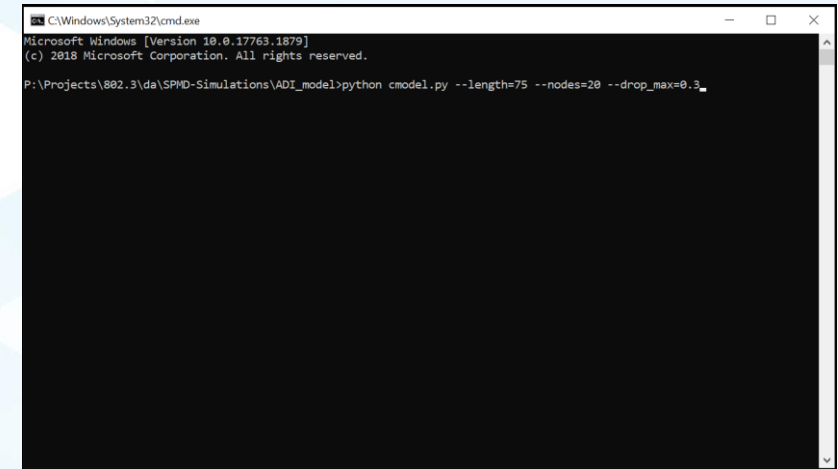# 802.3da
Model Animations

Michael Paul

Summary

- Share some different model outputs with the group

- Different parameters are swept, results are animated

- Please go to the public area and follow along with the .gif files in case Webex is too choppy
    - Or if reading this presentation in .pdf format
    - Each slide will have a reference to the relevant .gif

- https://www.ieee802.org/3/da/public/042121/index.html

Github Model

▶ This model is shared at

- https://github.com/SPE-MD/SPMD-Simulations/tree/main/ADI_model

▶ It uses python3 to generate scenarios and build netlists

▶ …and LTSpice for simulations

▶ In a Command Prompt, Run:

- python cmodel.py --help
- For a list of options and help running the model on your computer

▶ Example

- To simulate a mixing segment with 75 meter length, 24 nodes evenly spaced and drop lengths of 30cm
- python cmodel.py --length=75 --nodes=24 --drop_length=0.3

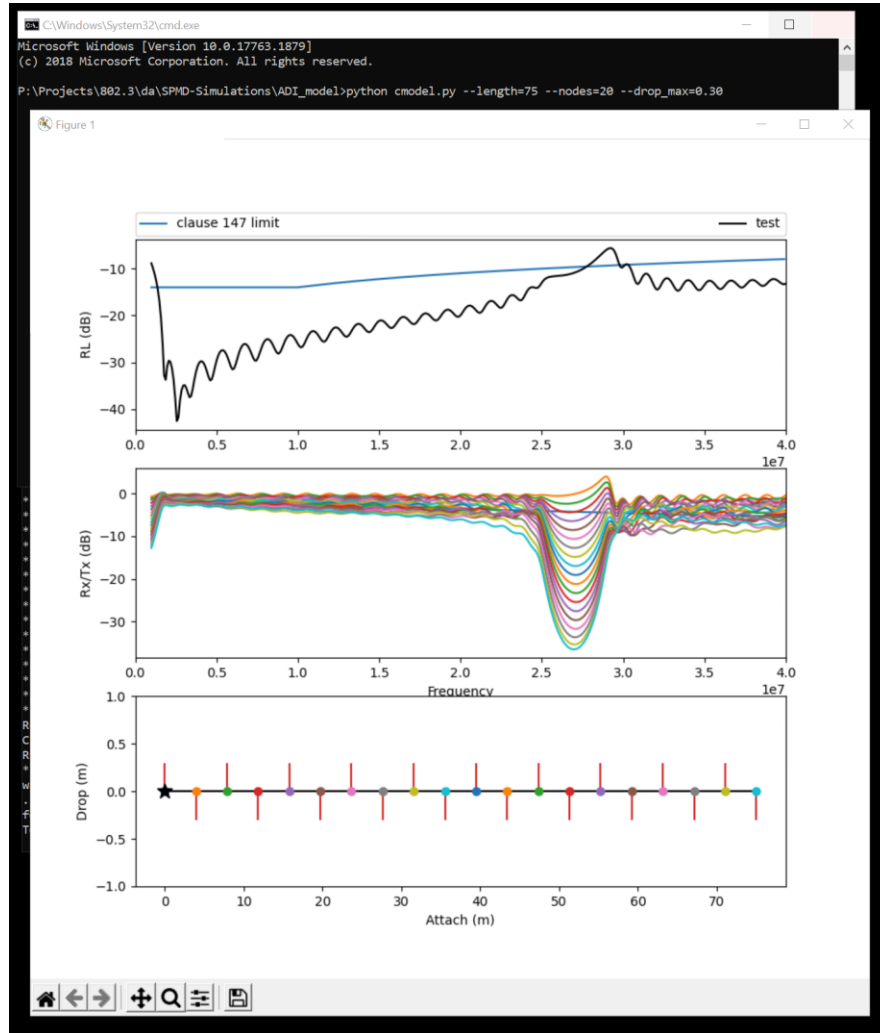▶ All sims default to 18 gage wire, Lpodl=80uH, Cnode=30pF, Rnode=10kOhm unless otherwise noted

