Bundled SPE thermal considerations
Multidrop Mixing Segment Considerations

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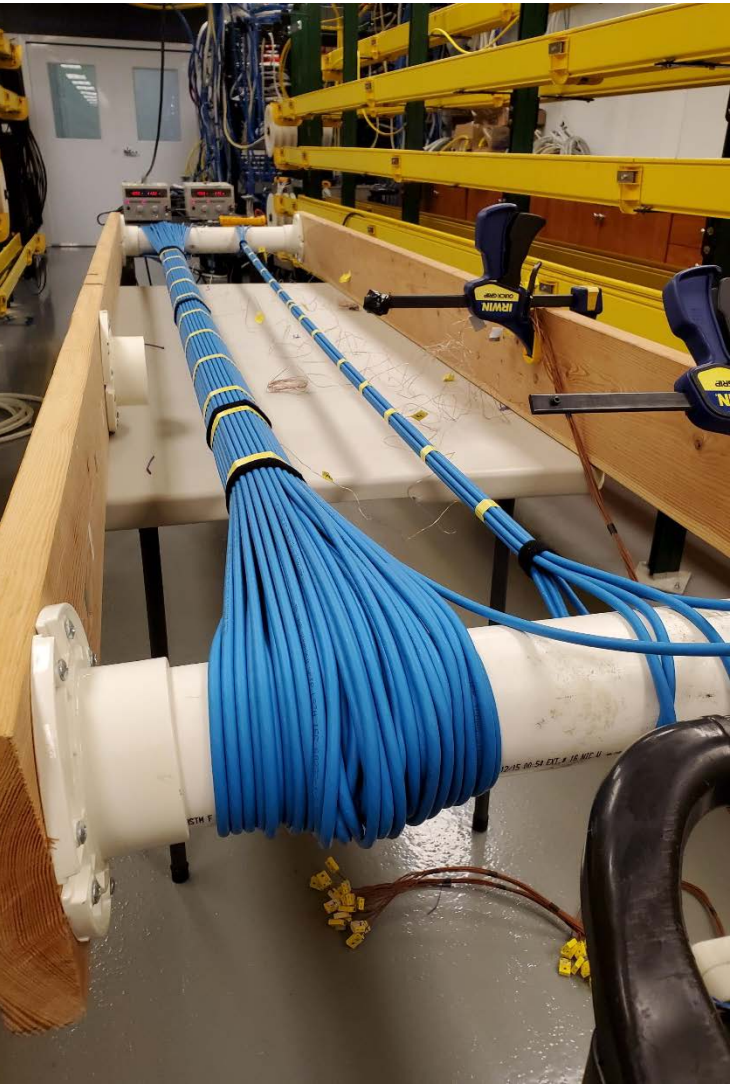
Purpose

- **Bundled SPE thermal considerations**
- **Multidrop mixing segment characteristics development considerations.**
  - **Link segment lengths**
  - **Stub Lengths**
  - **Number of nodes**
  - **MDI SI with PoDL**

Bundled SPE Thermal Considerations

Bundled SPE Thermal Characteristics



- Bundles are constructed from Panduit SPE cables that are 18AWG stranded (7x26) STP (Shielded Twisted Pair)
- Larger bundle is 91 cables, “90 around 1” configuration
- Smaller bundle is 7 cables, “6 around 1” configuration
- Constant current methodology
  - Current passed through bundles is stepped in 0.5 ampere increments from 0.5A to 2.5A
  - Limit test performed at 2.75A
  - Bundles allowed to come up to temperature and “soak” at each current increment

Thermal Test Setup

- *Separate precision current sources for each bundle*
- *Inline ammeter to confirm precise readings*
- *Data logger to measure and store thermocouple measurements*

