

# Automotive link segment for 10SPE including multidrop

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# Overview

- Goal for 10SPE automotive PHY must be to run on “CAN-like” or “FlexRay-like” cabling and connector configurations
- Bert Bergner showed measurements of 4mm pitch connectors showing the need to relax RF parameters to accommodate for 4mm pitch, see: [http://www.ieee802.org/3/cg/public/July2017/DiBiaso\\_Bergner\\_01a\\_0717.pdf](http://www.ieee802.org/3/cg/public/July2017/DiBiaso_Bergner_01a_0717.pdf)
- Another set of measurements you can find under: [http://www.ieee802.org/3/bw/public/buntz\\_tazebay\\_3bw\\_01\\_0914.pdf](http://www.ieee802.org/3/bw/public/buntz_tazebay_3bw_01_0914.pdf)
- Supplementing data from re-use of available “old” measurement data from RTPGE (measurement of a 100ohms FlexRay link out of a real automotive cable harness) to confirm this.
- Proposes a possible set of parameters for the automotive link segment, including multidrop

# Part 1 + Part 2

Re-visit presentation: Part 1+ Part 2

[http://www.ieee802.org/3/cg/public/adhoc/kaindl\\_matheus\\_3cg\\_01\\_0817.pdf](http://www.ieee802.org/3/cg/public/adhoc/kaindl_matheus_3cg_01_0817.pdf)

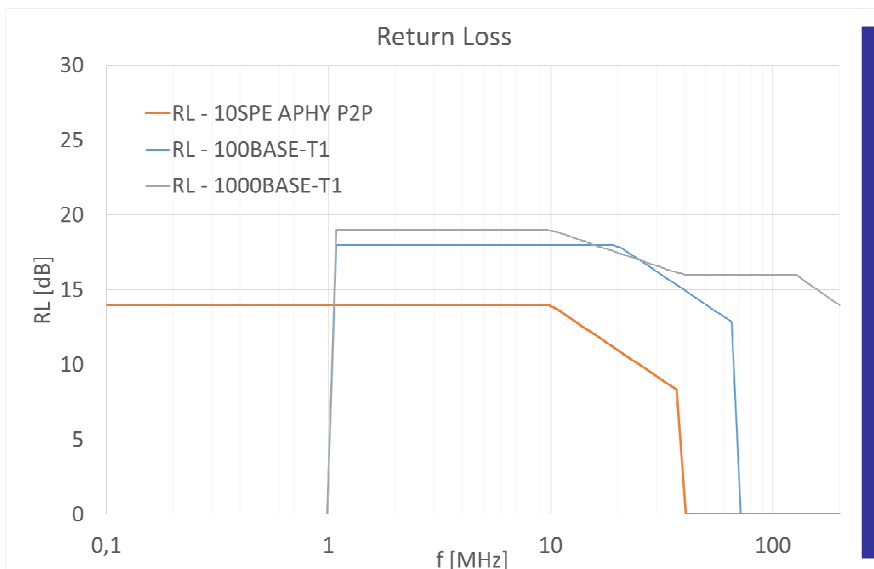
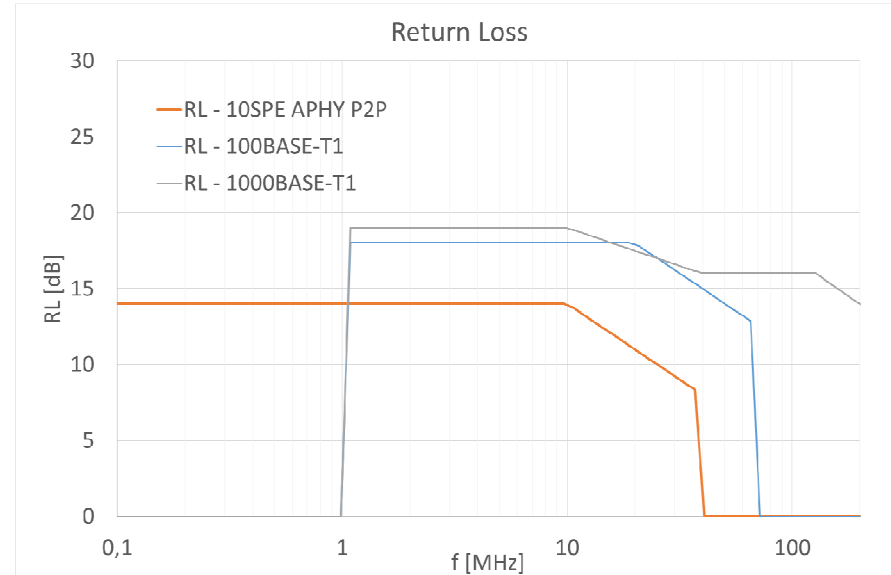
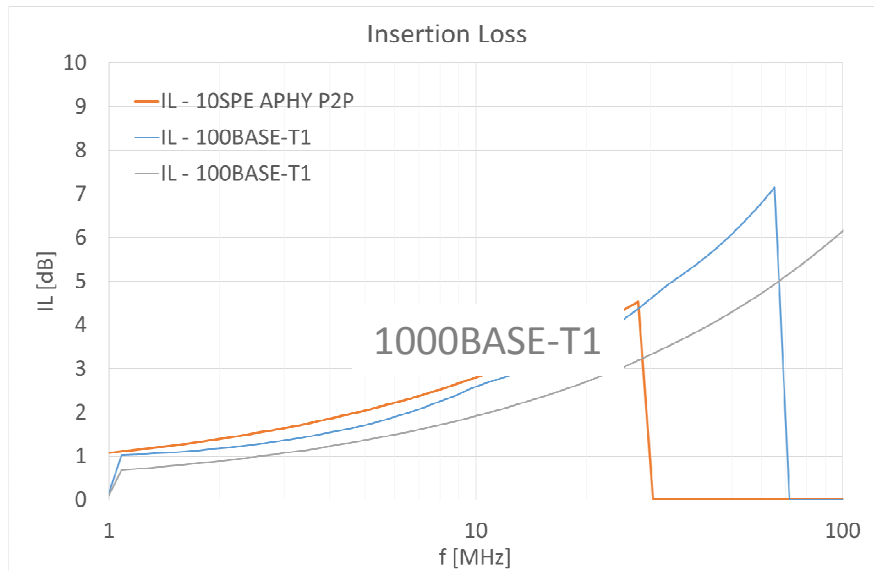
Re-visit of supplementing measurement data from

[http://www.ieee802.org/3/bw/public/buntz\\_tazebay\\_3bw\\_01\\_0914.pdf](http://www.ieee802.org/3/bw/public/buntz_tazebay_3bw_01_0914.pdf)

[http://www.ieee802.org/3/cg/public/July2017/DiBiaso\\_Bergner\\_01a\\_0717.pdf](http://www.ieee802.org/3/cg/public/July2017/DiBiaso_Bergner_01a_0717.pdf)