Example
## python cmodel.py --length=75 --nodes=24 --drop_max=0.3

► 1st pane is the return loss of the transmitter

► 2nd pane is the insertion loss seen at each node

► 3rd pane is a network diagram

  ▪ The transmitter is represented with a star

  ▪ The colored dots correspond to the colored lines in the 2nd pane

  ▪ Red lines emitting from the dots represent drop length
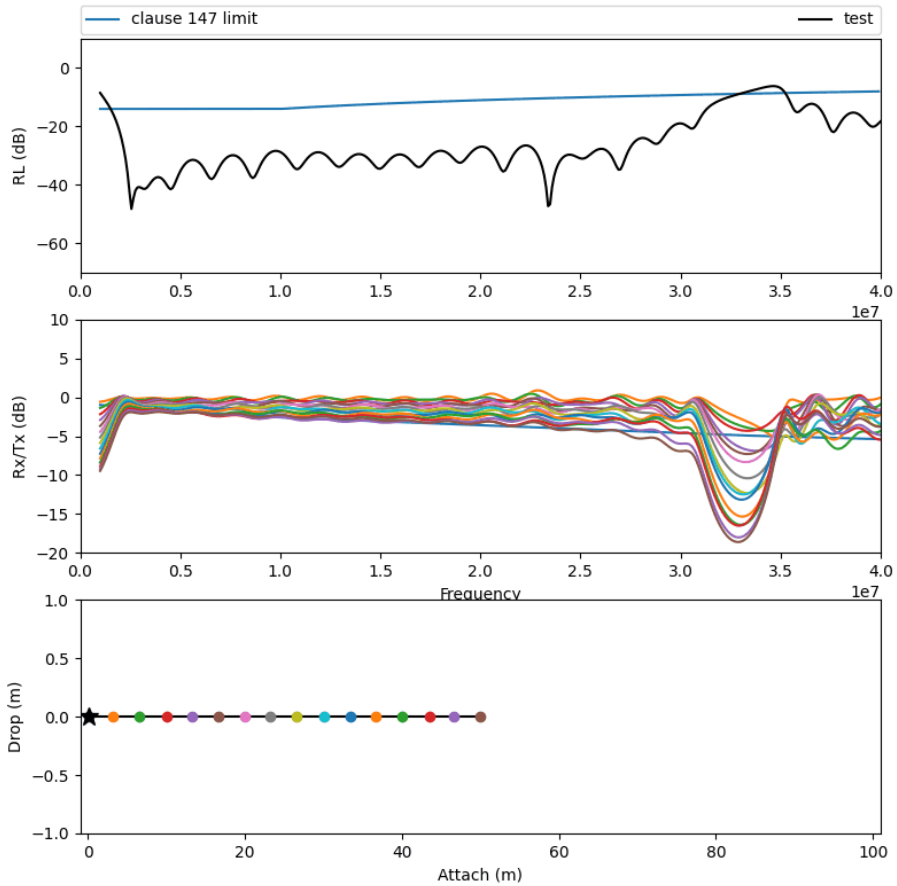
Varying the Transmitter Position
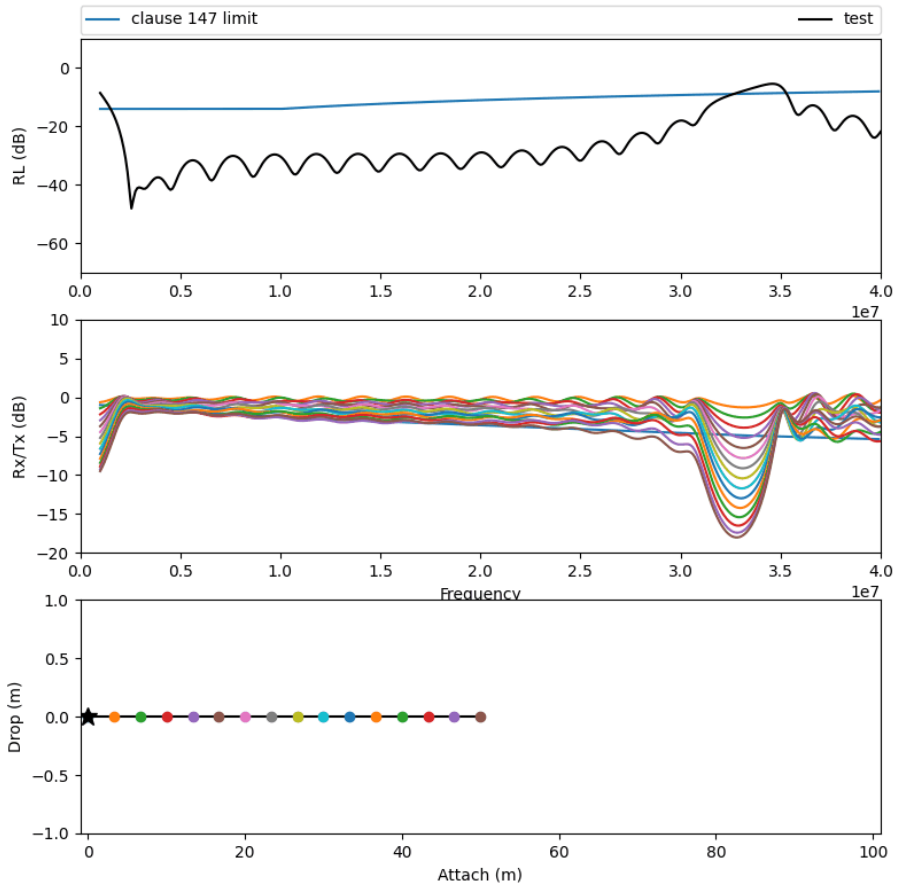
- ▶ Web: tx_position.gif
- ▶ Insertion loss is minimum (most loss) for