	0.375
63.4	880	75	0.35
63	920	75	0.325
62.6	960	75	0.4375
62.2	1000	75	0.5625
61.4	1080	75	0.525
60.6	1160	75	0.4
59.8	1240	75	0.4125
59	1320	75	0.4125
58.2	1400	75	0.55
57.4	1480	75	0.7
56.6	1560	75	0.6625
55.8	1640	75	0.525
55	1720	75	0.525
54.2	1800	75	0.5875
53.4	1880	75	0.6125
52.6	1960	75	0.6875
51.8	2040	75	0.625

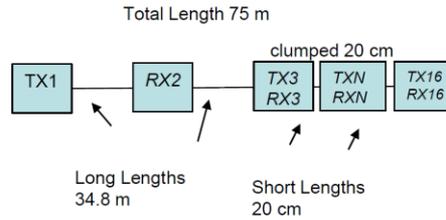
Mixing Segment Review - compensated



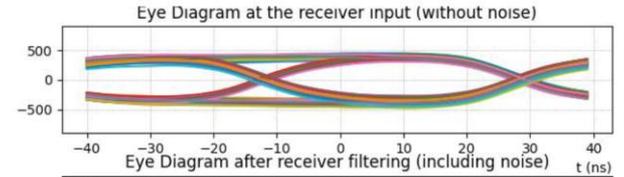
4X80 nH inductances



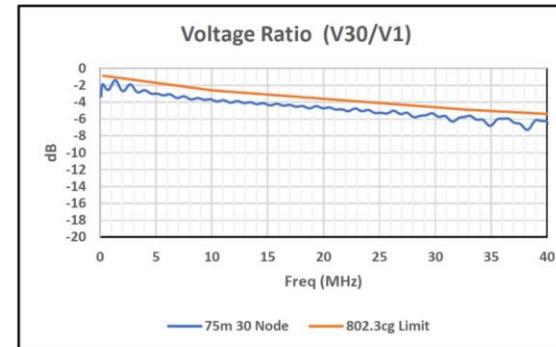
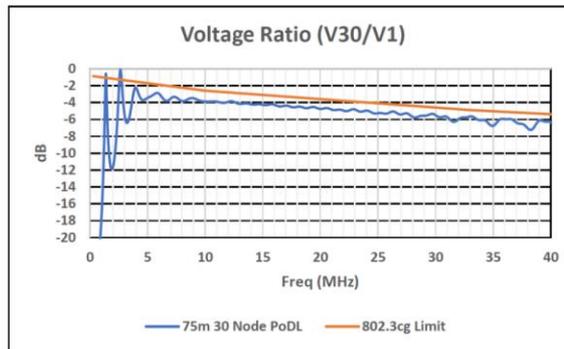
- 75 m, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths
- 4X80 nH inductances



