

Field Service Report FM Combiner and Antenna System

Chillicothe, OH.
Broadcast Facility
ERI Antenna: LPX-4C-SP
ERI 955-4 "TEE" Combiner
Feedline: 1 5/8" RFS Flex HCA158-50J (155')

WZCP – 89.3 MHz.
WVNA – 90.1 MHz.

ERI Project #30659A

August 9, 2016

Submitted By:

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INTRODUCTION

Listed below is a summary of the data and attached are the plots collected from the WZCP ~ WOHC transmission site in Chillicothe, OH. by Troy Knotts February 11, 2017.

- The antenna is a LPX-4C-SP.
- The combiner is a 955-4 "TEE" Combiner.
- Equipment used for combiner testing is a Copper Mountain.
- Equipment used for filter to antenna and antenna testing is a Copper Mountain.
- All measurements of the combiner were taken at the 1 5/8" input and at the 1 5/8" output "Tee".
- All feedline and antenna measurements were taken at the 1 5/8" flex connector in the transmitter room.

Site Address: 10398 OH-28, Frankfort, OH. 45628

Attendees: River Radio – Matt Levin
KLove – Patrick Maxwell and John Tocknell
ERI Technician – Troy Knotts

The reason for this Field Service Trip was to install and check the tune of the 89.3 MHz. and 90.1 MHz. TEE combiner and proof the system.

Final measurements of the T-combiner were no worse than -34.2 dB, (1.04:1 VSWR) @ carrier and no worse than -33 dB, (1.045:1) +/- 200 KHz. of carrier for either frequency.

SUMMARY and RECOMMENDATIONS

All measurements were taken by Troy Knotts of Electronics Research Inc. February, 2017.

Recommend installing insulated wire on the Northwest guy wire that runs through the antenna aperture.

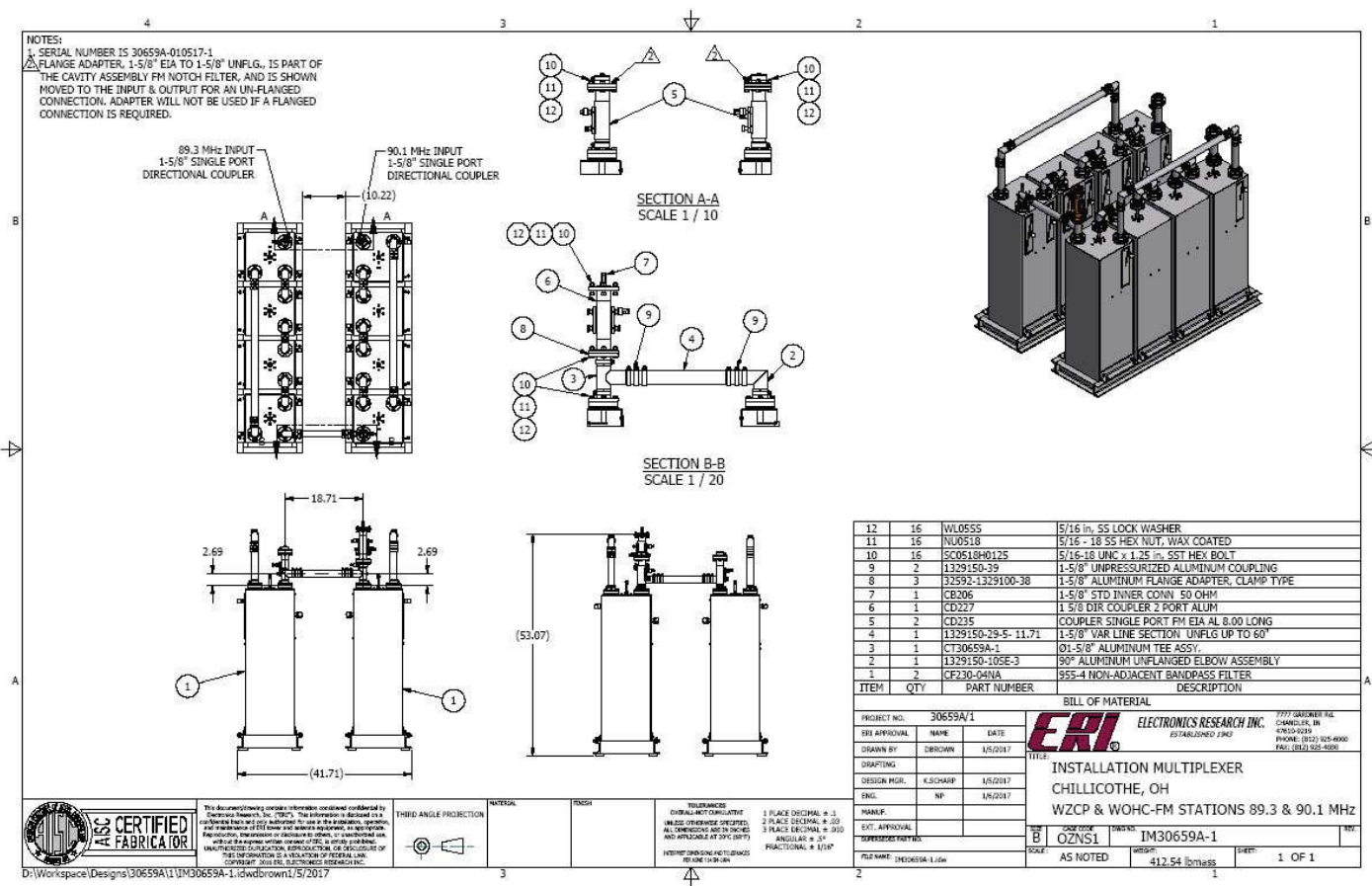
Recommend monitoring loop adjustment that was damaged after install. The combiner system passed the proof and the customer was satisfied without looking at the damage loop adjustment electrically.