Sensor Locations

SPE Cable

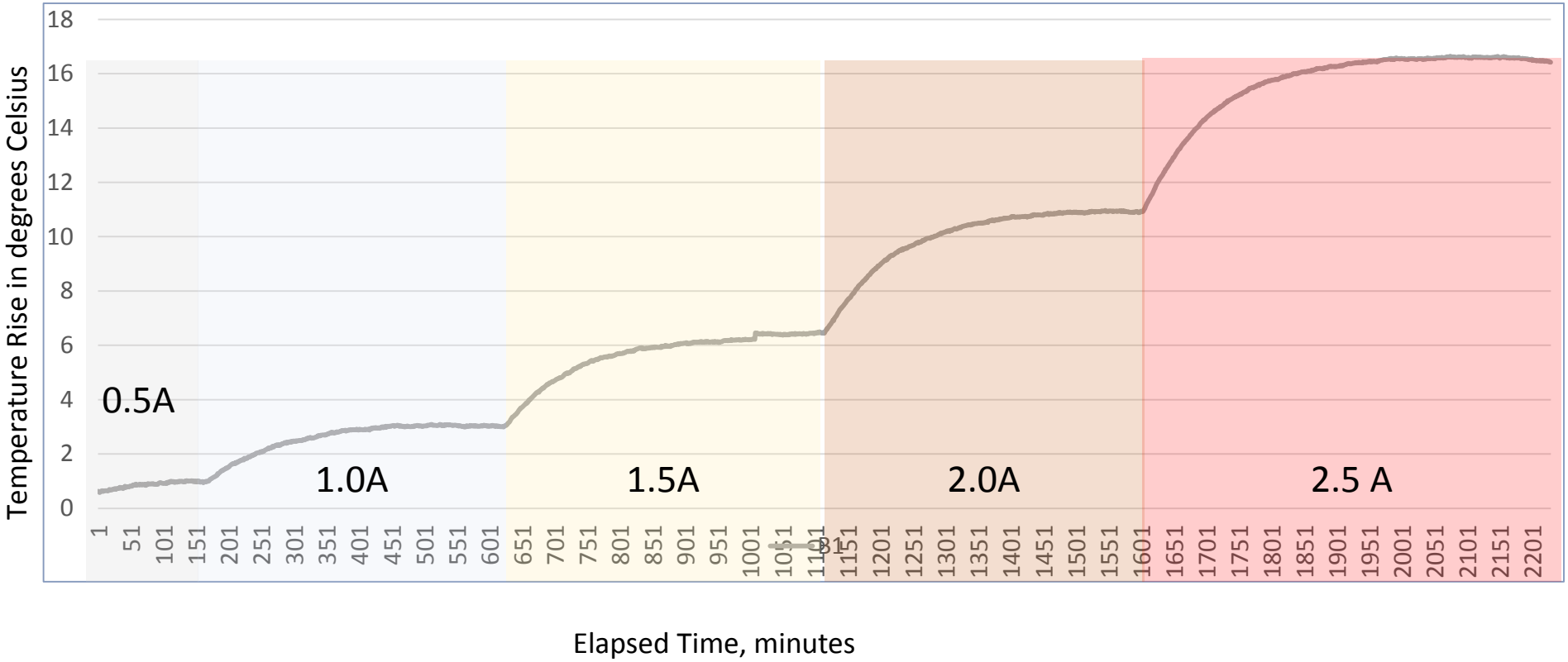
18 AWG SPE Thermal Performance

Bundle Temperature Rise over Ambient Temperature[1]