• Node RX2 with typical 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



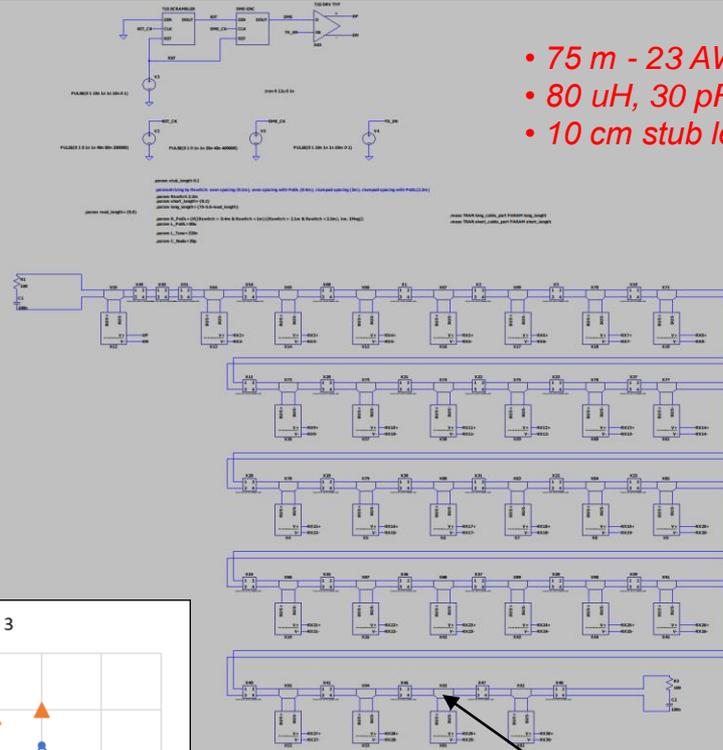
PoDL

No PoDL

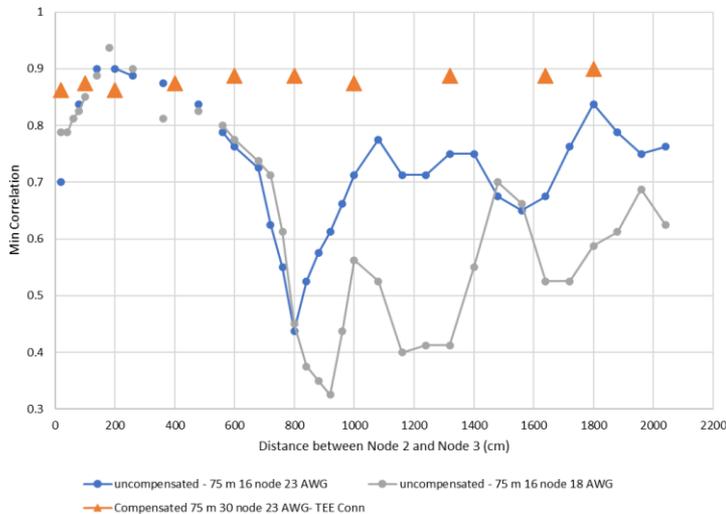
10 Mb/s SPMD Enhancement TG

Mixing Segment Topology - compensated

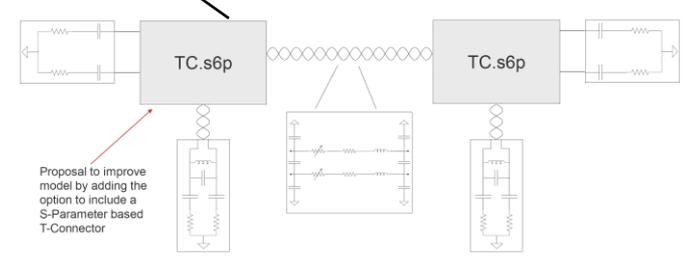
- 75 m - 23 AWG, 30 node, clumped topology
- 80 uH, 30 pF node parasitics
- 10 cm stub lengths



Node 2 Rx Min Correlation vs. Distance to Node 3



New Optional Element of the Consensus Model

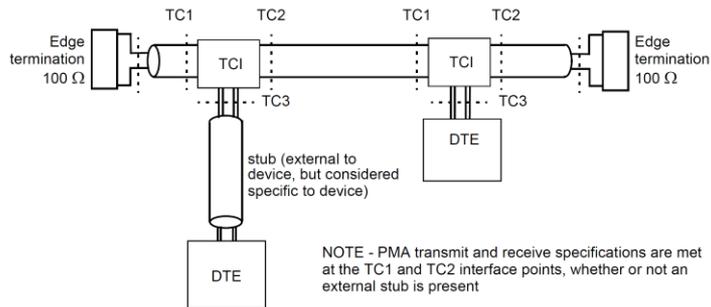


Proposal to improve model by adding the option to include a S-Parameter based T-Connector

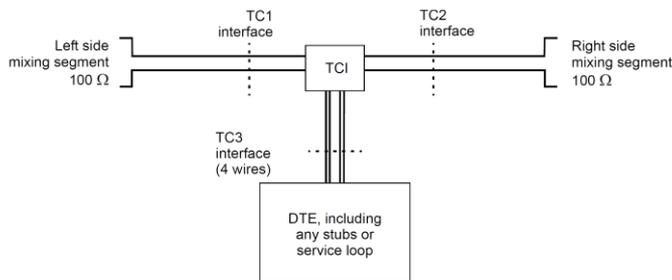
https://www.ieee802.org/3/da/public/100522/schreiner_3da_01_10_05_22.pdf

Insertion loss - TCI compensation

- Compensation networks are to be in trunk connection (see figure).