# Part1+Part2 Summary:

Look on RF parameter –  
comparison to 100BASE-T1/1000BASE-T1



$$IL = 0,2 + 0,004 * f + 0,8 * \text{SQRT}(f) + 0,07 * (1/\text{SQRT}(f))$$

f=0,1...40MHz\*

$$RL = 14 \quad f=0,1...10\text{MHz}$$

$$14 - 10 * \text{LOG}_{10}(f/10) \quad f=10...40\text{MHz}$$

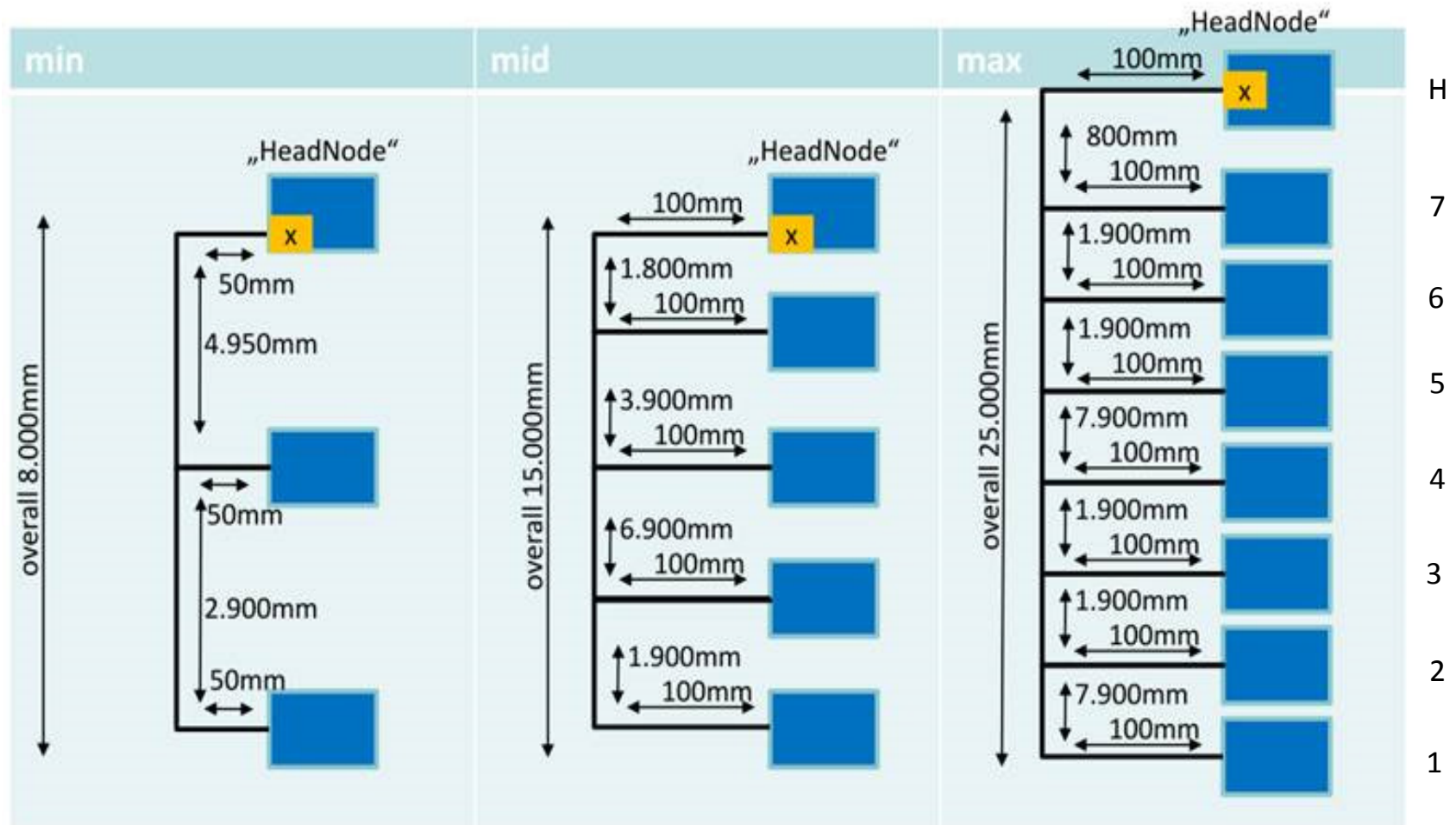
$$MC = 30 \quad f=0,1...20\text{MHz}$$

$$30 - 20 * \text{LOG}_{10}(f/20) \quad f=20...200\text{MHz}$$

# Part 3

- Channel measurement for 10SPE multidrop

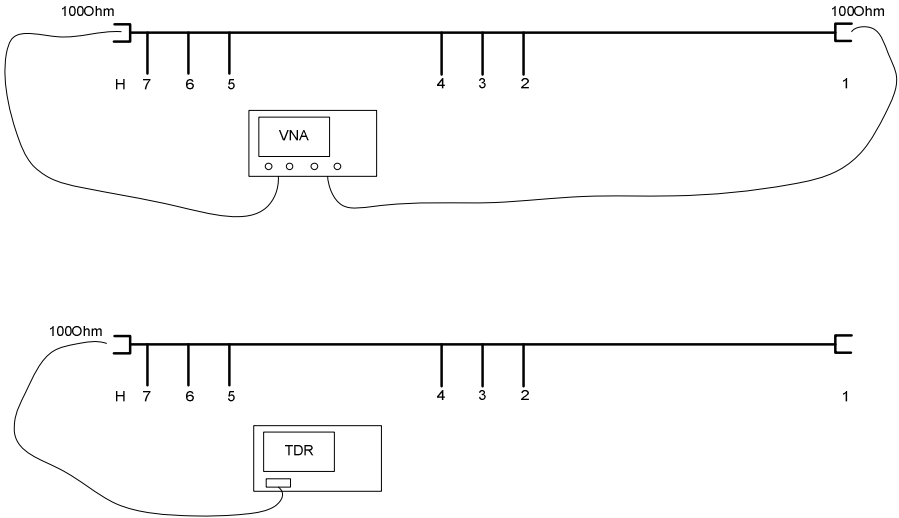
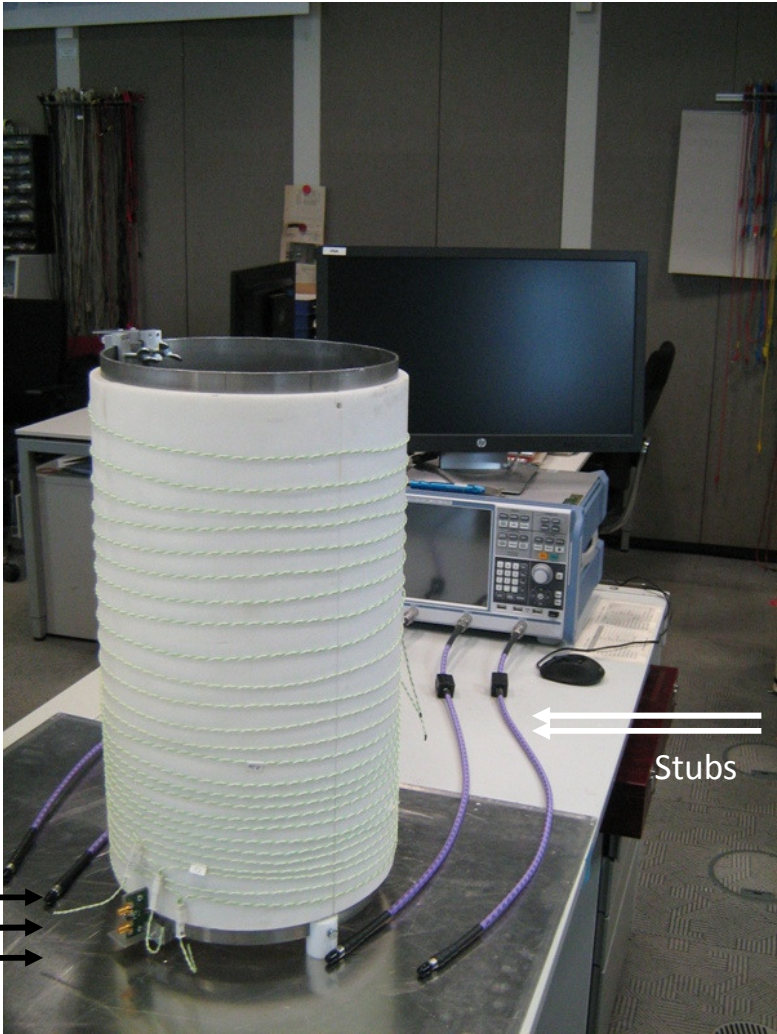
# Passive linear topologies



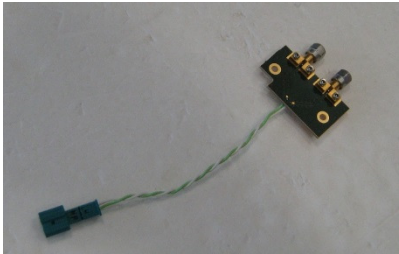
See [http://www.ieee802.org/3/cg/public/adhoc/buntz\\_10SPE\\_04\\_0308.pdf](http://www.ieee802.org/3/cg/public/adhoc/buntz_10SPE_04_0308.pdf)

