

Field Service Report Feedline and Antenna System

Hazelwood, MO.
WHHL Broadcast Facility
ERI Antenna: SHPX-6AE-HW-DA
Feedline: RFS HCA300J 530 Feet

WHHL – 104.1 MHz.

ERI Project # 34347H

November 13, 2023

Submitted By:

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INTRODUCTION

Listed below is a summary of the data and attached are the plots collected from the WHHL transmission site in St. Louis, MO. by Jeff Taylor, November 10, 2023.

- The antenna is an ERI SHPX-6AE-HW-DA.
- The feedline is RFS HCA300 Flex 530 Feet.
- Equipment used for feedline and antenna testing was a Rohde & Schwarz ZVL3 with amp.
- All measurements made on the 3 1/8" line at the output of the switch.

Site Address: 532 Debaliviere Ave.
St. Louis, MO. 63110

Attendees: Engineer ~ Aaron Cox
Electronics Research, Inc. ~ Jeff Taylor
Tower Service ~ Mike Lee Ultimate Tower

The reason for this Field Service Trip was to sweep the feedline and tune the antenna for 104.1 MHz.
Final Tune of the antenna was:

<u>Freq:</u>	<u>Return Loss</u>	<u>VSWR</u>
104.0 MHz.	-36.9 dB	1.02:1
104.1 MHz.	-45.3 dB	1.01:1
104.2 MHz.	-43.5 dB	1.01:1

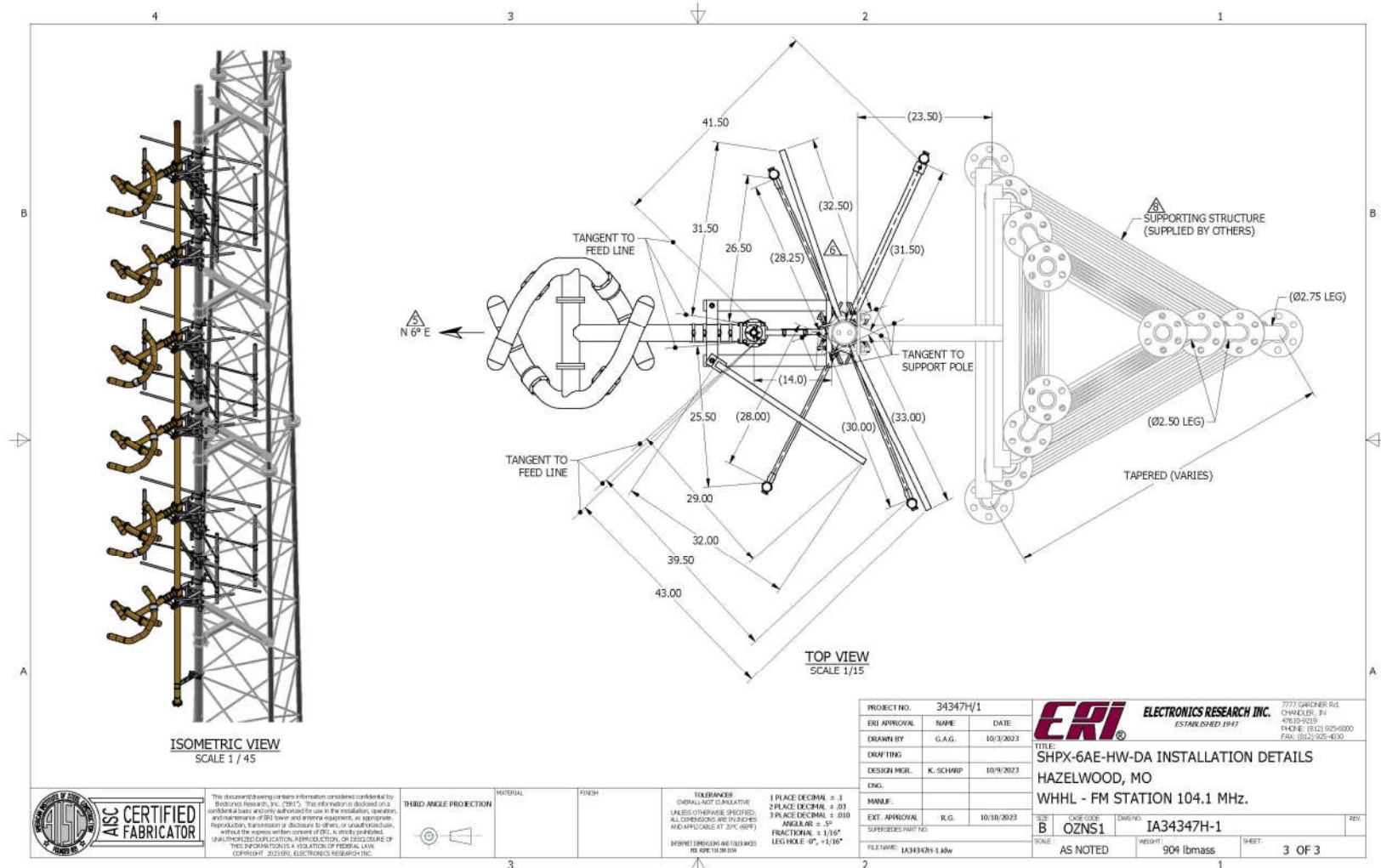
Final antenna with 3/4" slug @ 59 7/8" from bottom of inner to bottom of slug in the 6' matching section.
Feedline sweep with a 50-ohm load were no worse than 1.04:1 @ carrier on the 1 MHz. sweep.
Feedline sweeps were taken with the 50-ohm load on top of the RFS flex.