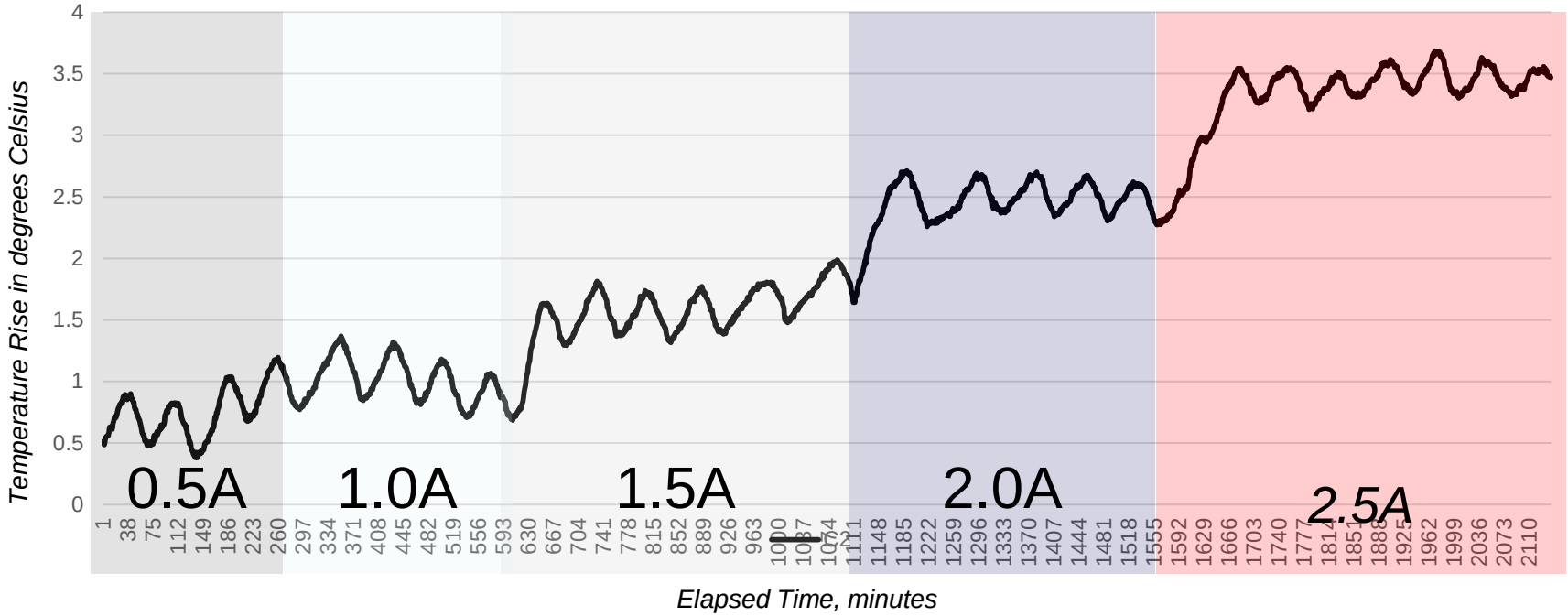
Bundle Size	**Current per Conductor, DC amperes**				
	0.5	**1.0**	**1.5**	**2.0**	**2.5**
7 cables[2]	0.82 °C	1.04 °C	1.57 °C	2.55 °C	3.38 °C
91 cables[3]	0.98 °C	3.04 °C	6.1 °C	10.92 °C	16.55 °C

Notes:
(1) Room ambient temperature in test lab is 21.2 °C
(2) 7 cable bundle is “6 around 1” configuration
(3) 91 cable bundle is “90 around 1” configuration

Rise Above Ambient – 91 Cable Bundle



Rise Above Ambient – 7 Cable Bundle



Comparison with Previous Data

- Shariff_3spmd_1B_09_0219
  - At 1A per conductor
    - 7 cable bundle, 18AWG = 0.8 °C rise above ambient
  - At 1A per conductor
    - 91 cable bundle, 18AWG = 3.6 °C rise above ambient
- This contribution
  - At 1A per conductor
    - 7 cable bundle, 18AWG = 1.04 °C rise above ambient, **+ 0.24 °C**
  - At 1A per conductor
    - 91 cable bundle, 18AWG = 3.04 °C rise above ambient, **- 0.54 °C**

Conclusions

- Data set covers an expanded range of current per conductor conditions
- Temperature rise tracks closely with previous contribution, Shariff_3spmd_1B_09_0219
- These results may be attributable to cable construction, i.e. foil shield and 80% coverage screen in SPE cable used for these tests

10 SPE Multidrop Enhancements Study Group

Mixing segment characteristics

- **10 SPE Multidrop Mixing Segment Consideration**
- **Apply validated 147 Multidrop Model**
- **Work in progress**