# Max Topology Test

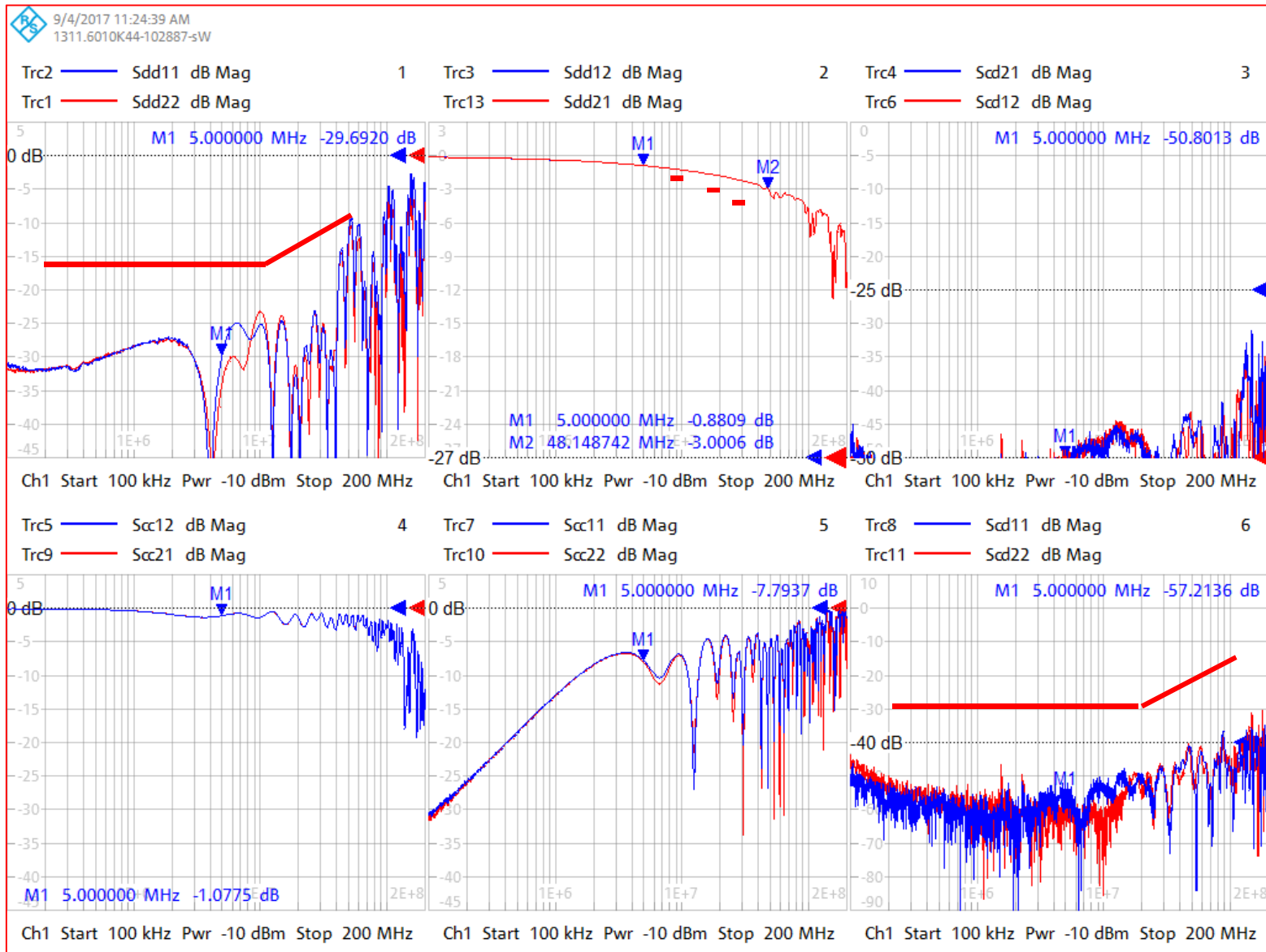
# TDR / VNA



Used Termination at Stubs

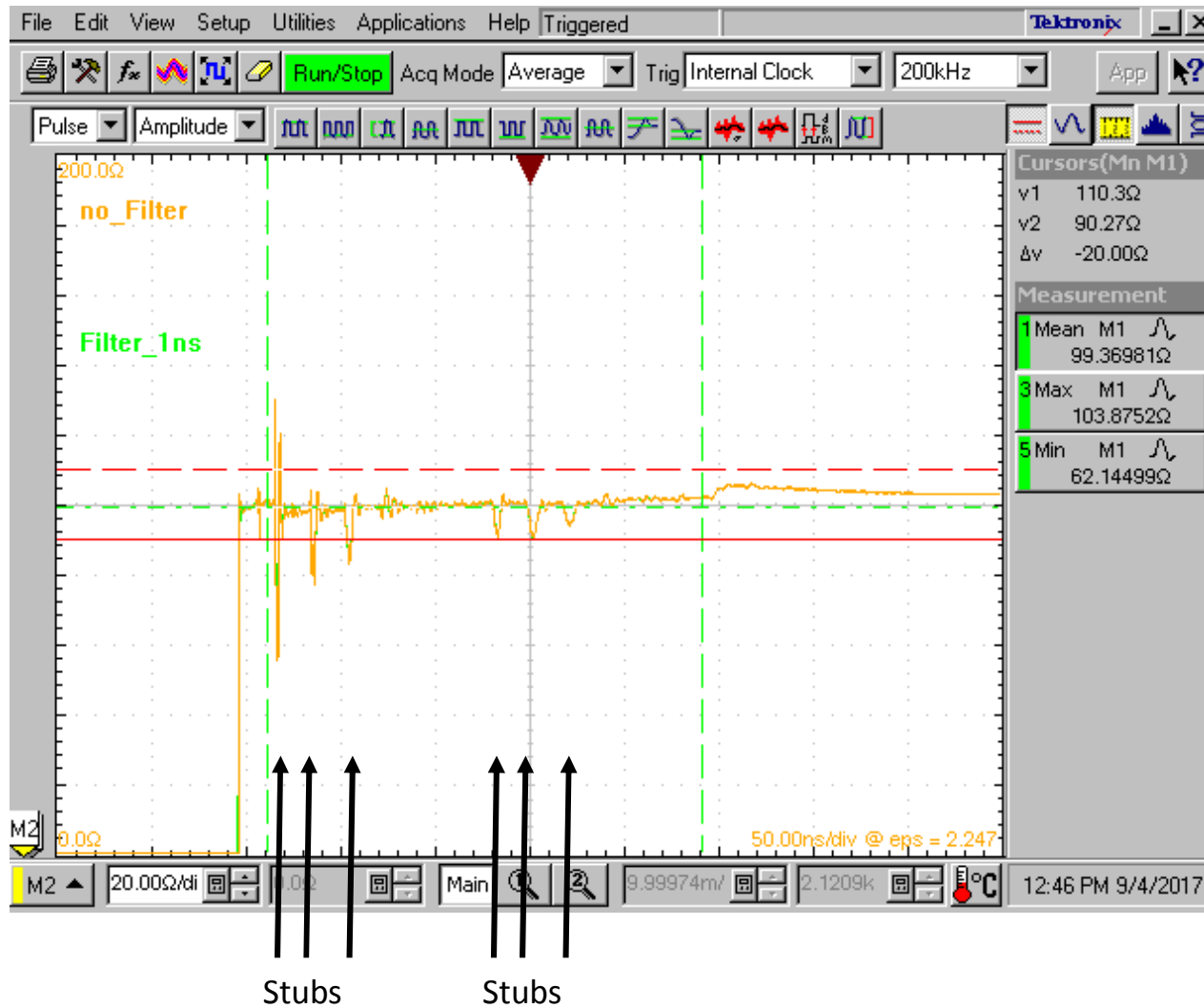


# Measurement over complete channel node H –node 1



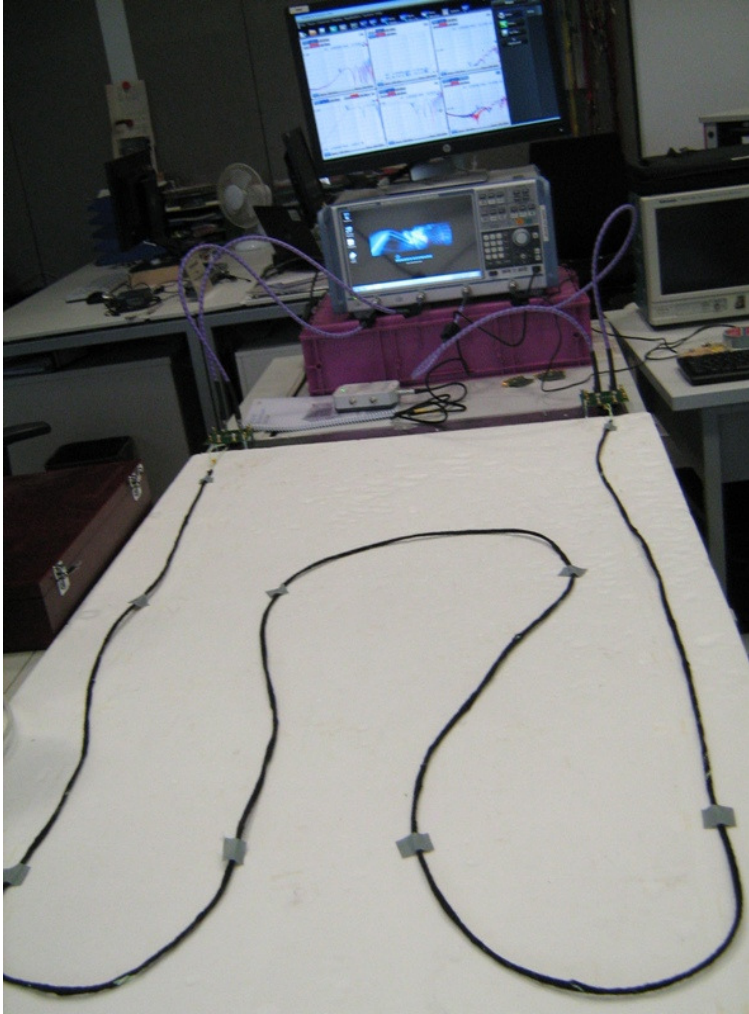


# Measurement over complete channel node H

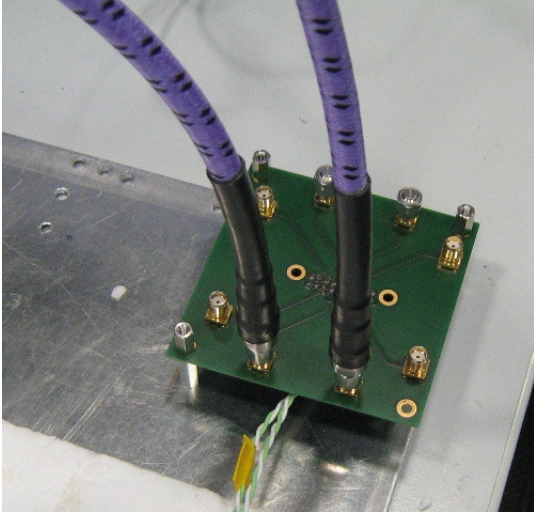