Sincerely,

Troy Knotts

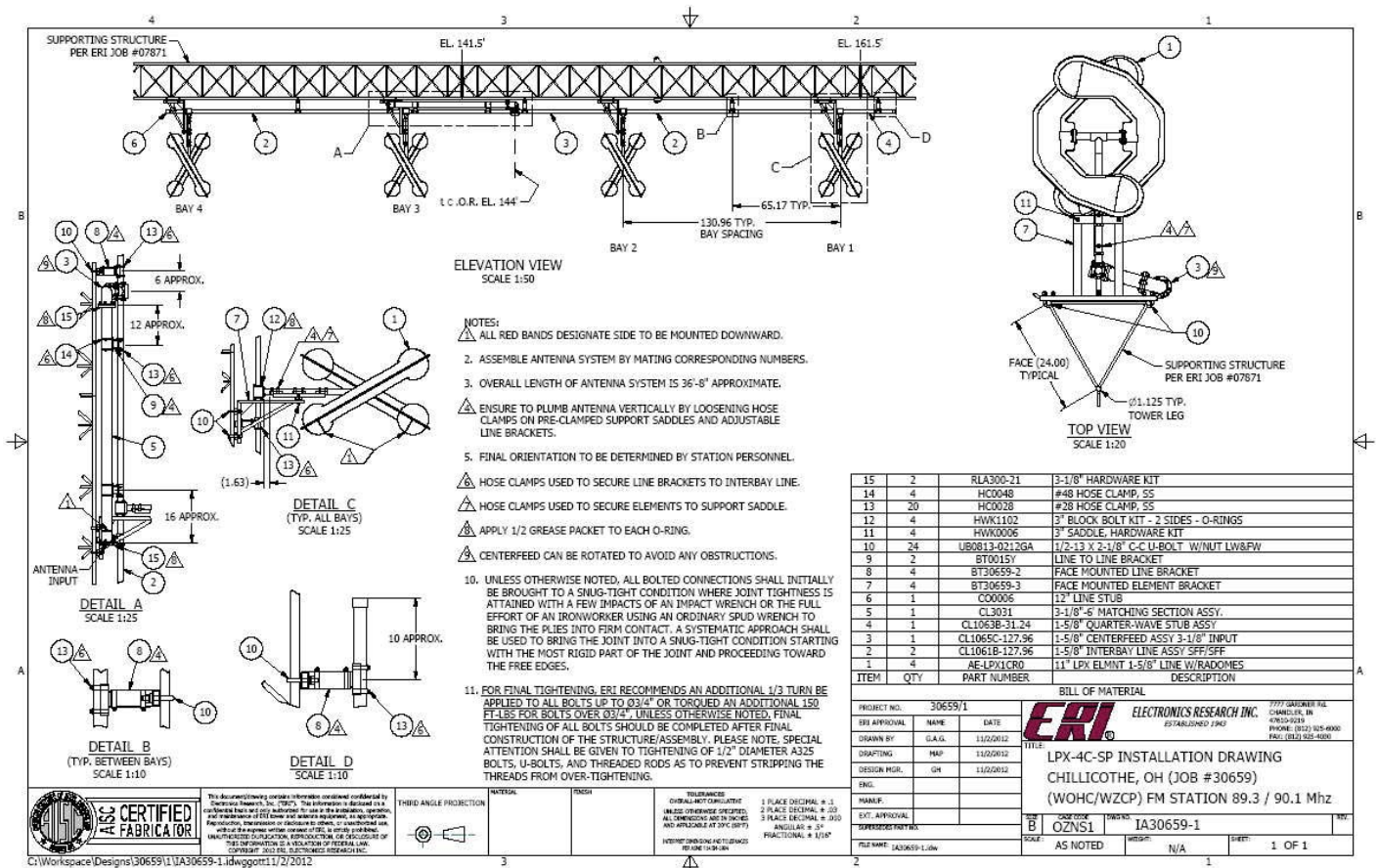
DRAWINGS

Figure 1: Combiner Drawing*

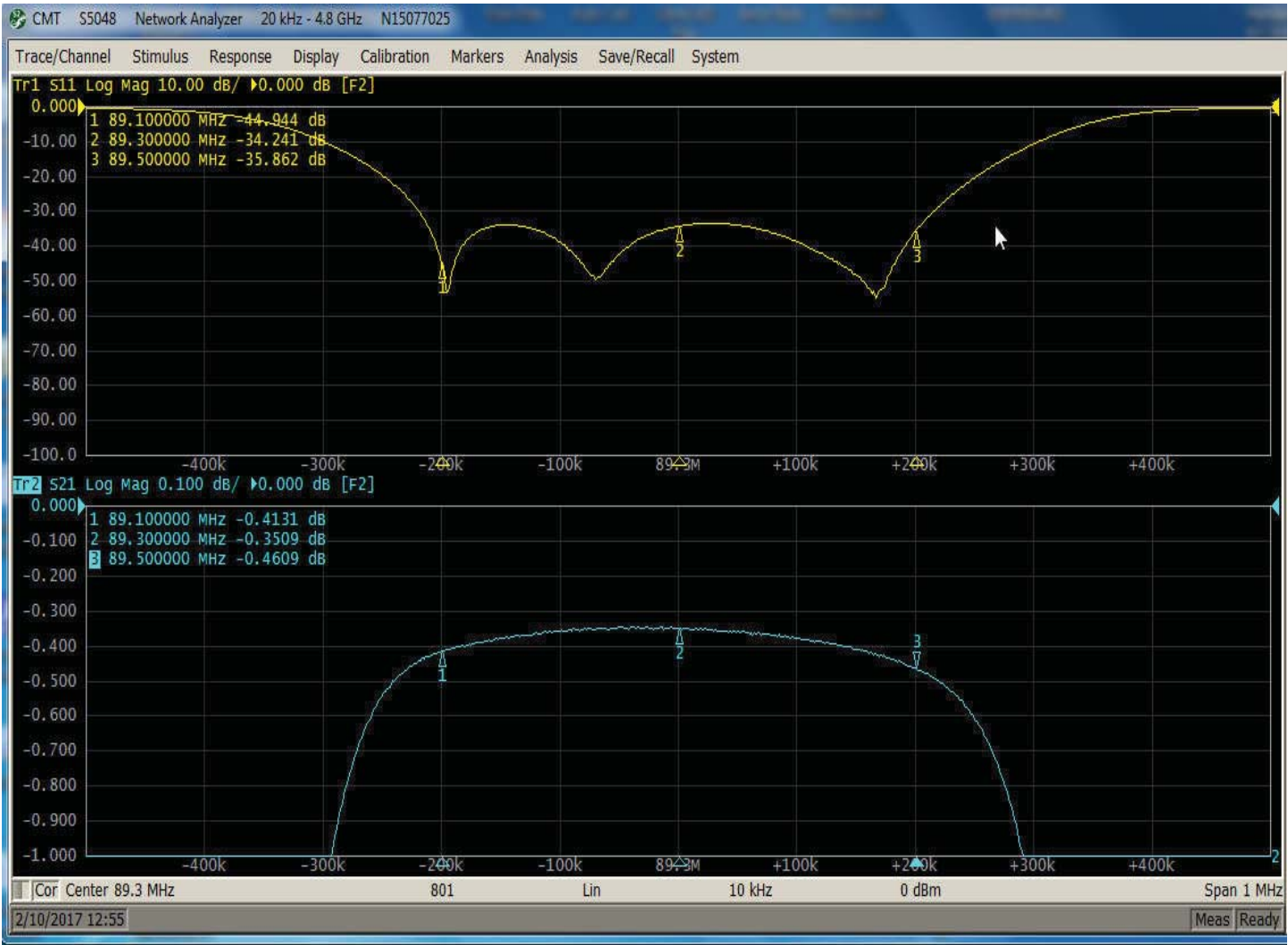


*The Combiner is actually set up end to end instead of side by side.