the nodes farthest away from the transmitter
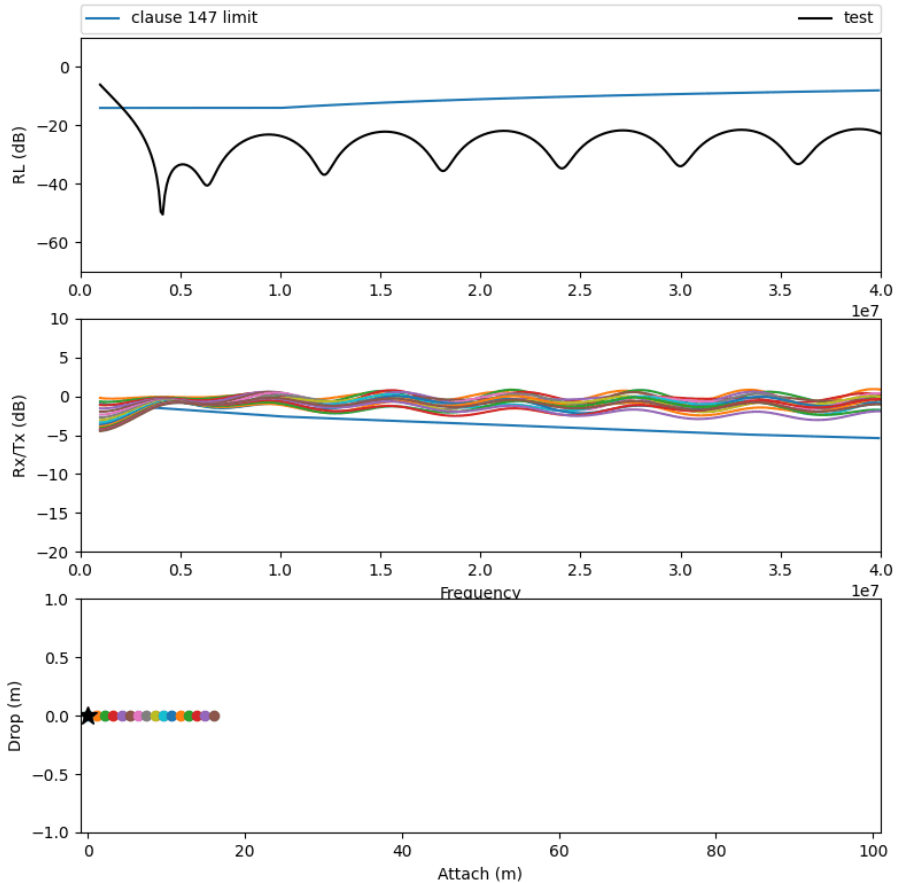
Varying the Capacitance
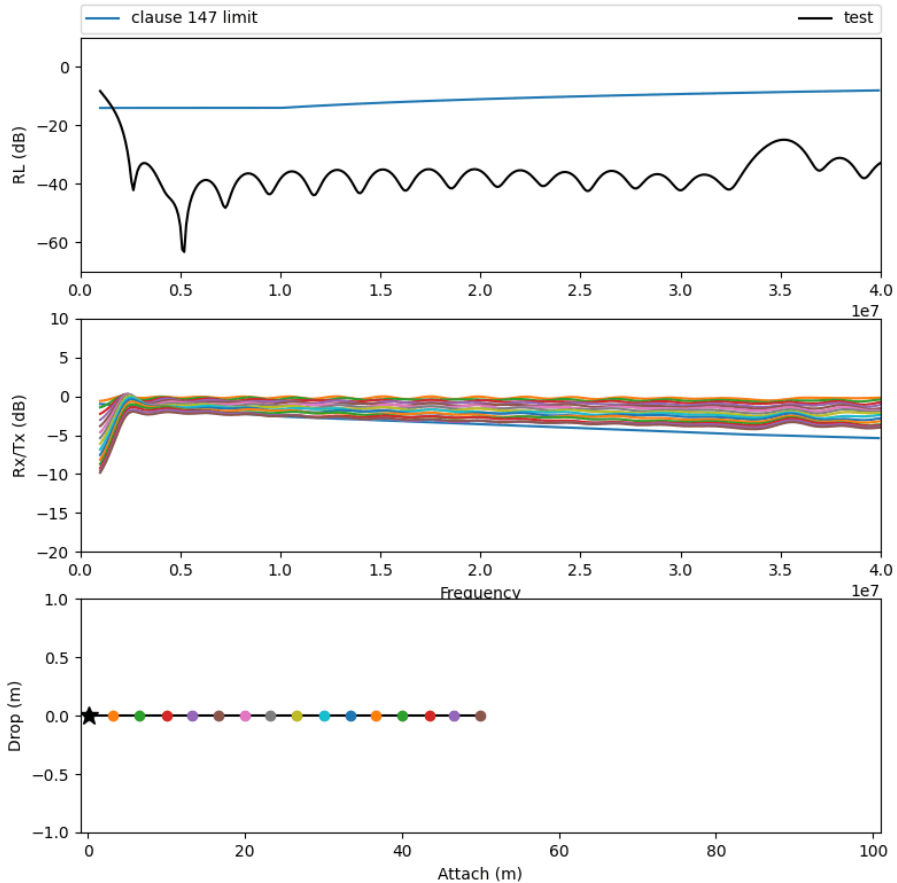
- ▶ Web: vary_cap.gif
- ▶ 50m cable, 16 nodes
- ▶ Vary capacitance from 1pF to 30pF
- ▶ Cnode causes impedance discontinuity in band