SUMMARY and RECOMMENDATIONS

All measurements taken by Jeff Taylor of Electronics Research, Inc. November 2023.

DRAWINGS

Figure 1: Antenna Drawing.



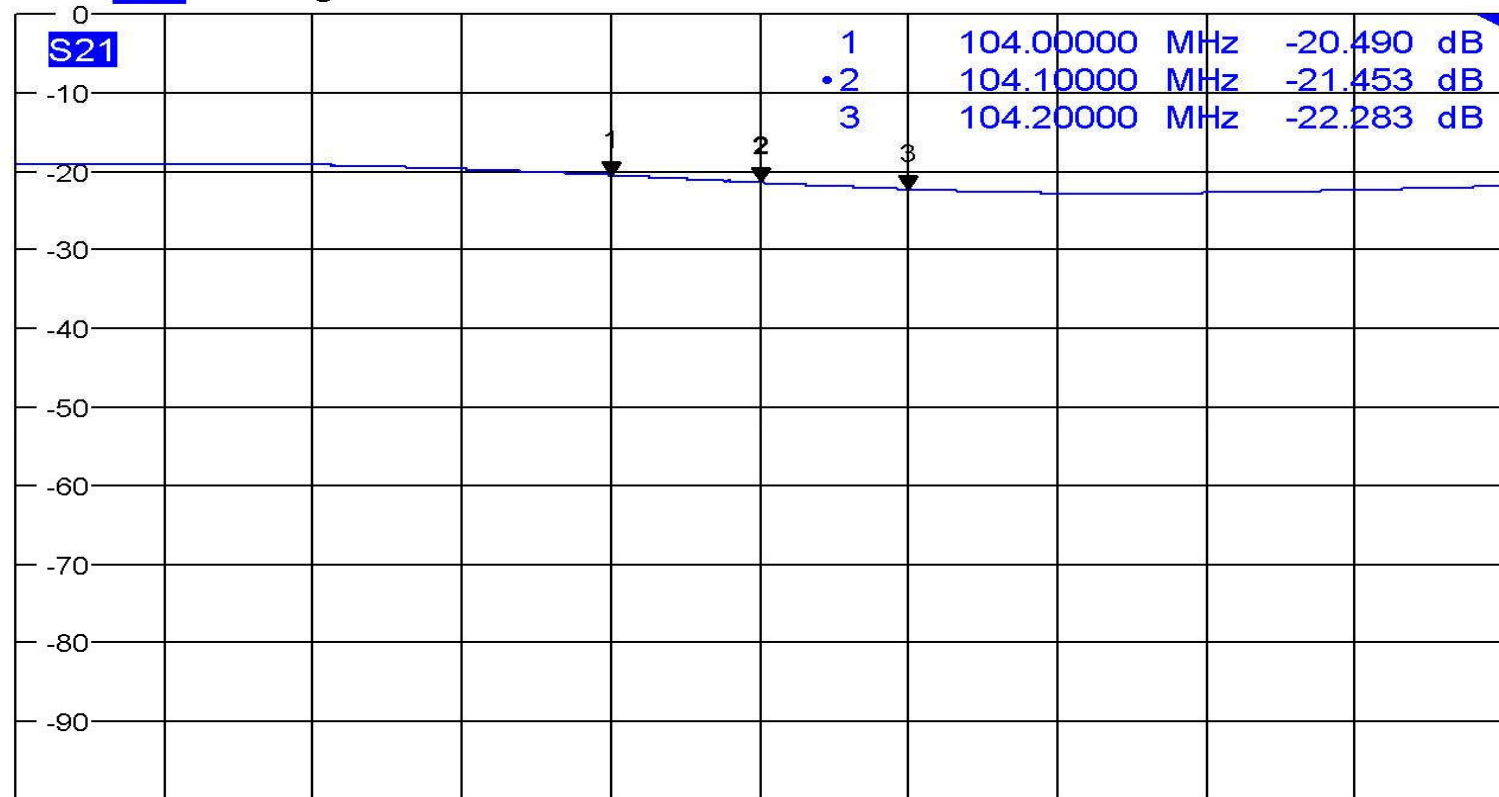
Measurement 1: 1 MHz Sweep of Antenna Before Tuning 104.1 MHz.