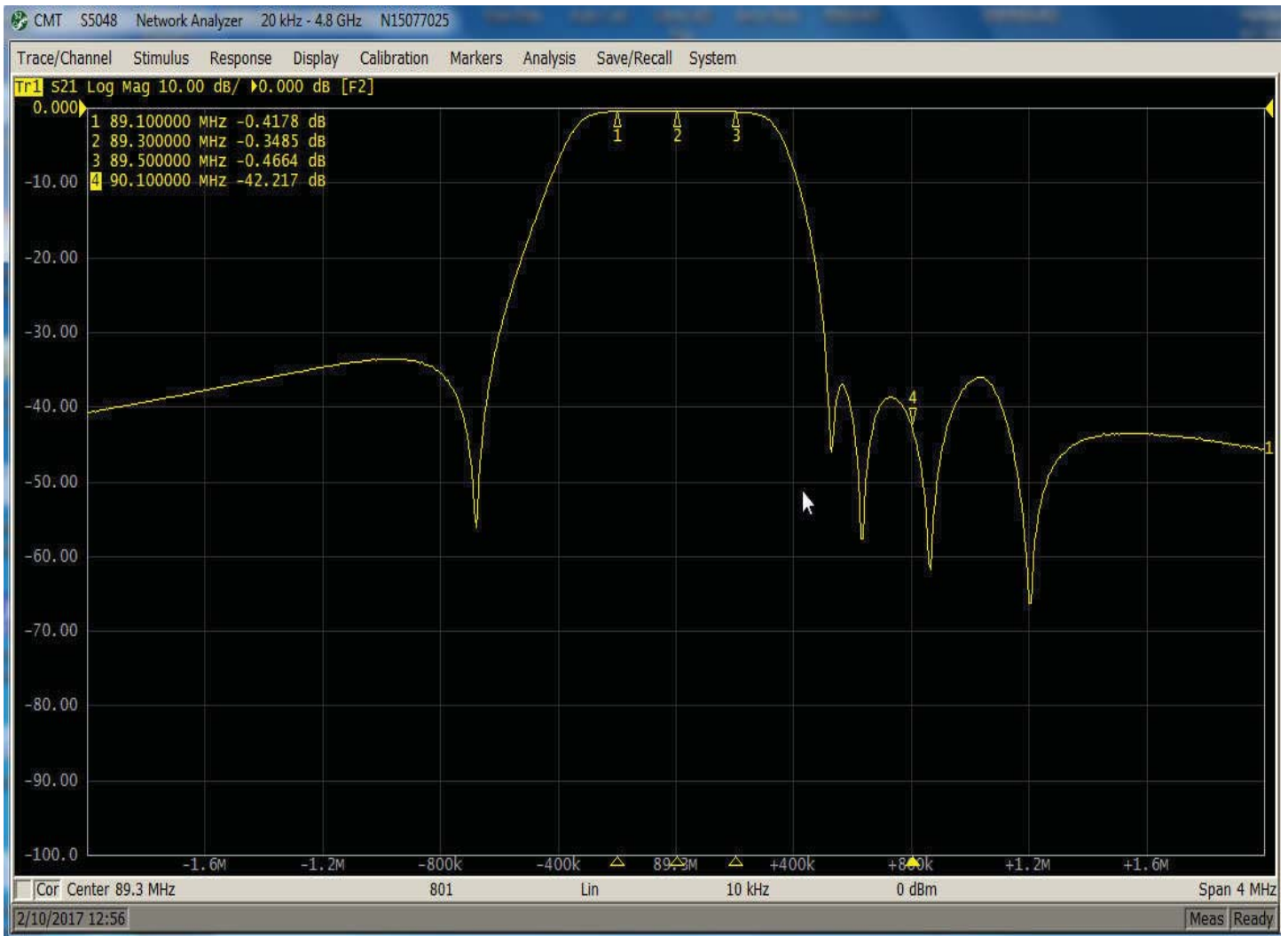
Figure 2: Antenna Drawing



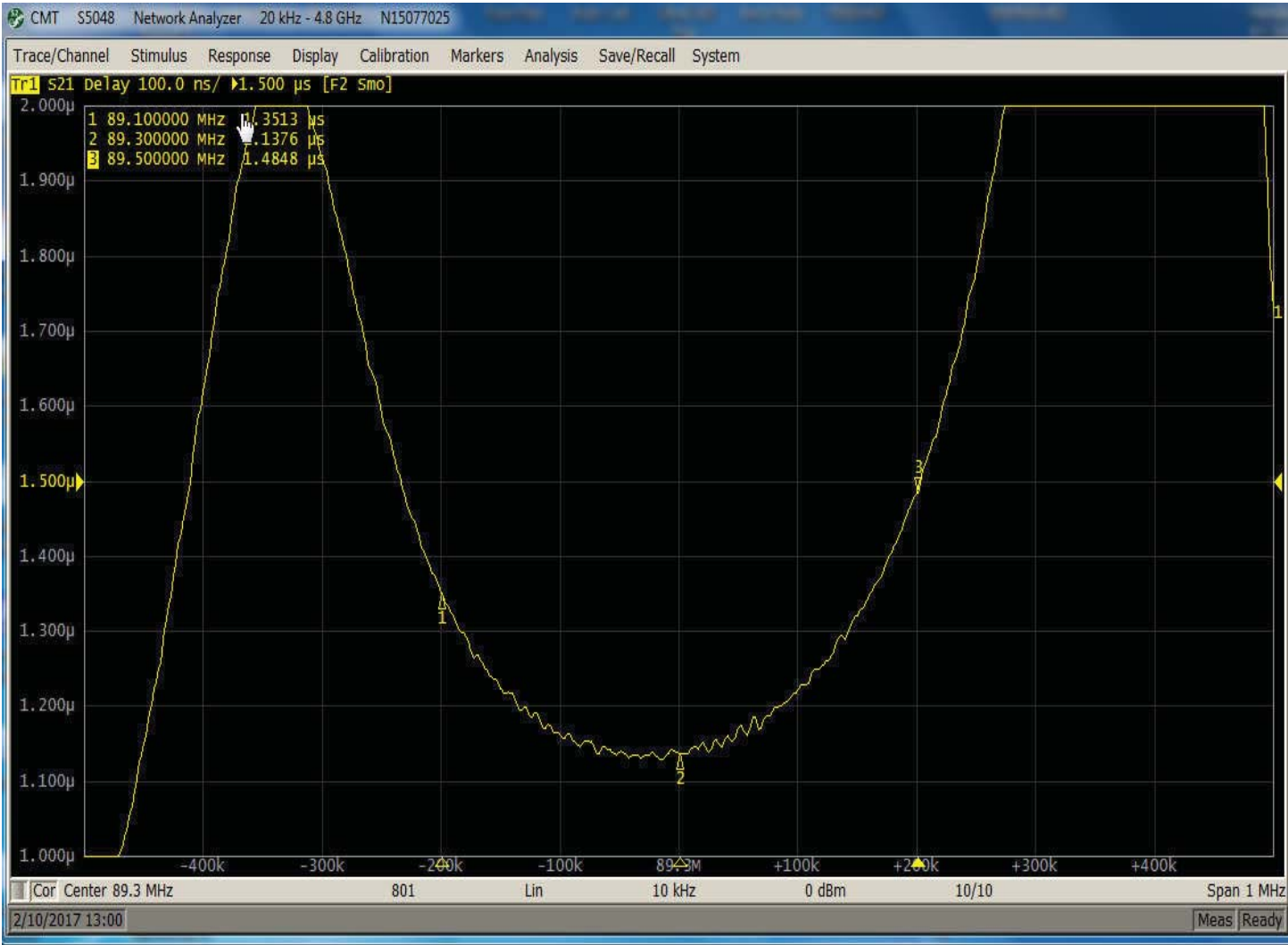
Measurement 1: Match and Insertion Loss of 89.3 MHz.



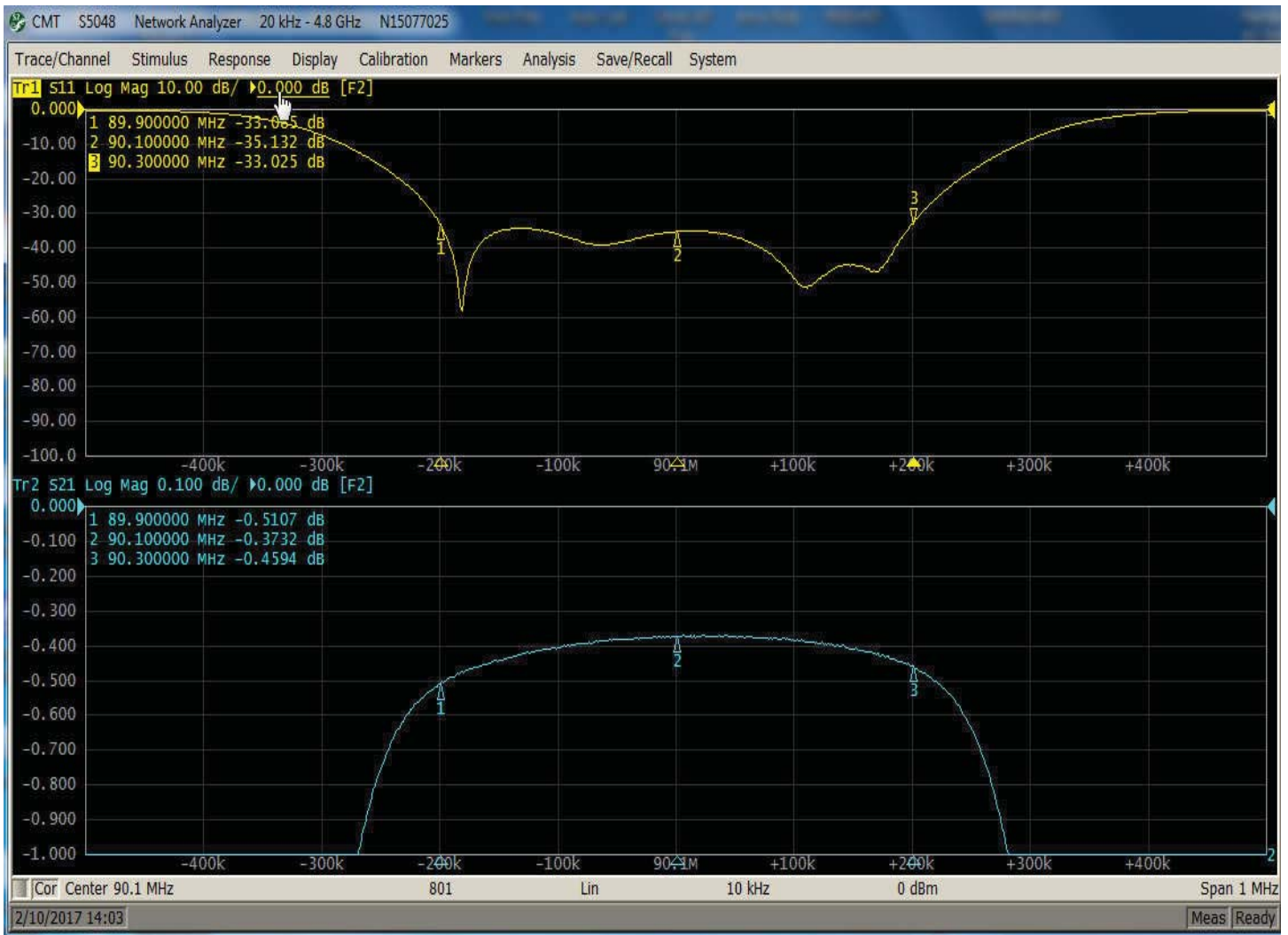
Measurement 2: Isolation + 800 KHz. of 89.3 MHz.