# Crosstalk Test

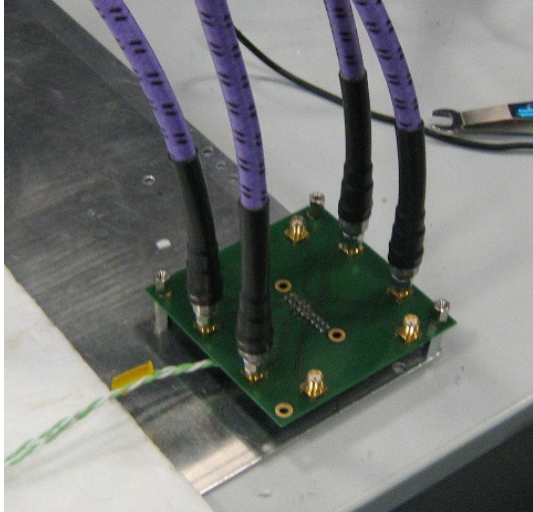
Setup: 5m, 2\* 0.35mm<sup>2</sup> -TP  
Plate; 1cm height



Setup: Connection (pair1)  
and FEXT



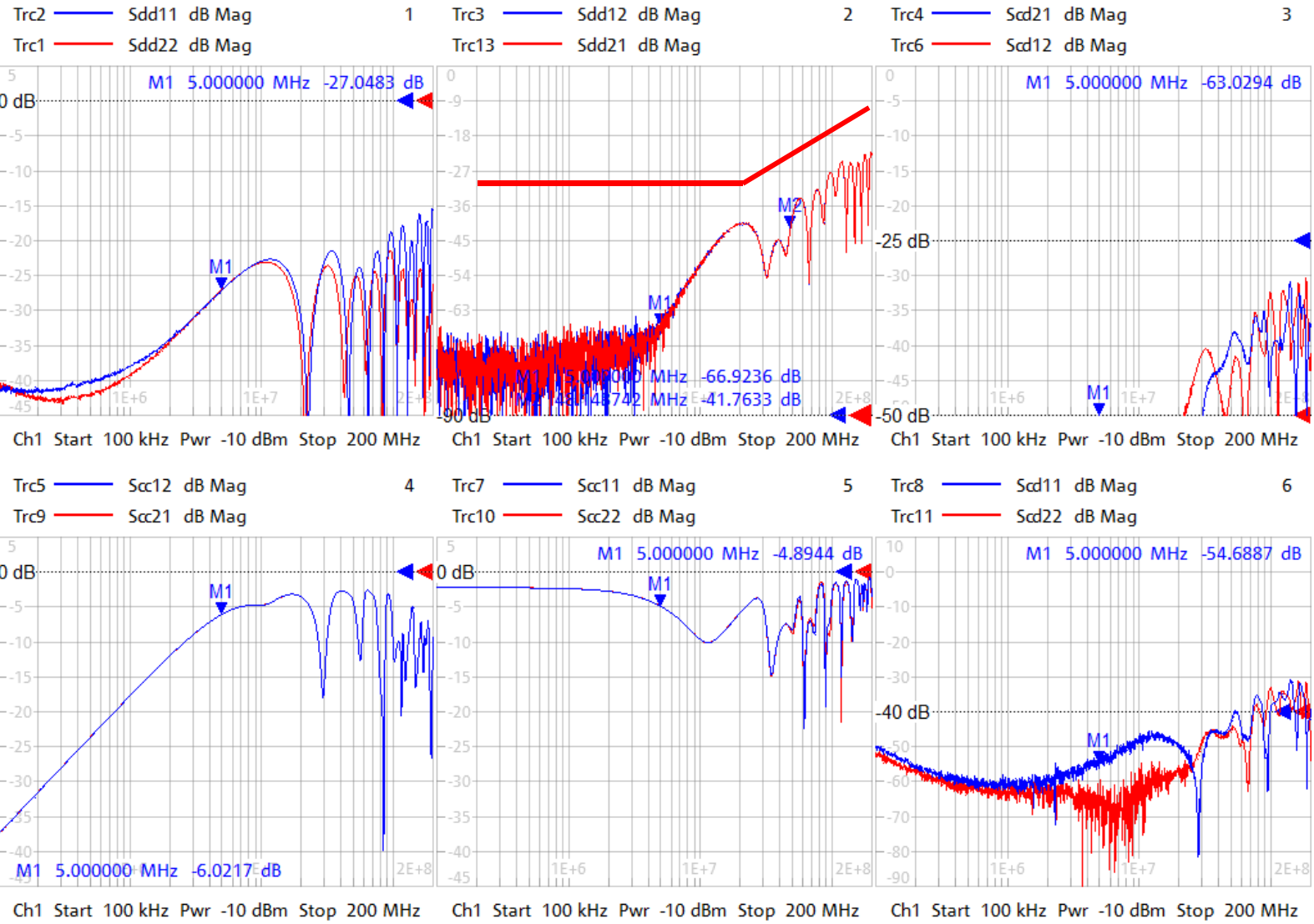
Setup: NEXT



2\* 5m KroSchu 64996567 2x0.35mm<sup>2</sup> PP SL15mm  
(BMW 100baseT1 Cable)