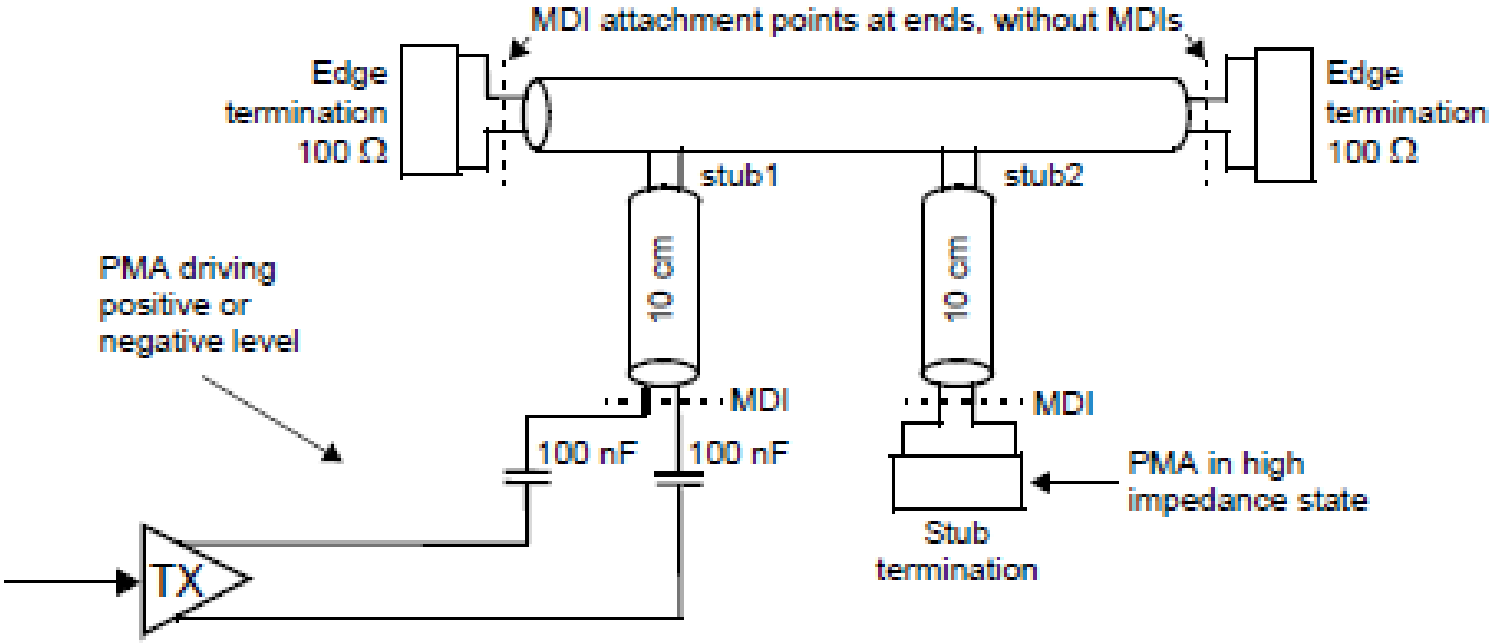