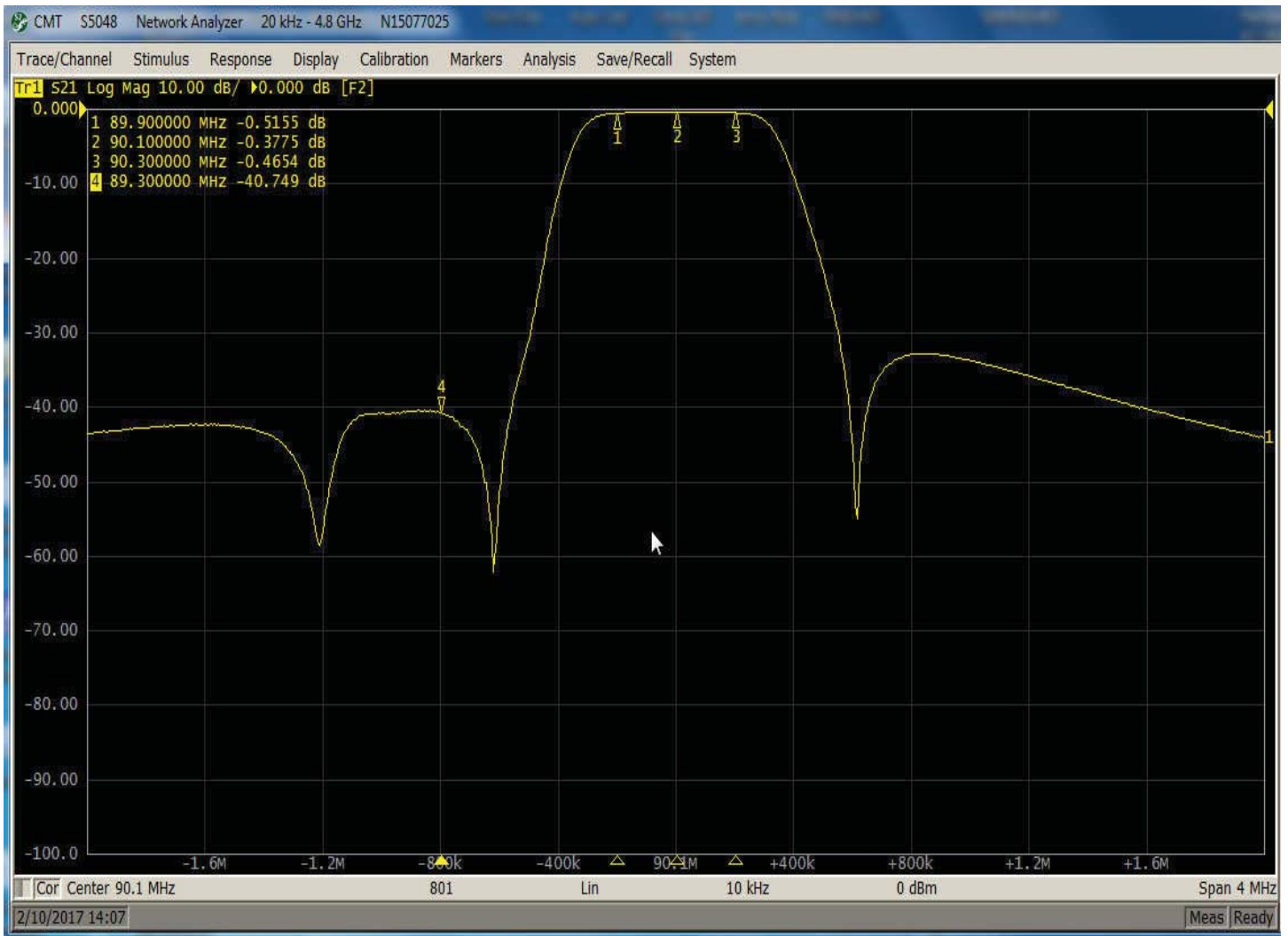
Measurement 3: Group Delay of 89.3 MHz.



Measurement 4: Match and Insertion Loss of 90.1 MHz.



Measurement 5: Isolation - 800 KHz. of 90.1 MHz.



Measurement 6: Group Delay of 90.1 MHz.

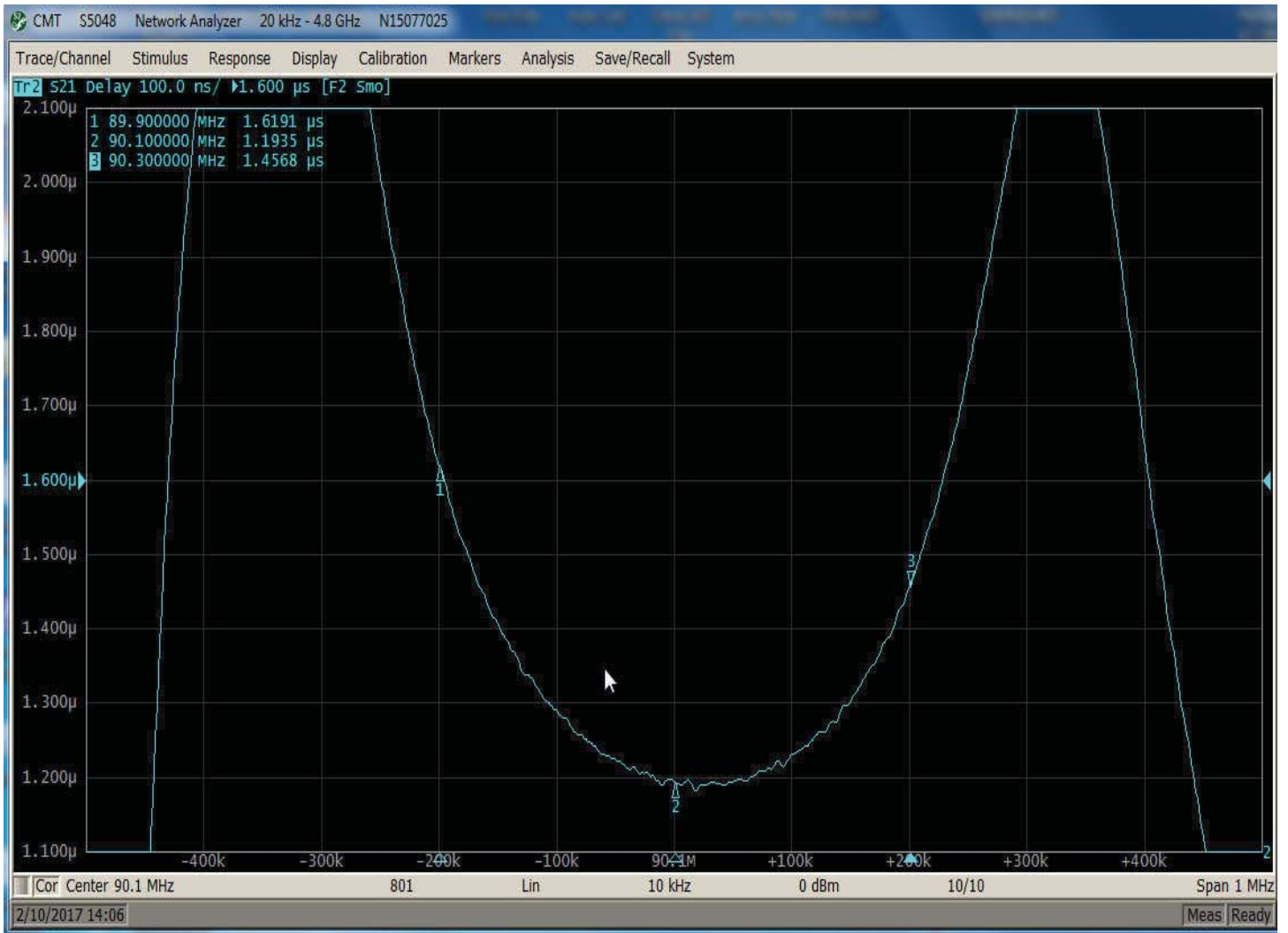


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Measurement 7: Port to Port Isolation 89.3 to 90.1 MHz.