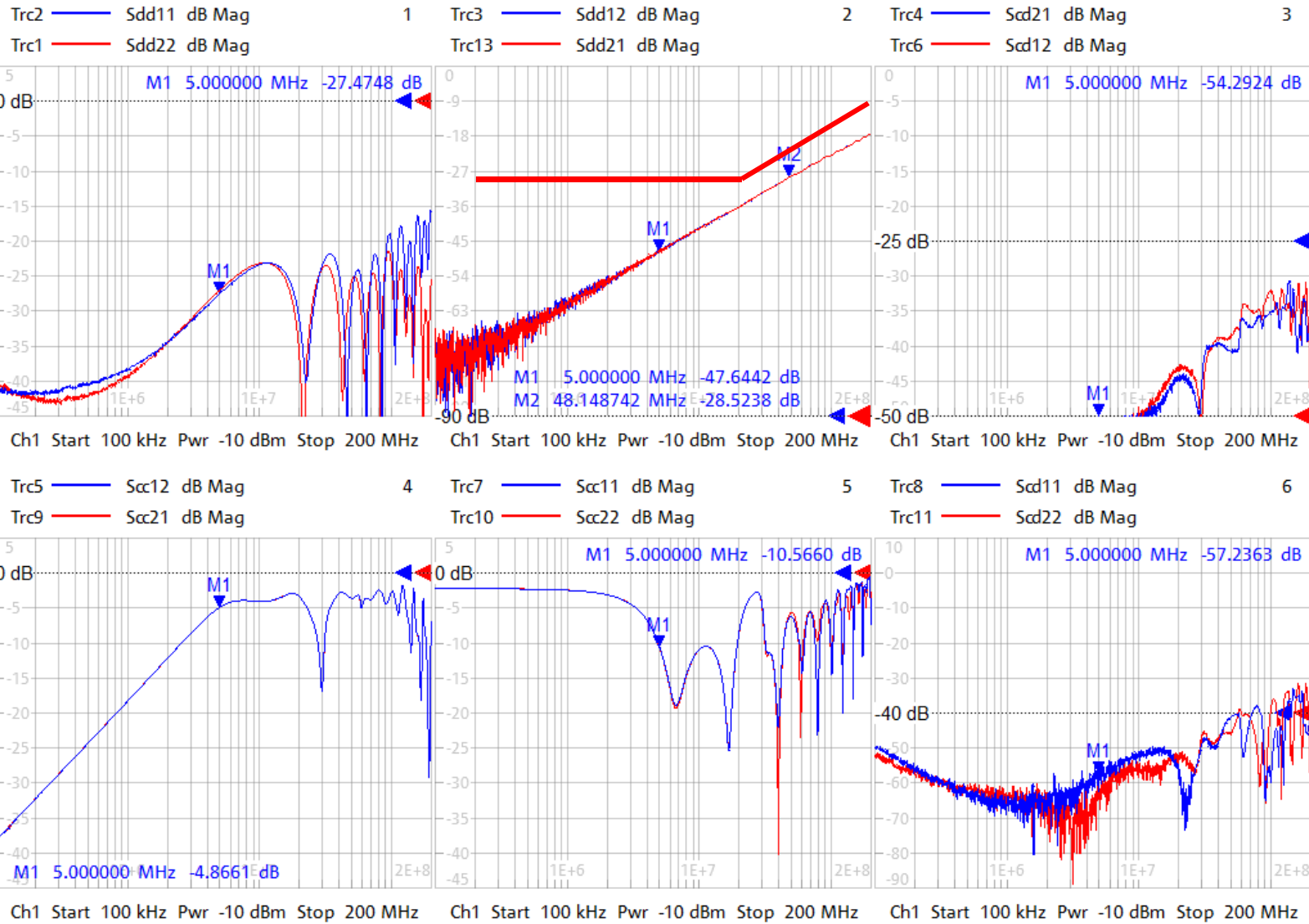
# NEXT pair –to- pair 5m

9/8/2017 7:01:44 AM  
1311.6010K44-102887-sW

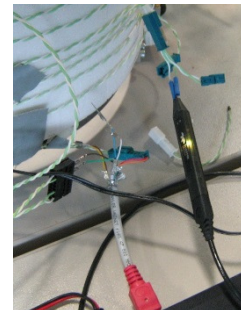
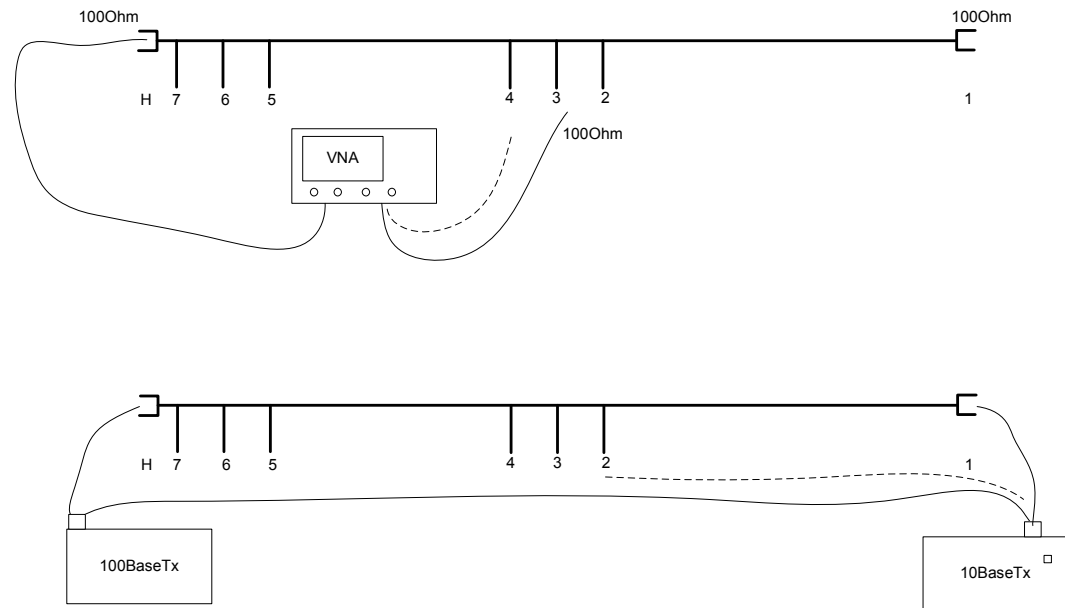
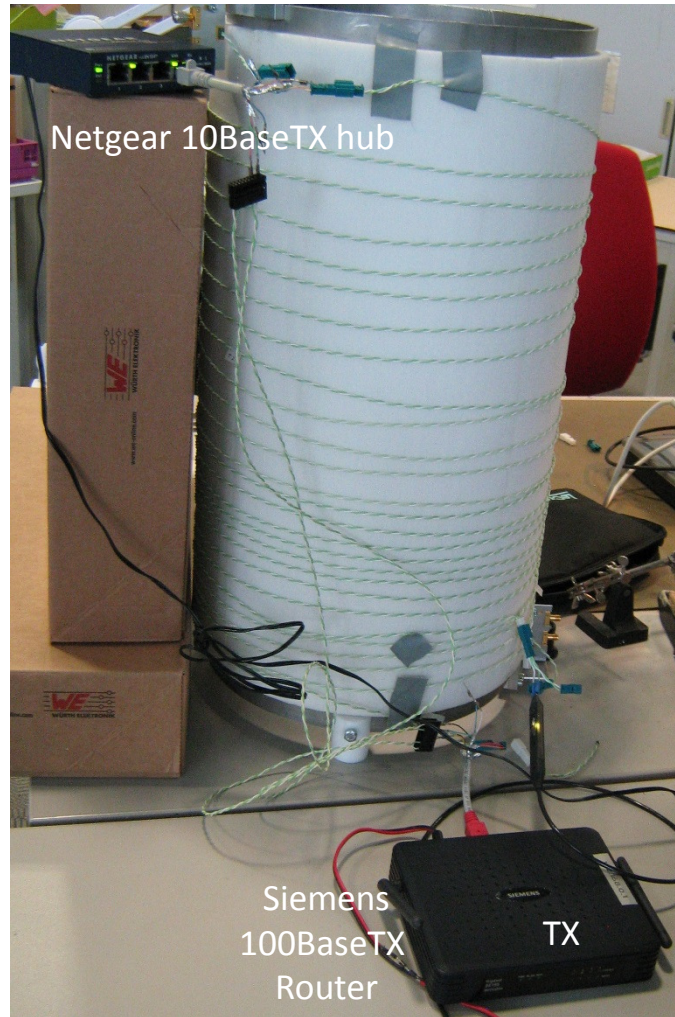