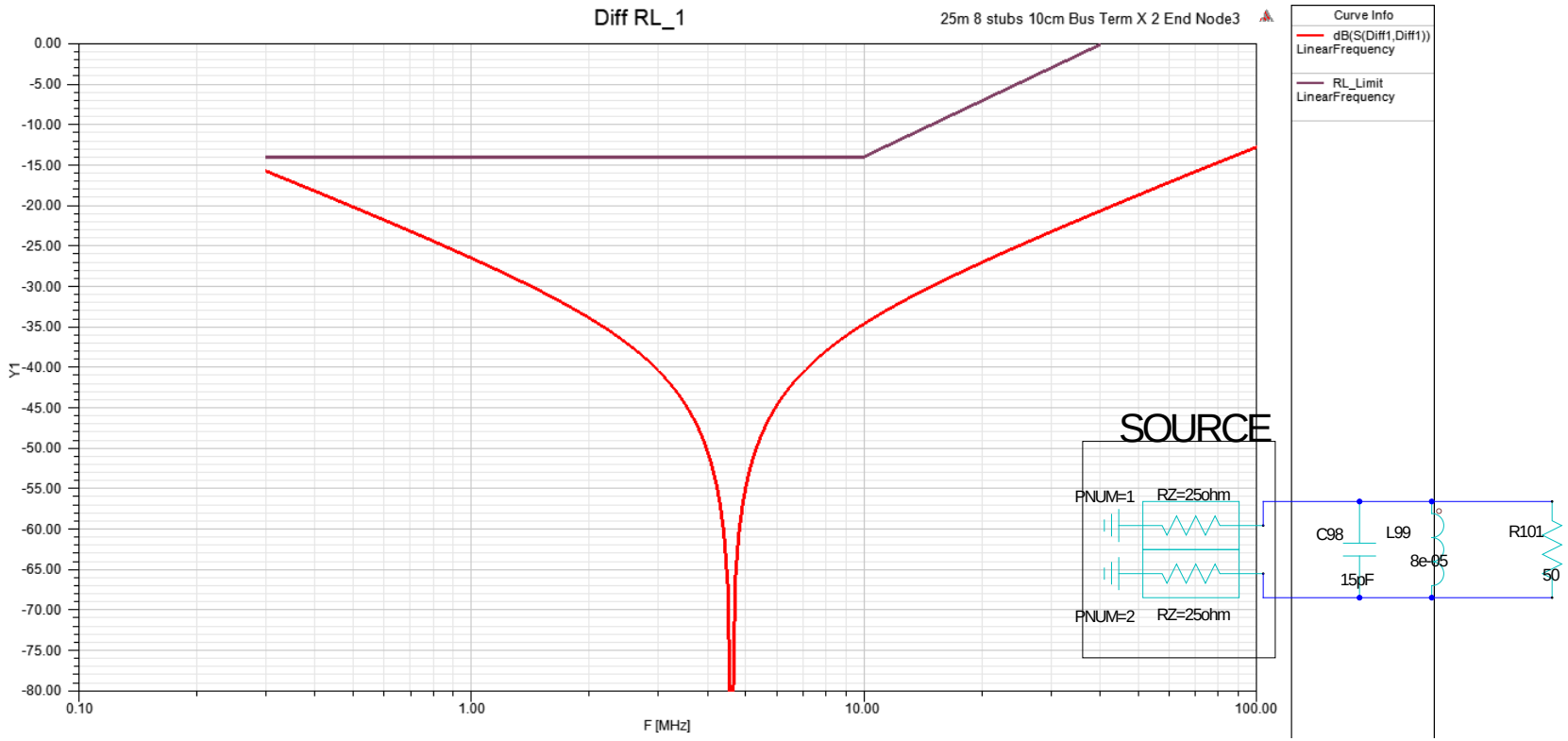