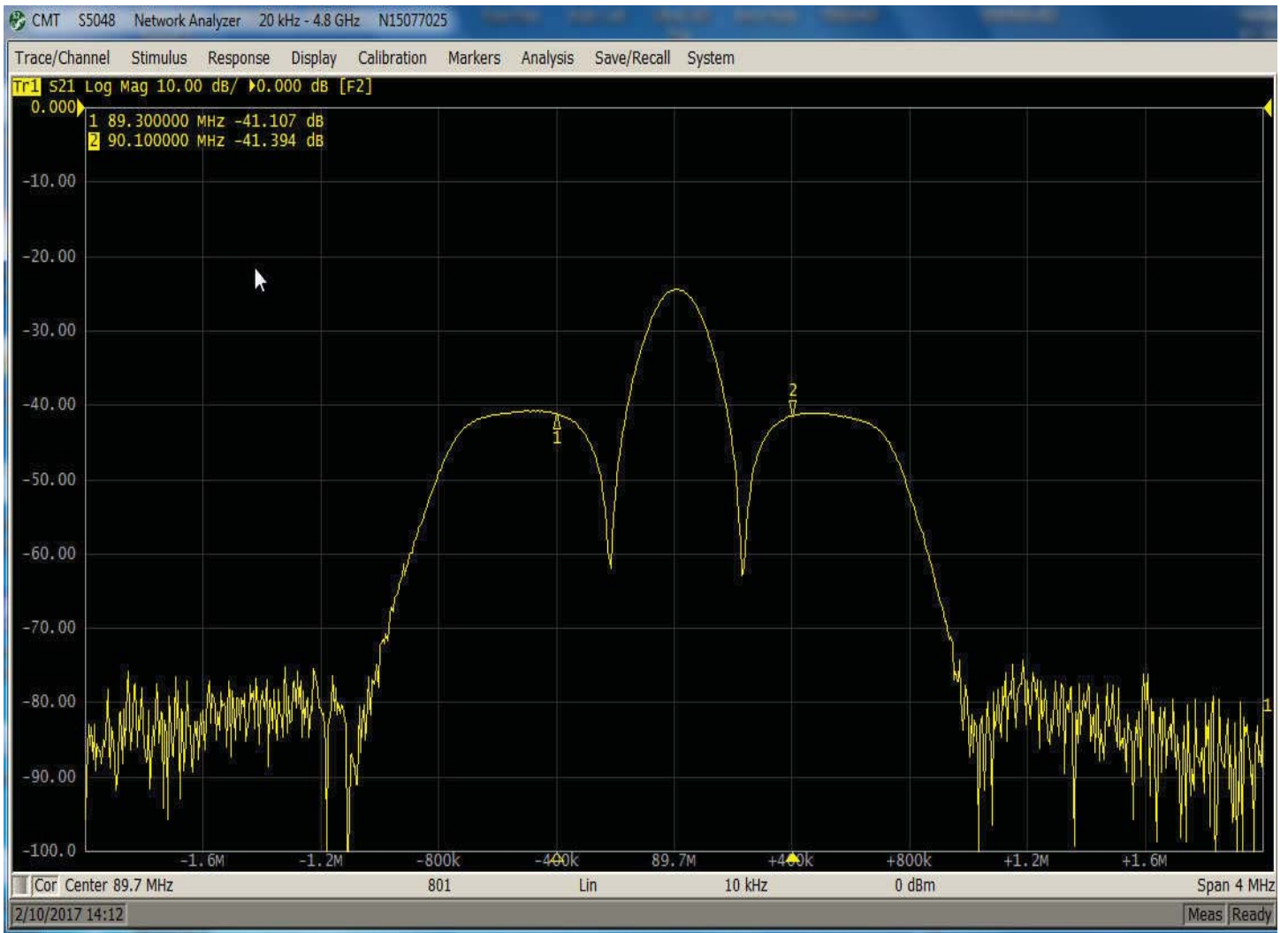


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Measurement 8: Narrow Sweep of Antenna and Feedline.