# FEXT pair-to-pair 5m

9/8/2017 7:06:20 AM  
1311.6010K44-102887-sW

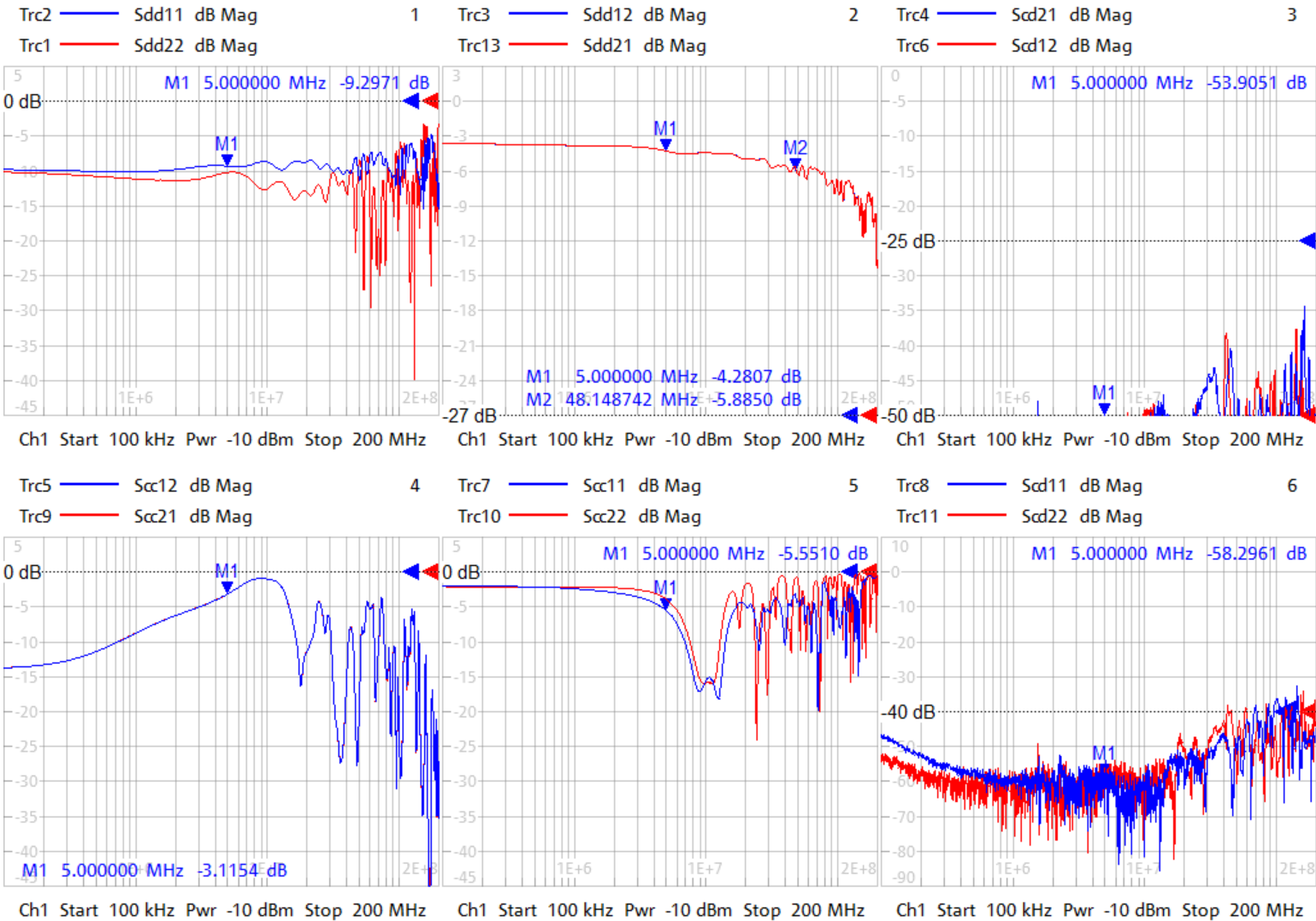


# Max Topology Test VNA / 10BaseTX



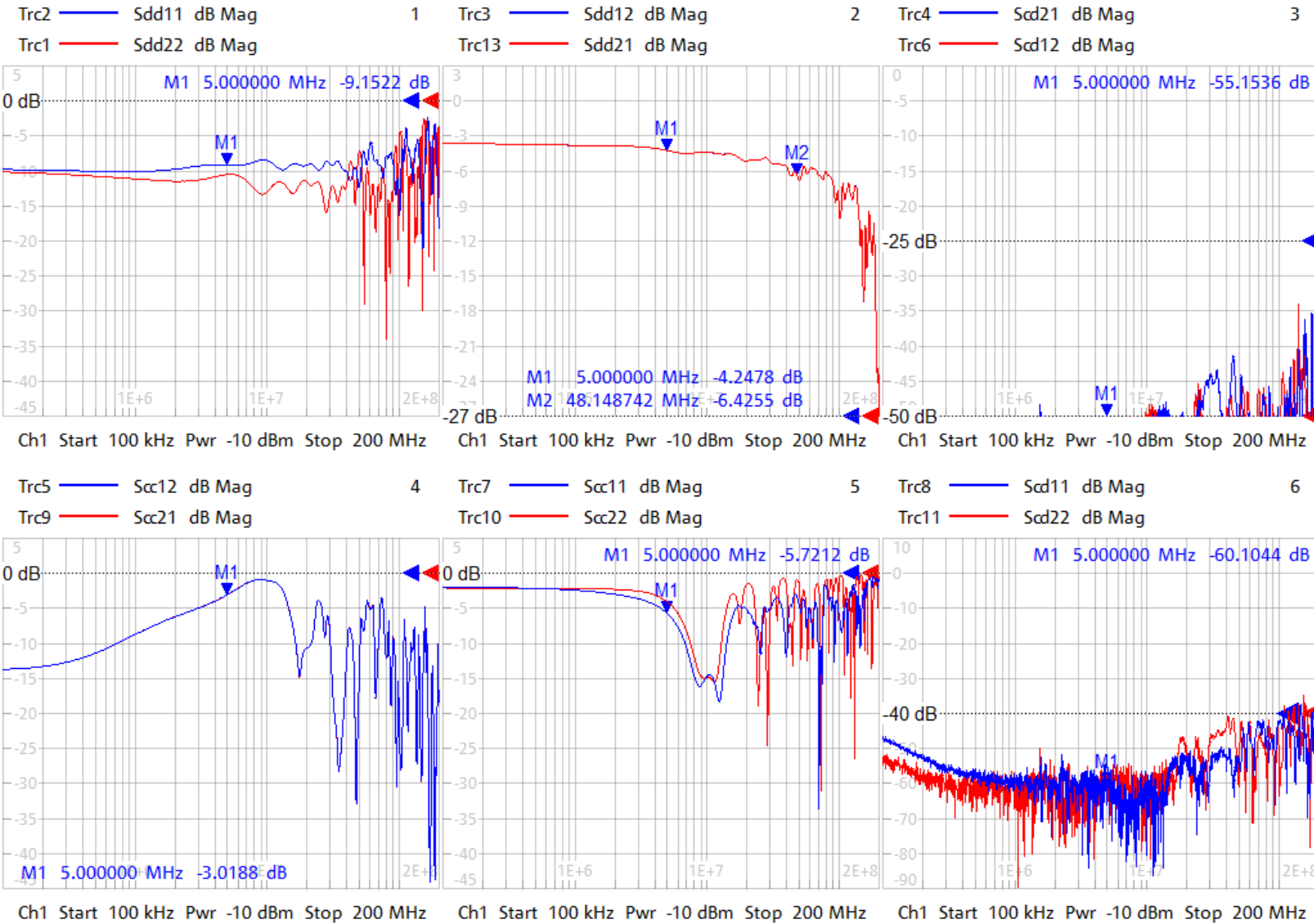
# Measurement over node H –node 2 node 1 terminated