Figure 147–20—Multidrop line termination and PMA

147.8.1 Insertion loss

Tx MDI RL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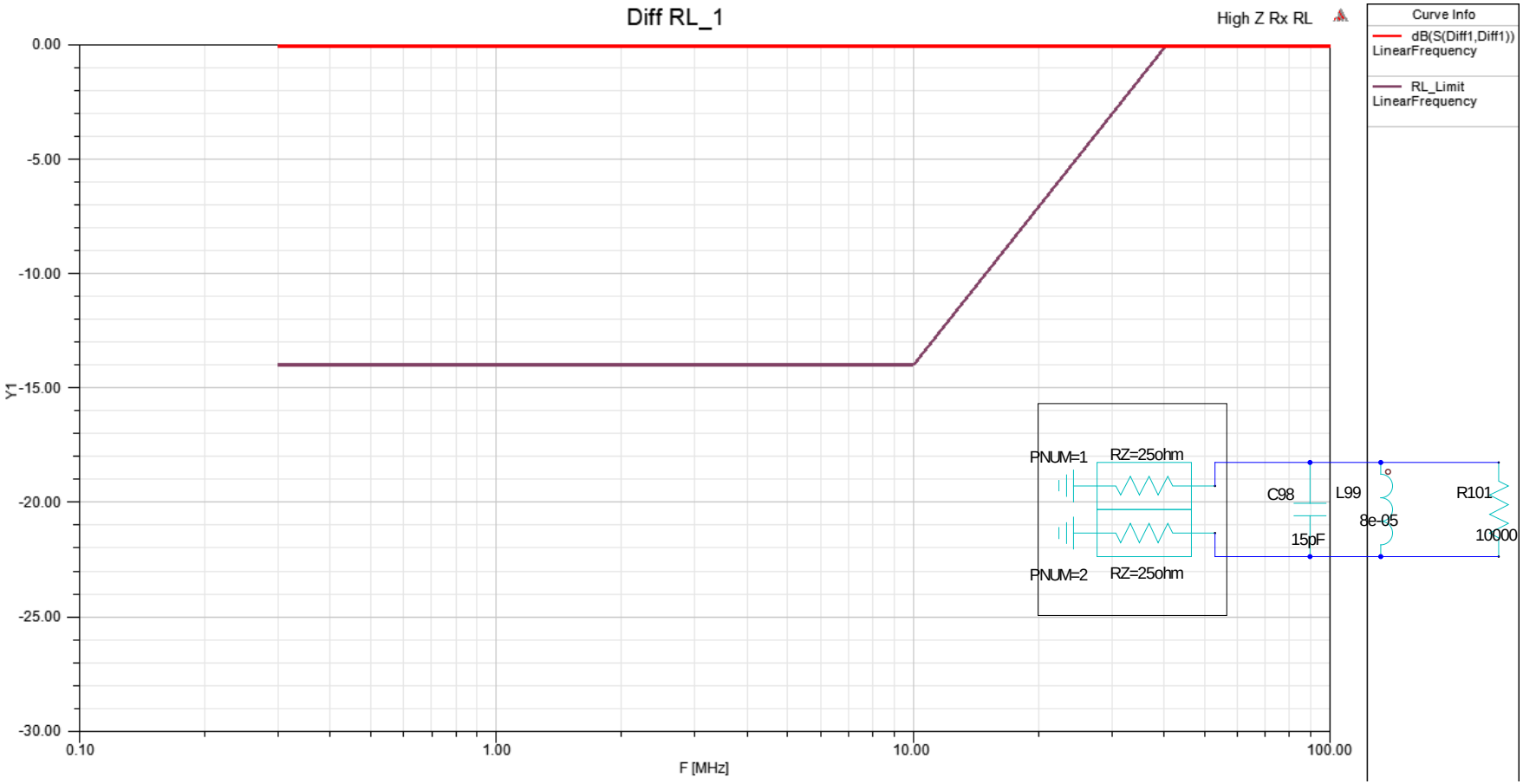
25m 8 stubs 10cm Bus Term X 2 End Node3
Curve Info
dB(S(Diff1,Diff1))
LinearFrequency
RL_Limit
LinearFrequency
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
-45.00
-50.00
-55.00
-60.00
-65.00
-70.00
-75.00
-80.00
Y1
0.10
1.00
10.00
100.00
F [MHz]
SOURCE
PNUM=1
RZ=25ohm
PNUM=2
RZ=25ohm
C98
15pF
L99
8e-05
R101
50

High Z Rx RL

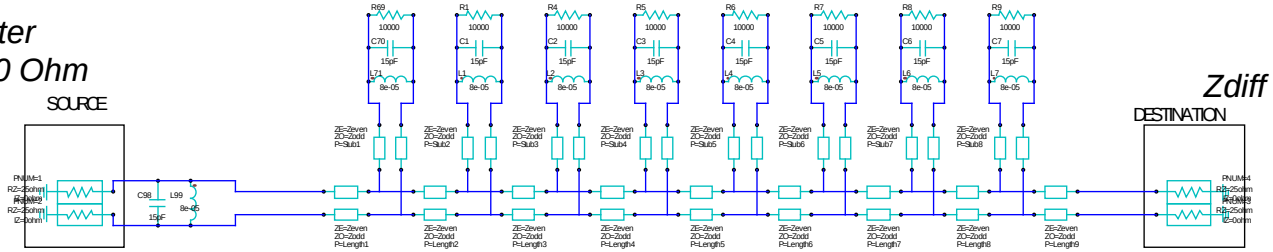

Diff RL_1
High Z Rx RL
Curve Info
dB(S(Diff1,Diff1))
LinearFrequency
RL_Limit
LinearFrequency
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
Y1
0.10
1.00
10.00
100.00
F [MHz]
PNUM=1
RZ=25ohm
PNUM=2
RZ=25ohm
C98
15pF
L99
8e-05
R101
10000