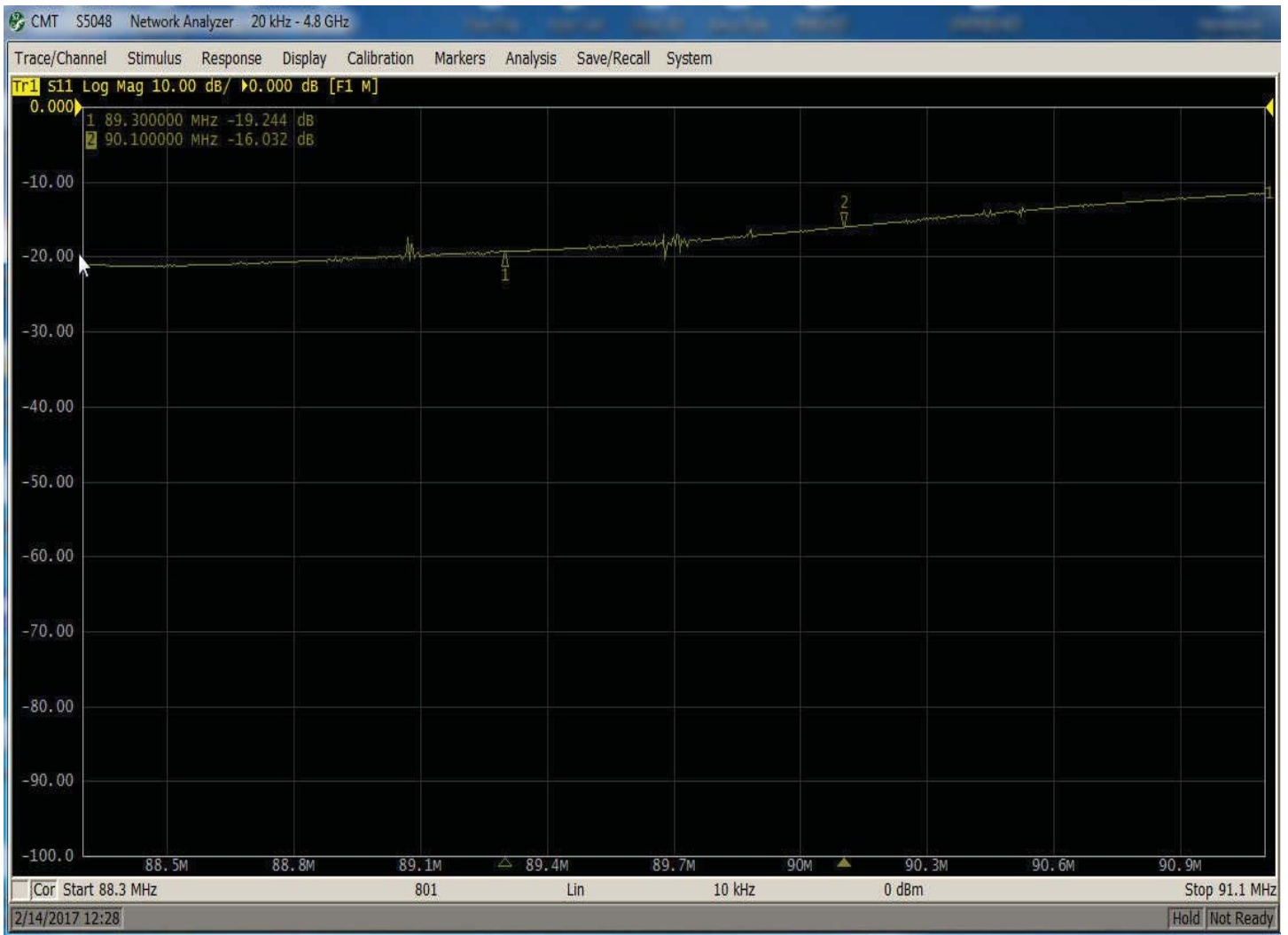


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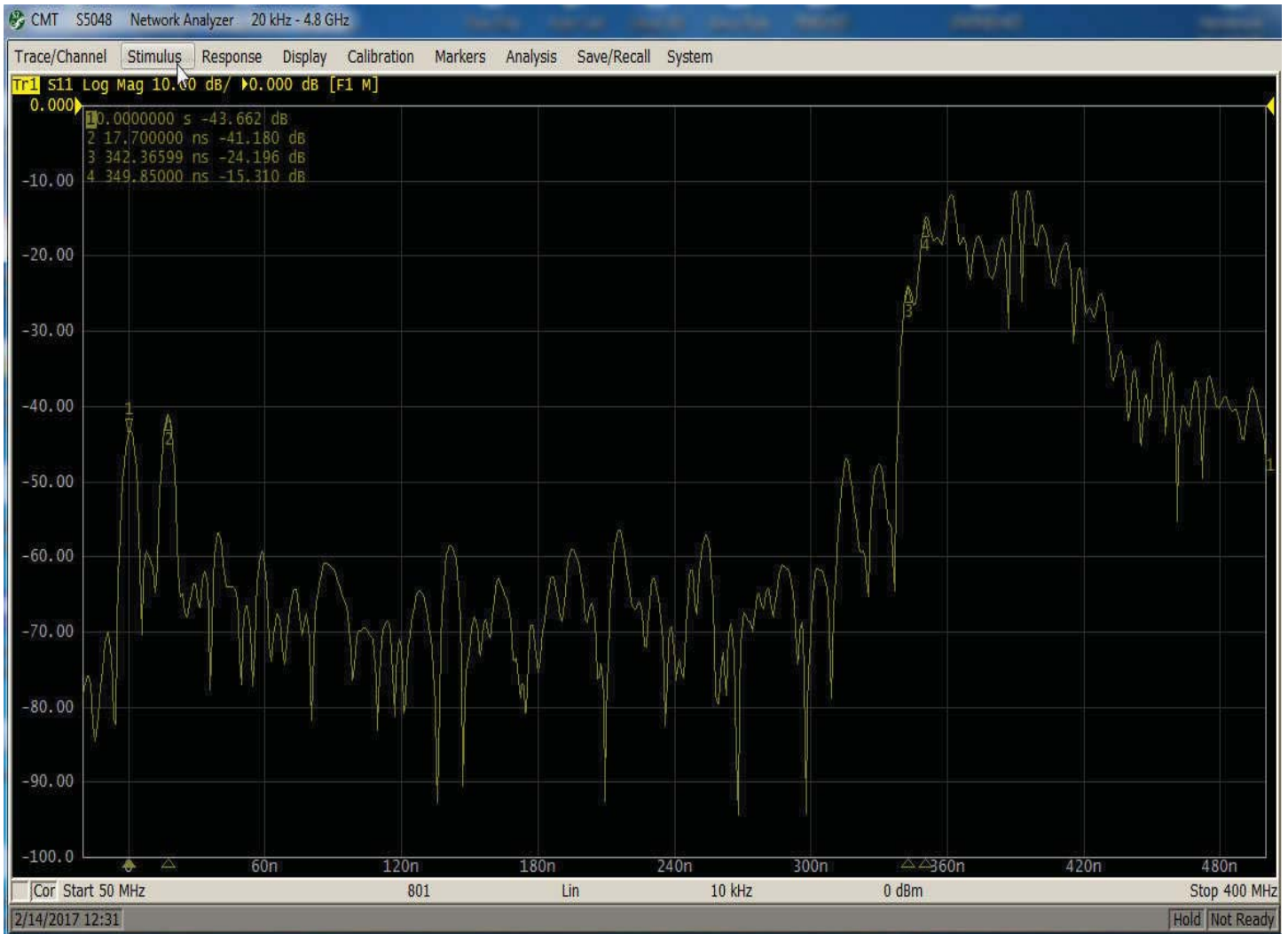
Measurement 9: 50 to 400 MHz. Sweep of Feedline with Antenna as a Load (TDR).

Mkr#1 is Test Transition @ 0 Feet.

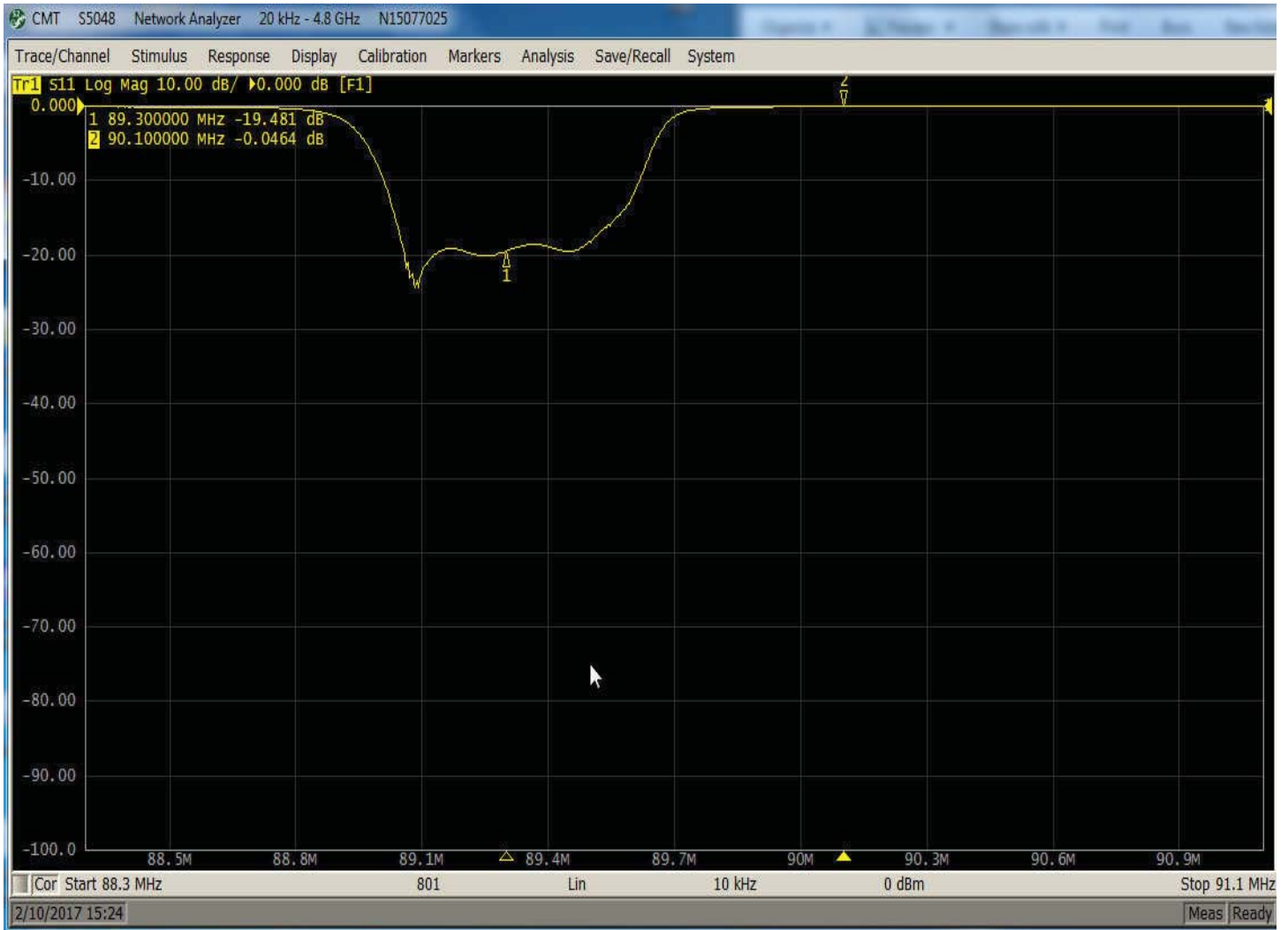
Mkr#2 is an impedance miss-match (bend in feedline) @ Approx 8 Feet.

Mkr#3 is the connector/antenna slug @ Approx 155 Feet.

Mkr#4 is the Antenna @ Approx 158 Feet.



Measurement 10: Filter to Antenna 89.3 MHz.



Measurement 11: Filter to Antenna 90.1 MHz.