Vary the Drop Length

- ► Web: drop_length.gif
- ► 50m cable, 16 nodes, 30pF MDI capacitance
- ► Drop Length and MDI Capacitance have a similar effect
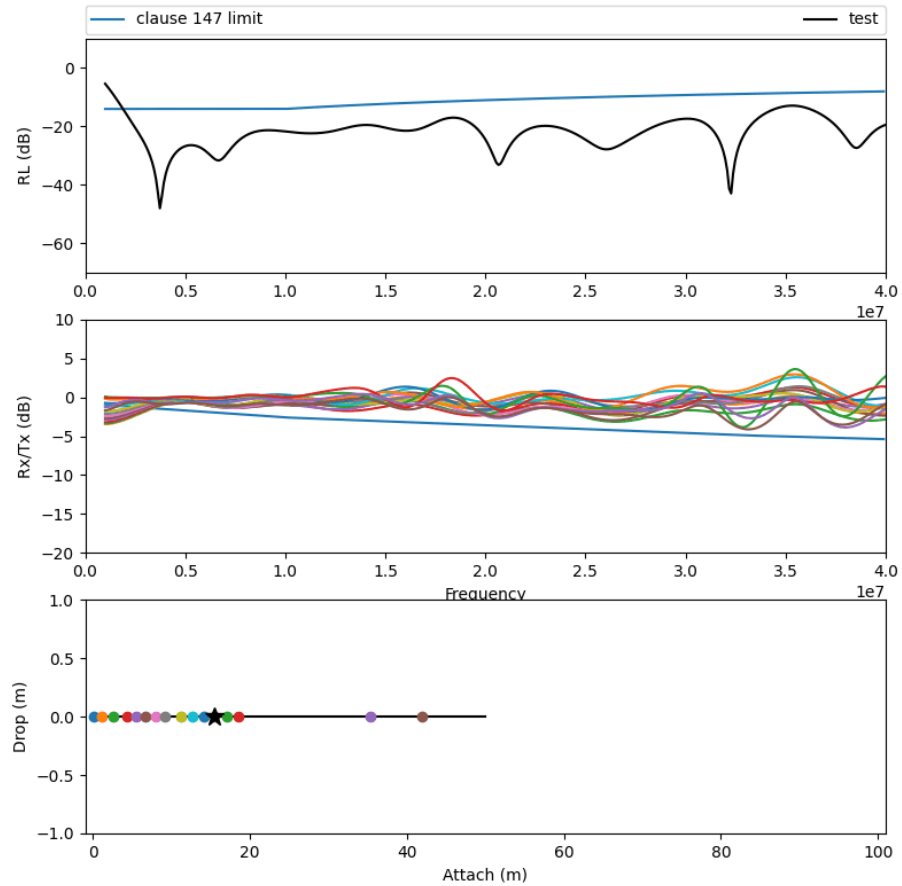
Vary the Mixing Segment Length (16-nodes)