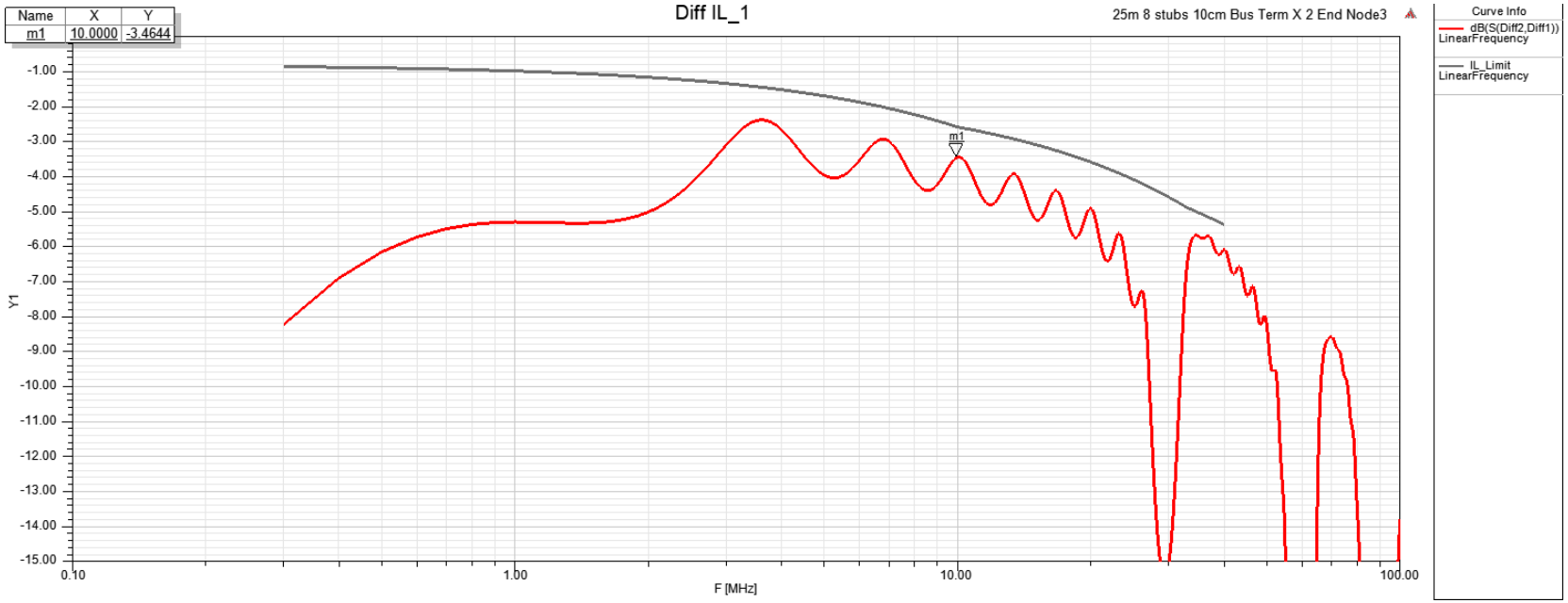
Model with PoDL

High Z Termination

Transmitter Zdiff = 50 Ohm

Zdiff = 50 Ohm



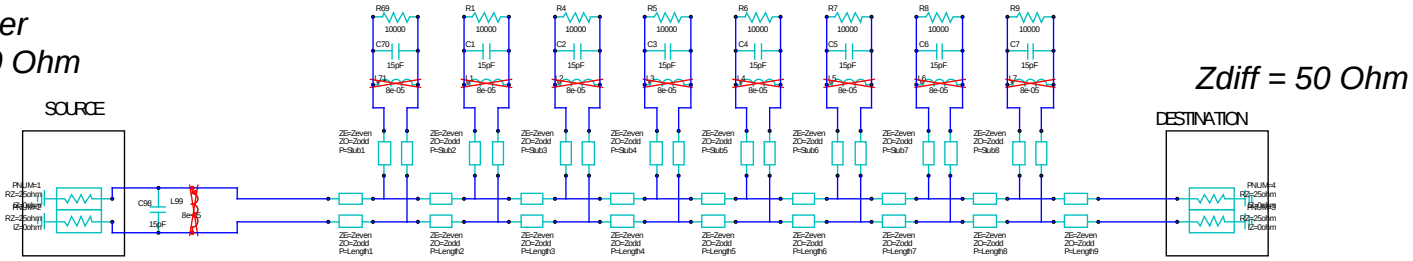