168.7.1 Insertion lossThe mixing segment insertion loss, without any DTEs attached, shall meet the values determined using Equation (168–3) between edge termination attachment points. The reference impedance is 100 Ω . If the mixing segment includes TCI connectors which are specified to use a dummy load, this requirement may be met with the dummy load attached.



168.8.1.1 TCI Insertion Loss

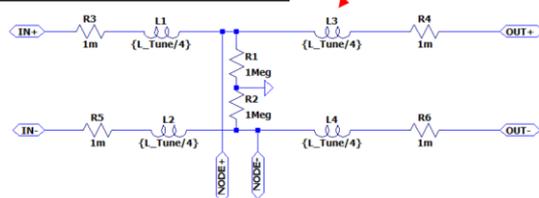
Without a PMA or PMA loading present, the differential insertion loss of the TCI between TC1 and TC2 shall be less than TBD dB (ed note - small number) from 0.3 to 40 MHz, in each direction, measured into 100 Ω . This specification does not apply if the DTE cannot be electrically disconnected from the TCI.

With the PMA (or PMA load specified for the TCI) present at TC3, the differential insertion loss of the TCI between TC1 and TC2 shall be less than TBD dB (ed note - allows for compensation and phy loading –may be an equation) from 0.3 to 40 MHz, in each direction, measured into 100 Ω .

Source: 8023da_D0p75.pdf

- << Lower loss than physical TEE

4X80 nH inductances'

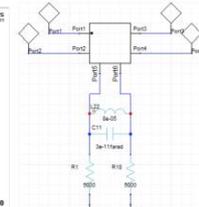
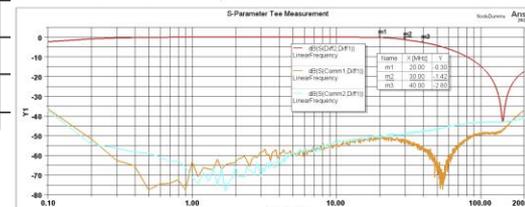
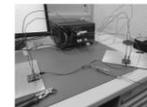


Name	X [MHz]	Y
m1	20.00	-0.30
m2	30.00	-1.42
m3	40.00	-2.80

Prototype Tee

Prototype of a compensated tee

- Very simple soldered prototype
- Includes compensation components
- Implementation shows low pass characteristic, which might be beneficial