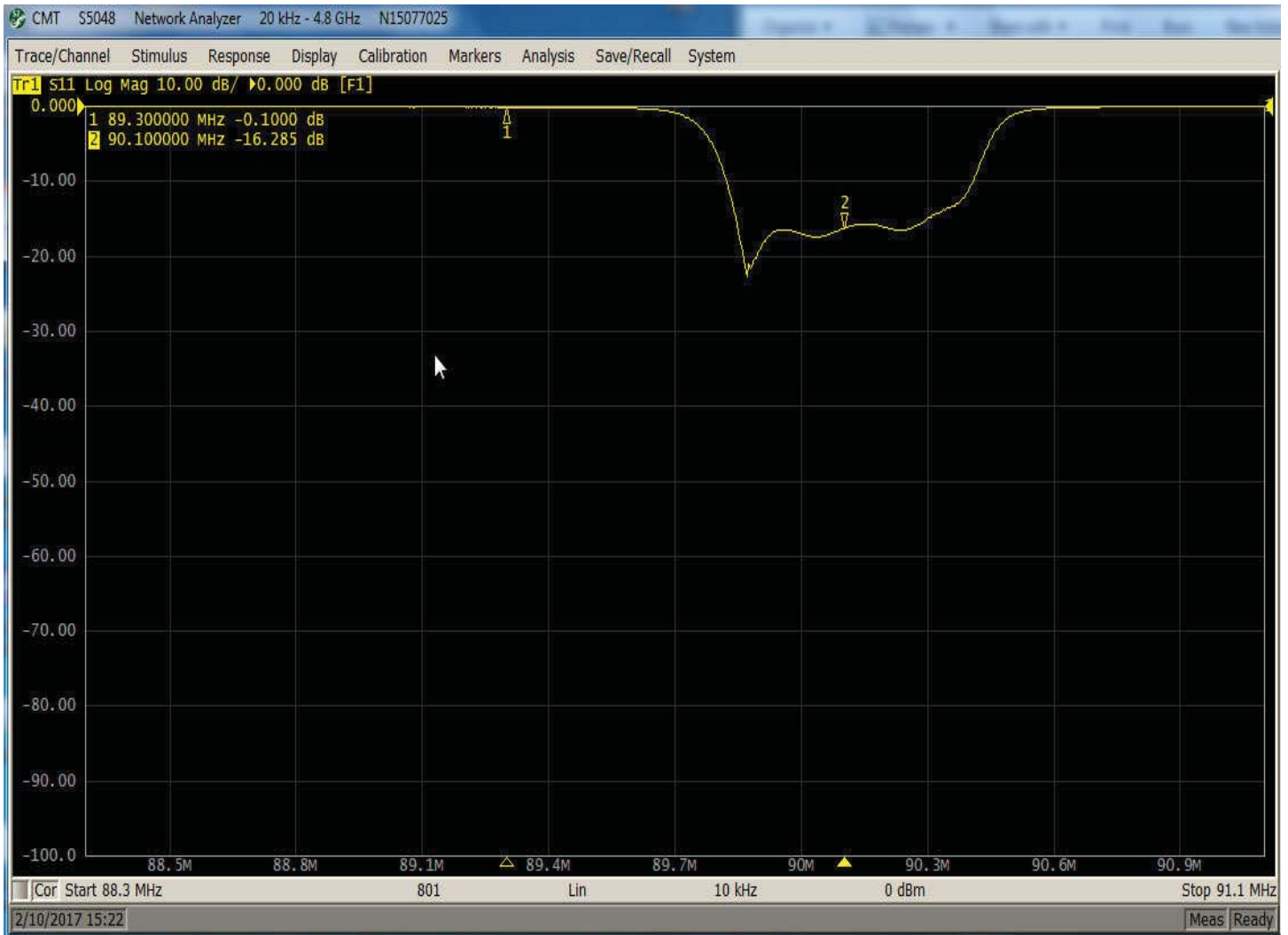


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Table 1: Loss Budget Table 89.3 & 90.1 MHz.

Preliminary Power Analysis

Antenna Model: LPX-4AC-SP

Analog

Call Letters:	WZCP (FM)	
Frequency:	89.3 MHz	
ERP:	2.1 kW	6.232 dBk
Polarization:	Circular	
Antenna Gain:	2.137 Numeric	3.298 dB
Antenna Input Power:	0.983 kW	2.934 dBk
Transmission Line Type - Vertical Run:	1-5/8-inch rigid line	
Vertical Run Length:	155 feet	
Vertical Run Attenuation:	0.191 dB/100-feet	
Transmission Line Type - Horizontal Run:	1-5/8-inch rigid line	
Horizontal Run Length:	0 feet	
Horizontal Run Attenuation:	0.191 dB/100-feet	
Line Loss:	-0.069 kW	0.296 dB
Line Efficiency:	93.410%	
Power Output from Combiner:	1.052 kW	3.085 dBk
Peak Voltage:	451 volts	
Combiner System Losses:	-0.088 kW	0.350 dBk
Transmitter Power Output:	1.140 kW	3.219 dBk

Analog

Call Letters:	WOHC (FM)	
Frequency:	90.1 MHz	
ERP:	7.0 kW	8.451 dBk
Polarization:	Circular	
Antenna Gain:	2.130 Numeric	3.284 dB
Antenna Input Power:	3.286 kW	2.934 dBk
Transmission Line Type - Vertical Run:	1-5/8-inch rigid line	
Vertical Run Length:	155 feet	
Vertical Run Attenuation:	0.192 dB/100-feet	
Transmission Line Type - Horizontal Run:	1-5/8-inch rigid line	
Horizontal Run Length:	0 feet	
Horizontal Run Attenuation:	0.192 dB/100-feet	
Line Loss:	-0.233 kW	0.298 dB
Line Efficiency:	93.377%	
Power Output from Combiner:	3.519 kW	3.085 dBk
Peak Voltage:	451 volts	
Combiner System Losses:	-0.295 kW	0.370 dBk
Transmitter Power Output:	3.815 kW	3.219 dBk

Figure 3: Vertical Plane Relative Plot 89.3 MHz.

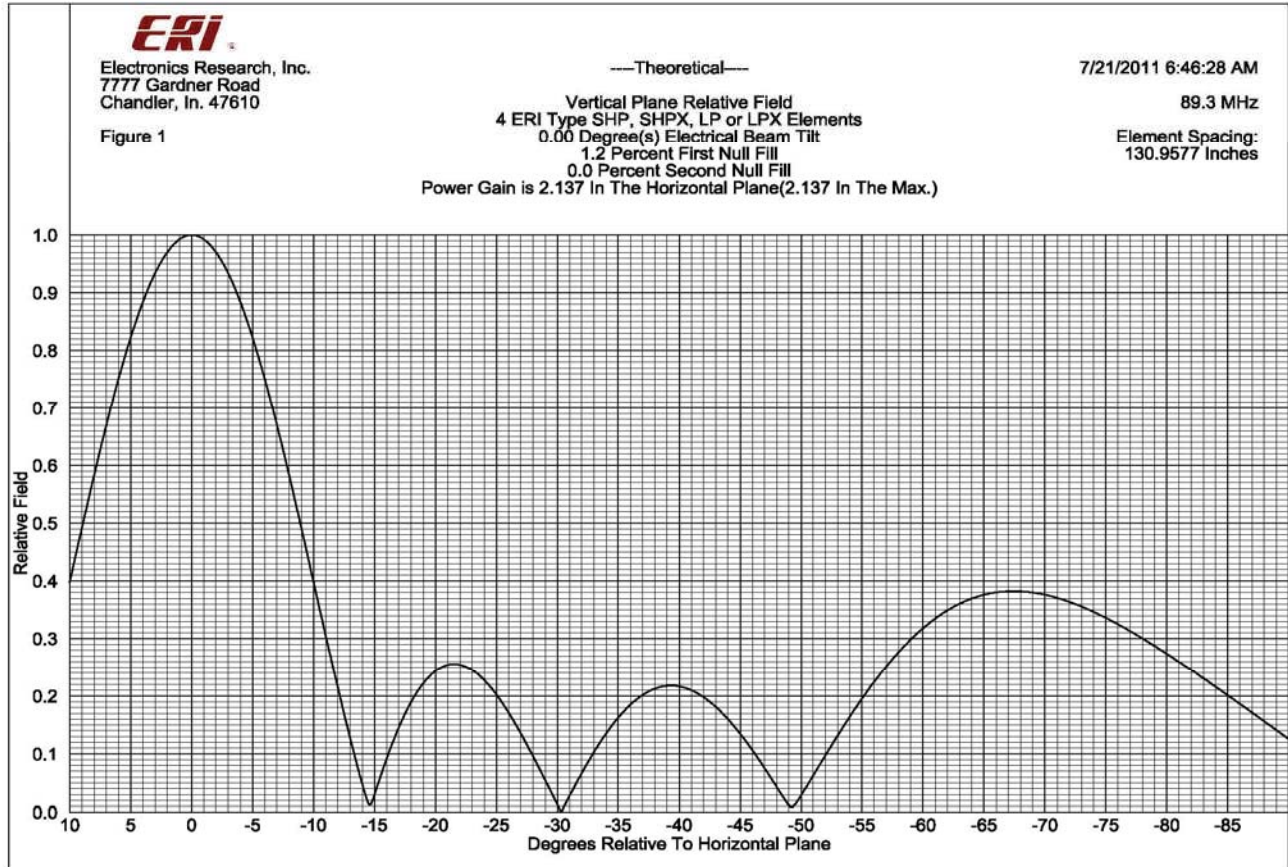


Figure 4: Vertical Plane Relative Field Plot 90.1 MHz.