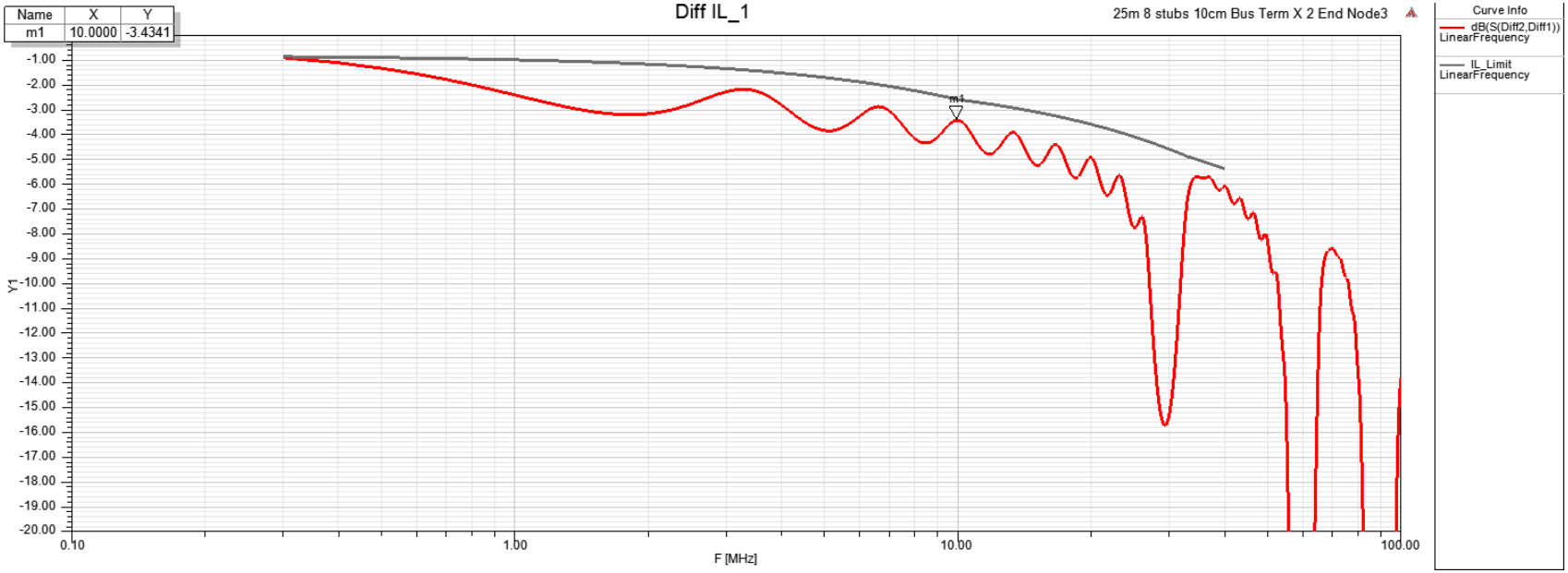
Model (No PoDL)

High Z Termination

Transmitter Zdiff = 50 Ohm

Zdiff = 50 Ohm





Model (No PoDL)

High Z Termination

Transmitter Zdiff = 100 Ohm

Zdiff = 100 Ohm