- ▶ Web: vary_l_16n.gif
- ▶ Skin effect becomes more pronounced with longer cable
- ▶ Notch frequency is related to the distance between nodes
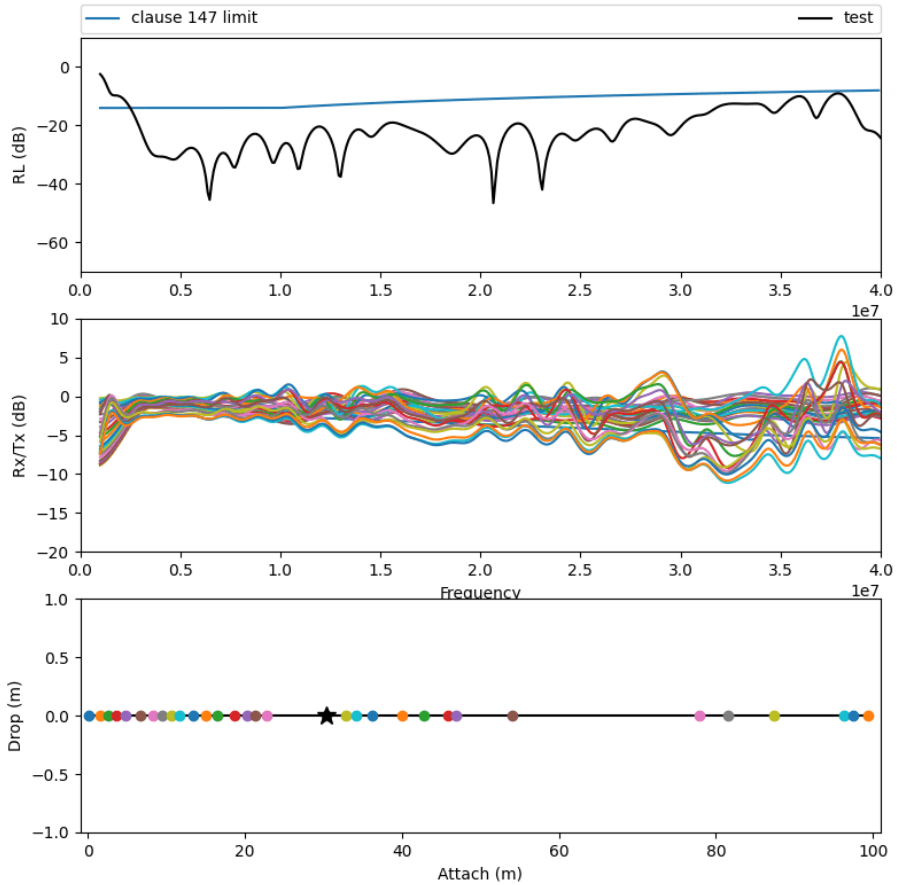
Vary the Mixing Segment Length (32-nodes)
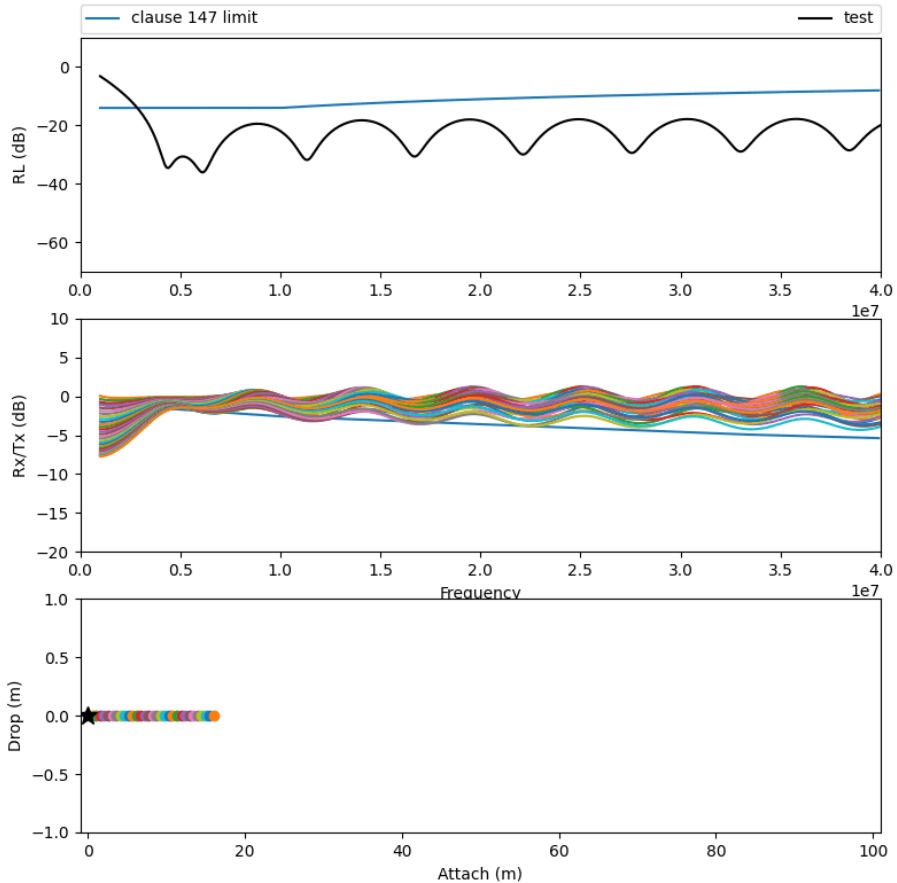
- ▶ Web: vary_l_32n.gif
- ▶ Compared to 16 node version, the notch only showed up once, because nodes are closer together
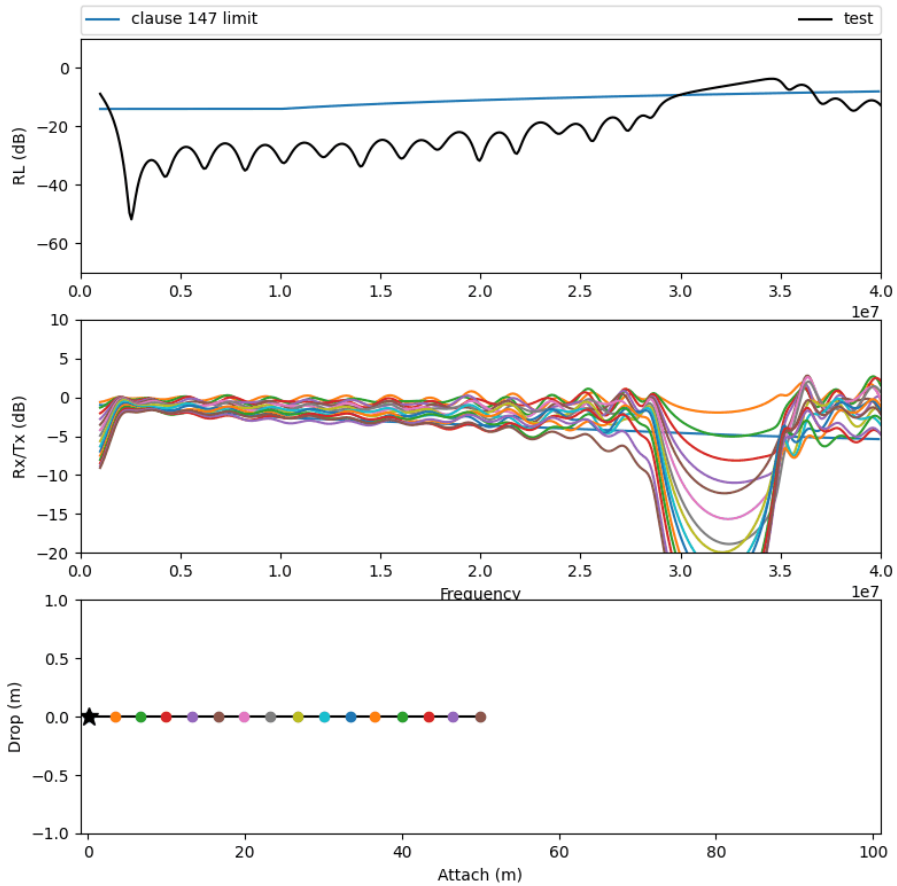
Random node positioning 16 nodes, 50m Trunk

▶ Web: random_16n_50m.gif

Random node positioning 32 nodes, 100m Trunk

Web: random_32n_100m.gif

Gaussian Variation of Attach Points σ=10cm

▶ Web: gauss_attach.gif

▶ 16 nodes, 50 meters

Conclusion

- Some configurations far exceed the clause 147 insertion loss lines

- Mixing segments with even node spacing have the most extreme violations of the insertion loss line

- Can the data path cope with the insertion loss violations as shown

Acknowledgments

▶ Jason Potterf – Cisco

▶ Paul Wachtel - Panduit

▶ George Zimmerman – CME Consulting