9/5/2017 8:55:42 AM  
1311.6010K44-102887-sW



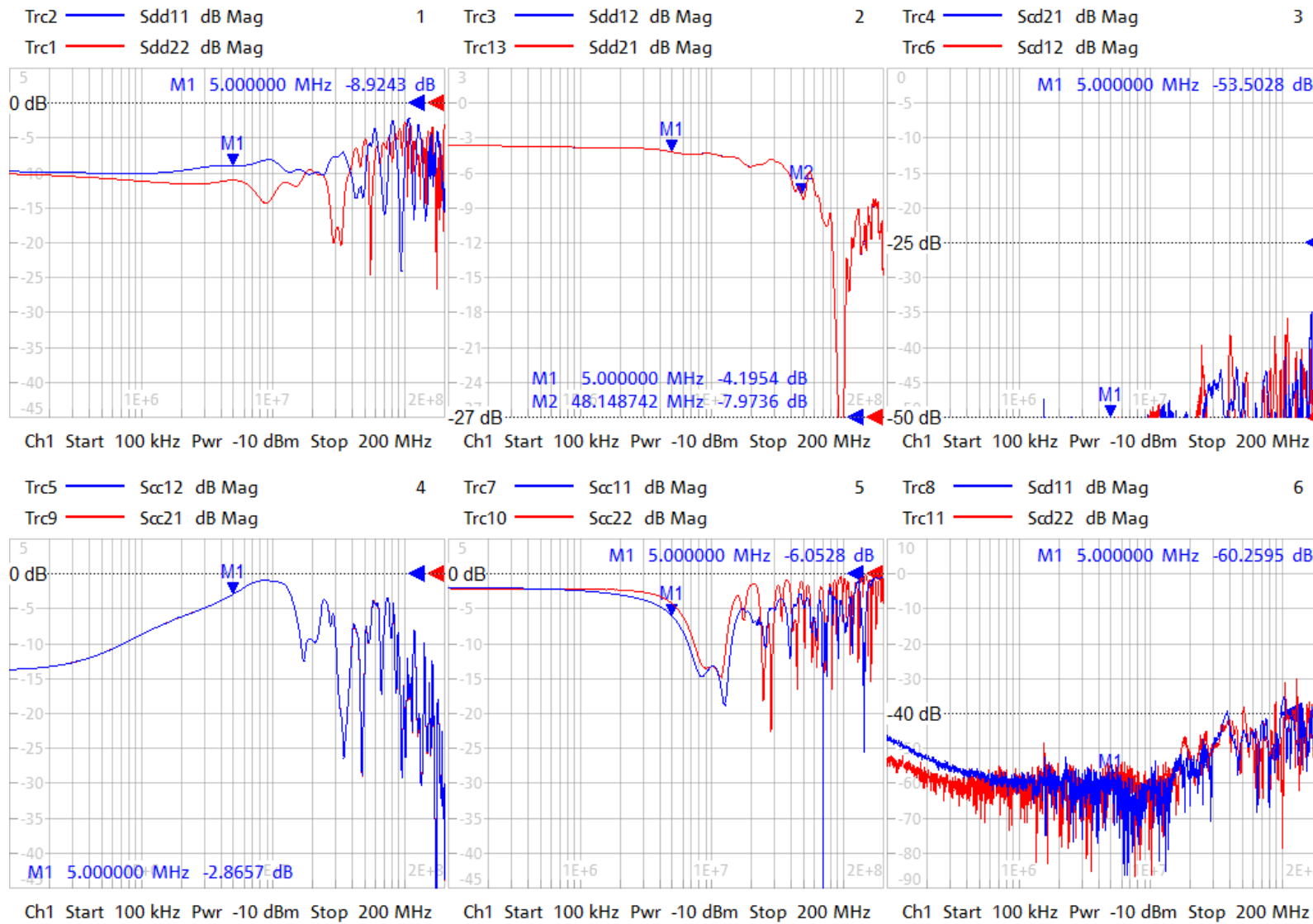
# Measurement node H –node 2 node 4 Stub 20cm node 1 terminated

9/5/2017 9:00:27 AM  
1311.6010K44-102887-sW



# Measurement over complete channel node H –node 2 node 4 Stub 50cm node 1 terminated

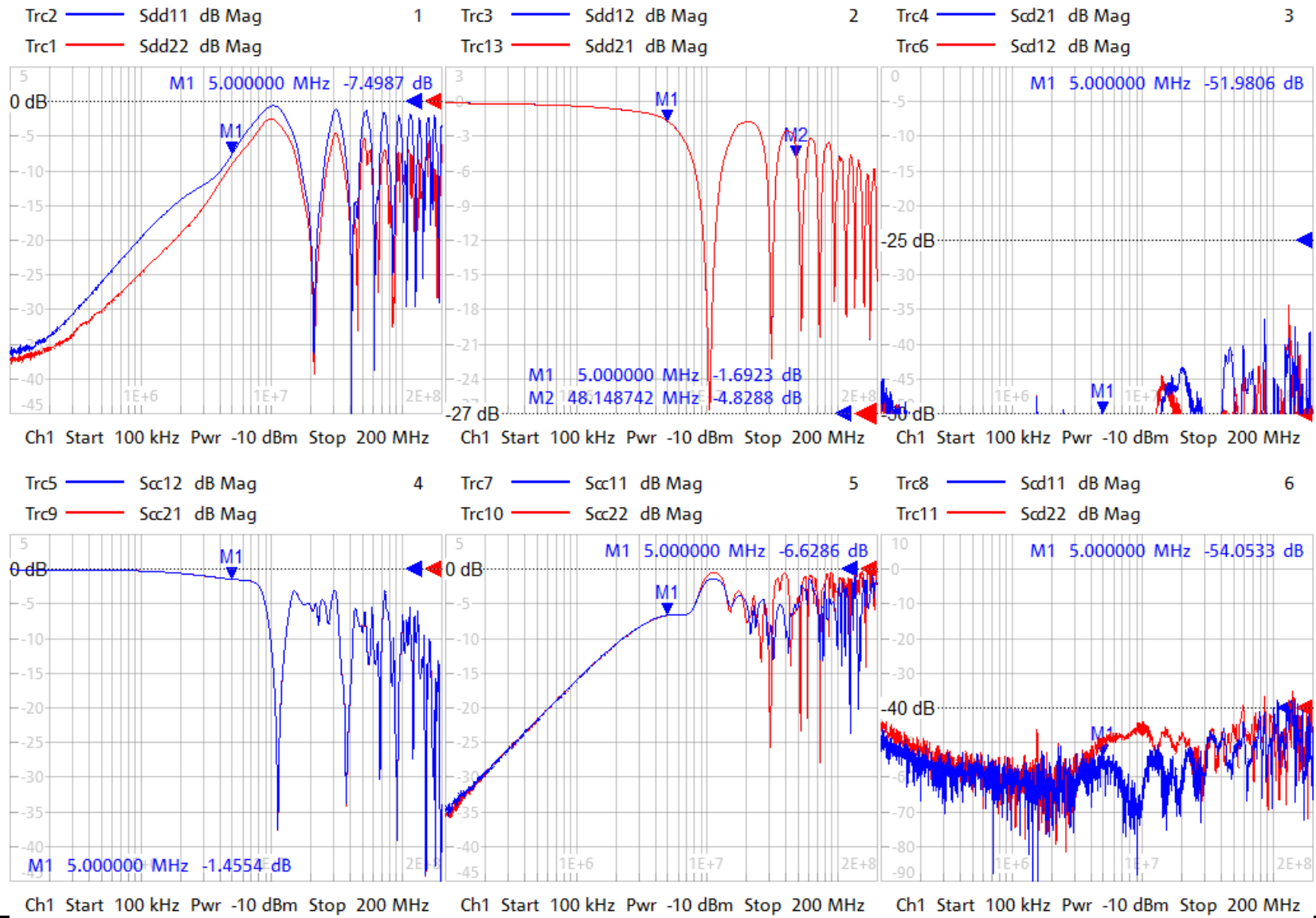
9/5/2017 8:58:38 AM  
1311.6010K44-102887-sW