https://iee802.org/3/da/public/050323/schreiner_3da_May_23.pdf

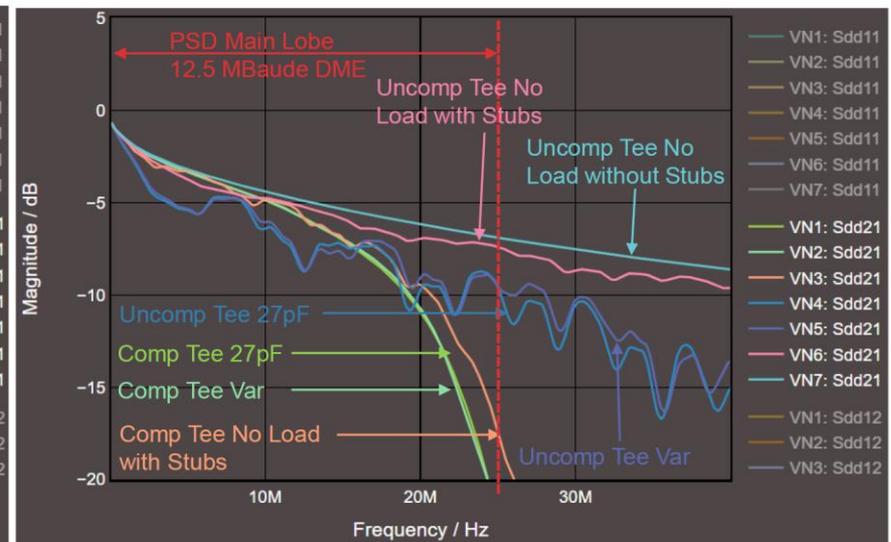
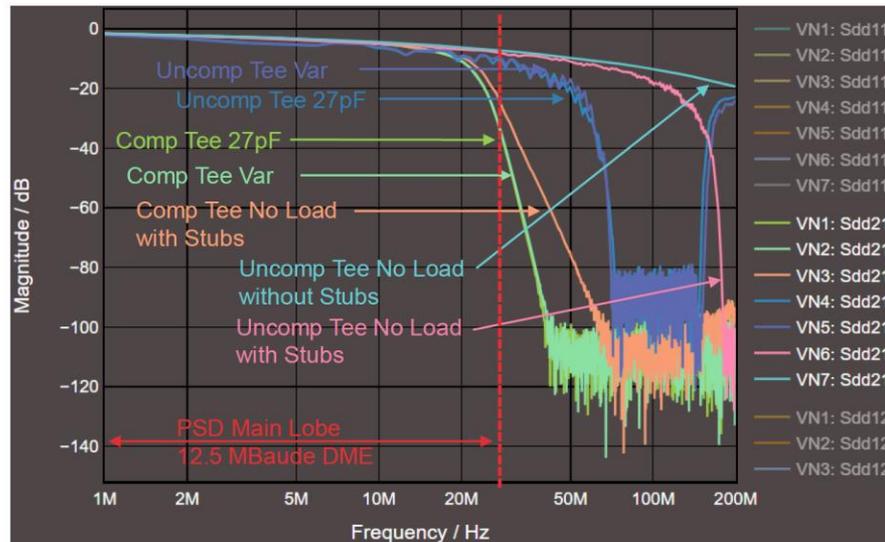
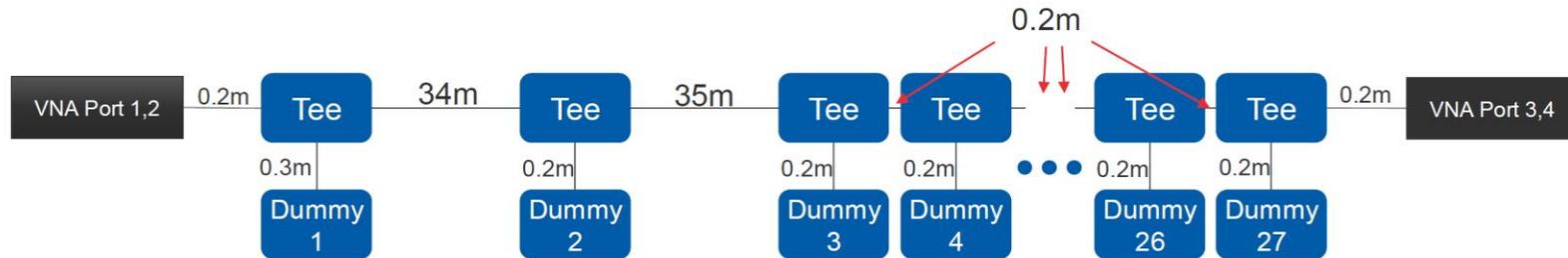
10 Mb/s SPMD Enhancement TG

Mixing Segment Insertion loss

- TCI with and without compensation

Measurement Result

Measurement 5 - VNA Channel



https://www.ieee802.org/3/da/public/0723/schreiner_3da_12_July_23.pdf

Summary

- RX correlation < 0.6 uncompensated
 - 75 m - 23/18 AWG, 30 node, clumped topology
 - 80 uH, 30 pF node parasitics
 - 10 cm stub lengths
- RX correlation > 0.8 with compensating circuit or compensating TEE
 - 75 m - 23 AWG, 30 node, clumped topology
 - 80 uH, 30 pF node parasitics
 - 10 cm stub lengths