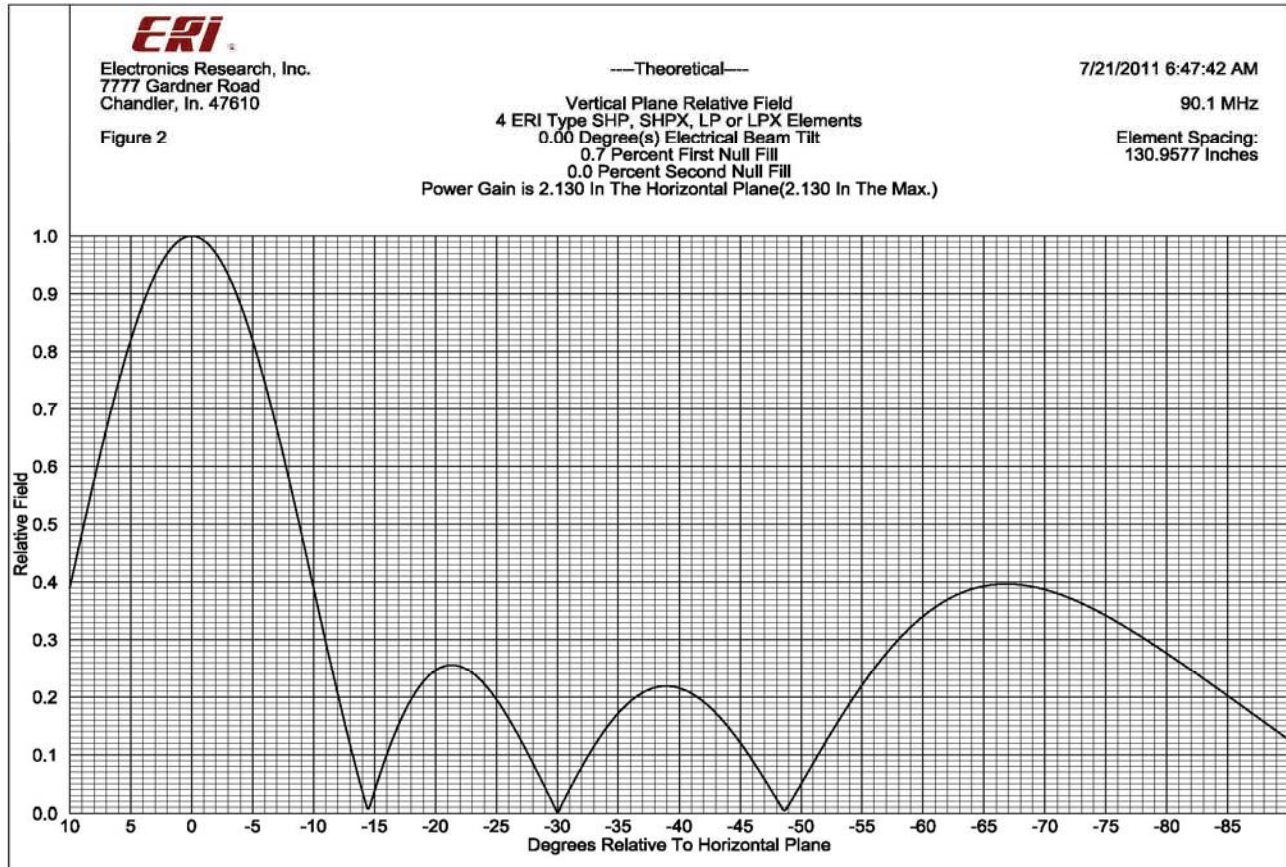


Photo 1: Combiner Layout.



Photo 2: Damaged Loop Adjustment.

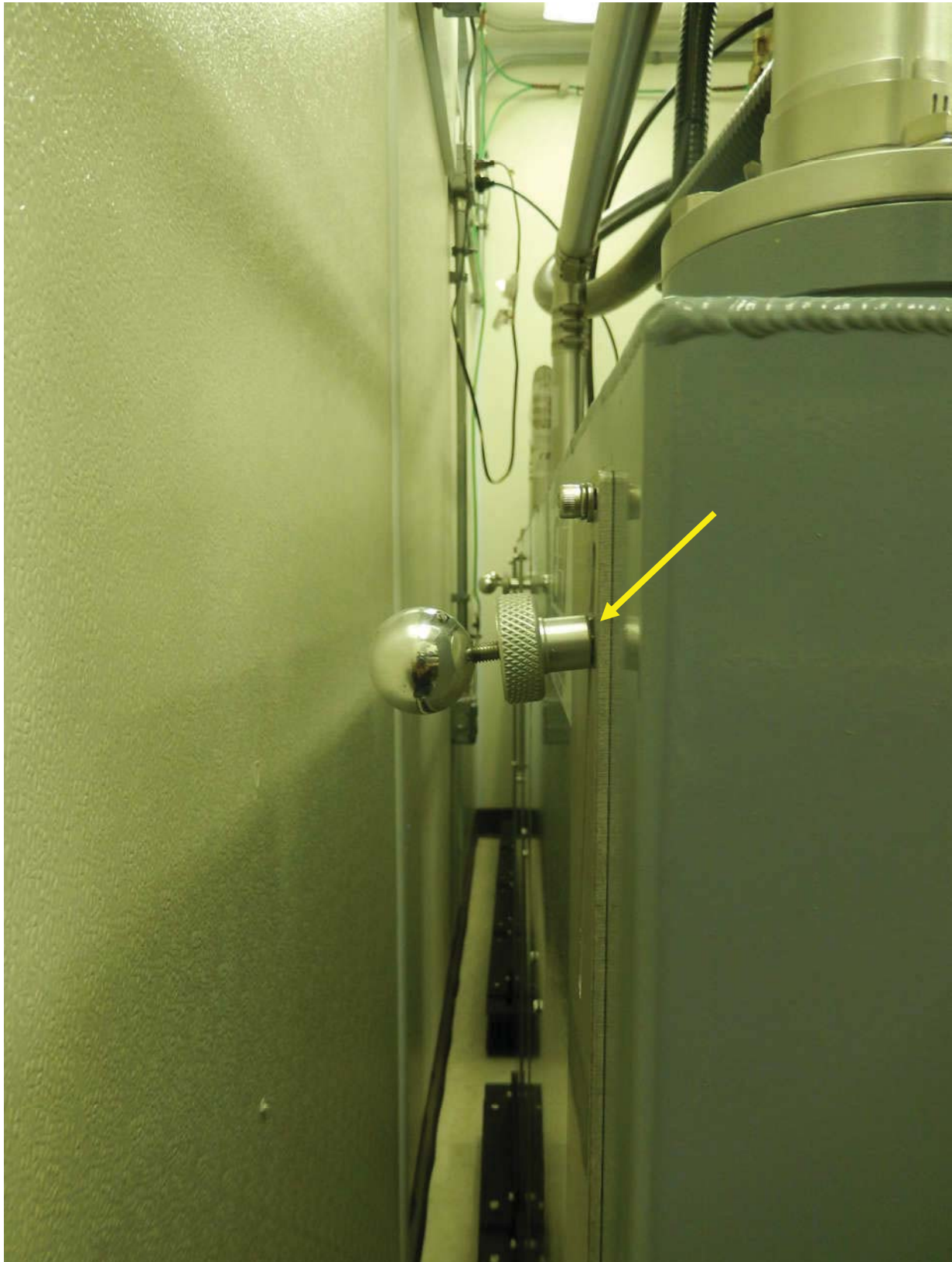


Photo 3: Un-insulated Guy Wire.