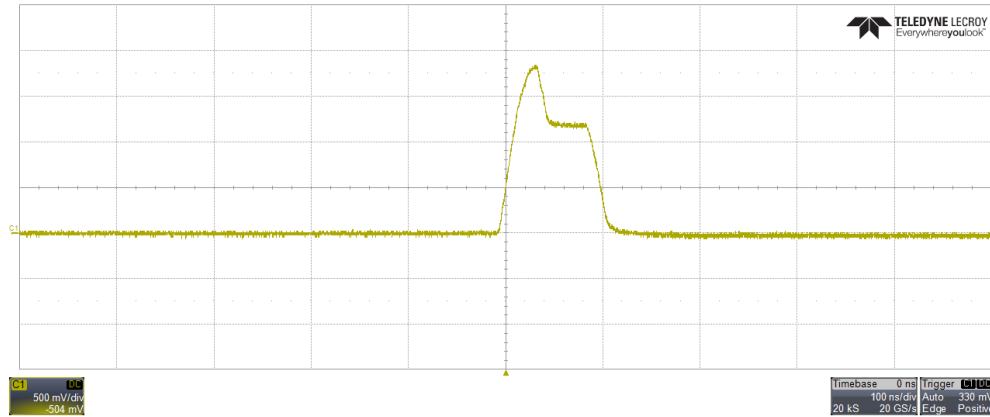


# Measurement over complete channel node 5 –node 2 node 1 termination at H open

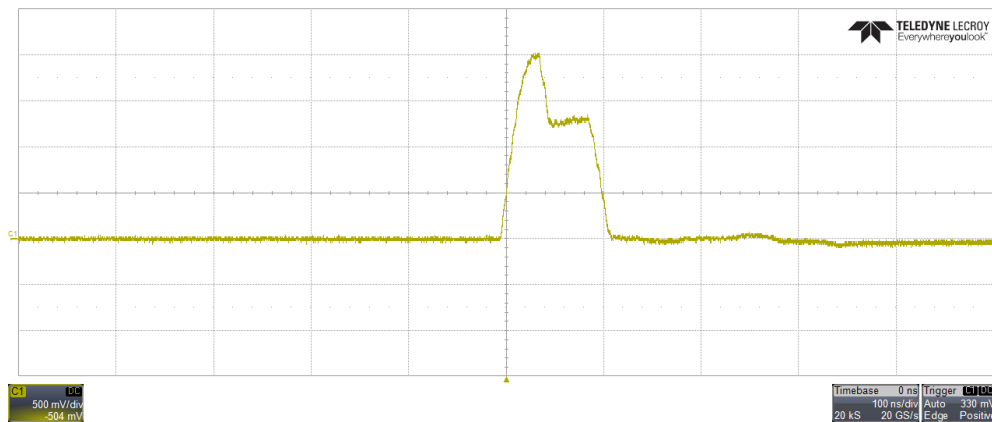
9/5/2017 8:34:06 AM  
1311.6010K44-102887-sW



## Test 10MB Both Nodes @End; only Stub (each open)



Pulseform @ 1 (Netgear)



Pulseform @ H (Gigaset)

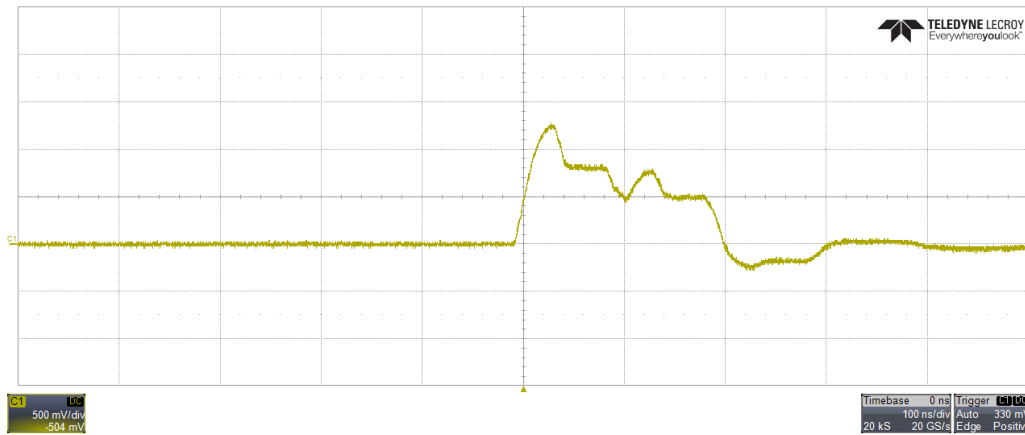
observed:

→ Even attaching the TX Devices in the middle of the topology and adding a termination at the end  
Only the amplitude was mainly influenced; Not a massive increase of „noise“ echo's etc,

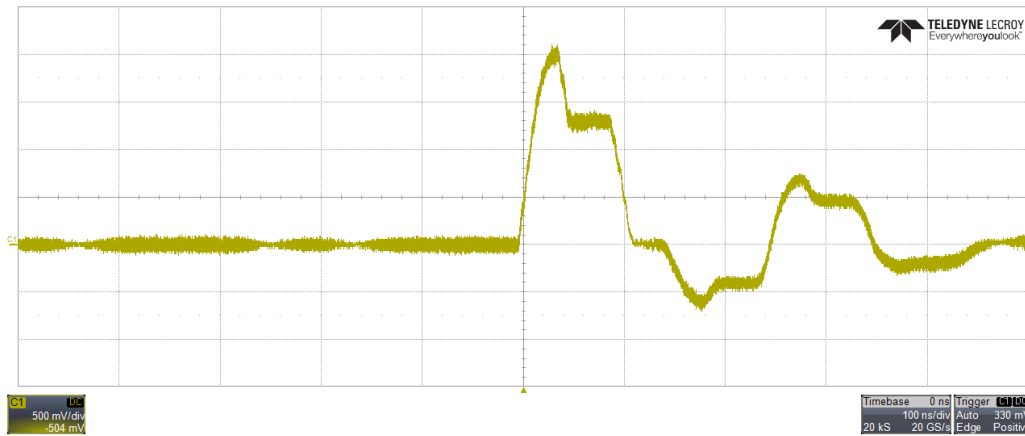
→ Most critical: removing the termination at one of the topology end:

→ Massive Echo occur if open line at the end of the bus structure

Test 10MB Sender @ H; Linkpartner @ 3 ; 1 = open



Pulseform @ Linkpartner /3



Pulseform @ Sender / H

# Summary

- **This presentation showed measurement results for the multidrop channel in addition to the previously presented P2P link.**
- **These inputs are intended to support semiconductor manufacturers in their investigations and to adopt a baseline proposal for the channel.**
- **Results in detail:**
  - **The standard VNA/TDR test results show: The previously made baseline proposal for the channel is valid for multidrop as well**
  - **The length of stub and the termination at the end have major impact. 10..20cm stubs seem o.k.**
- **Proposal: Adopt baseline proposal for short reach 10SPE channel**