Return Loss Measurement.



Trc1 S21 dB Mag 10 dB / Ref 0 dB Cal Smo

1



Ch1 Center 104.1 MHz

Pwr -10 dBm

Span 1 MHz

Date: 10.NOV.2023 13:36:34

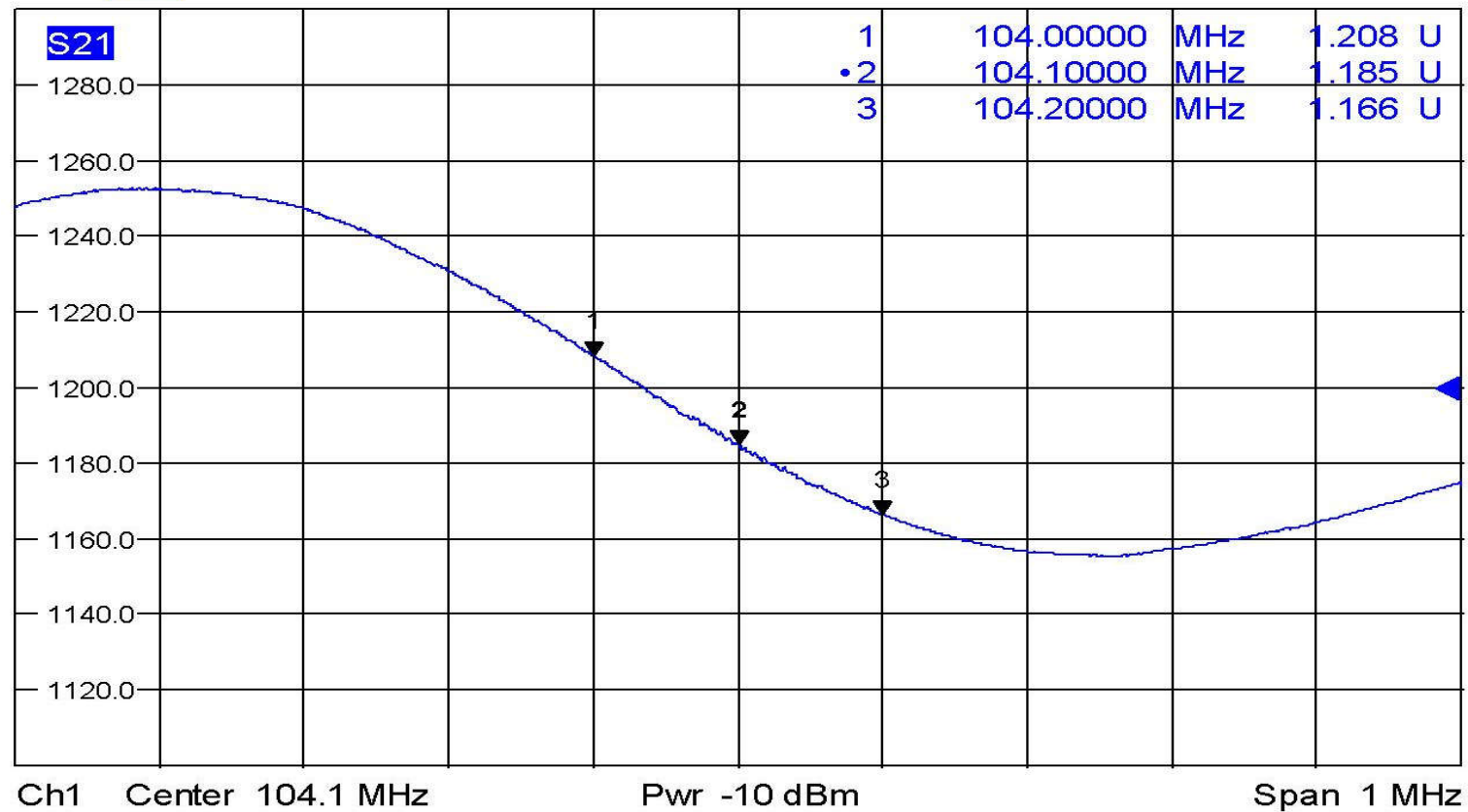
Measurement 2: 1 MHz Sweep of Antenna Before Tuning 104.1 MHz.

VSWR Measurement.



Trc1 **S21** SWR 20 mU/ Ref 1.2 U Cal Smo

1

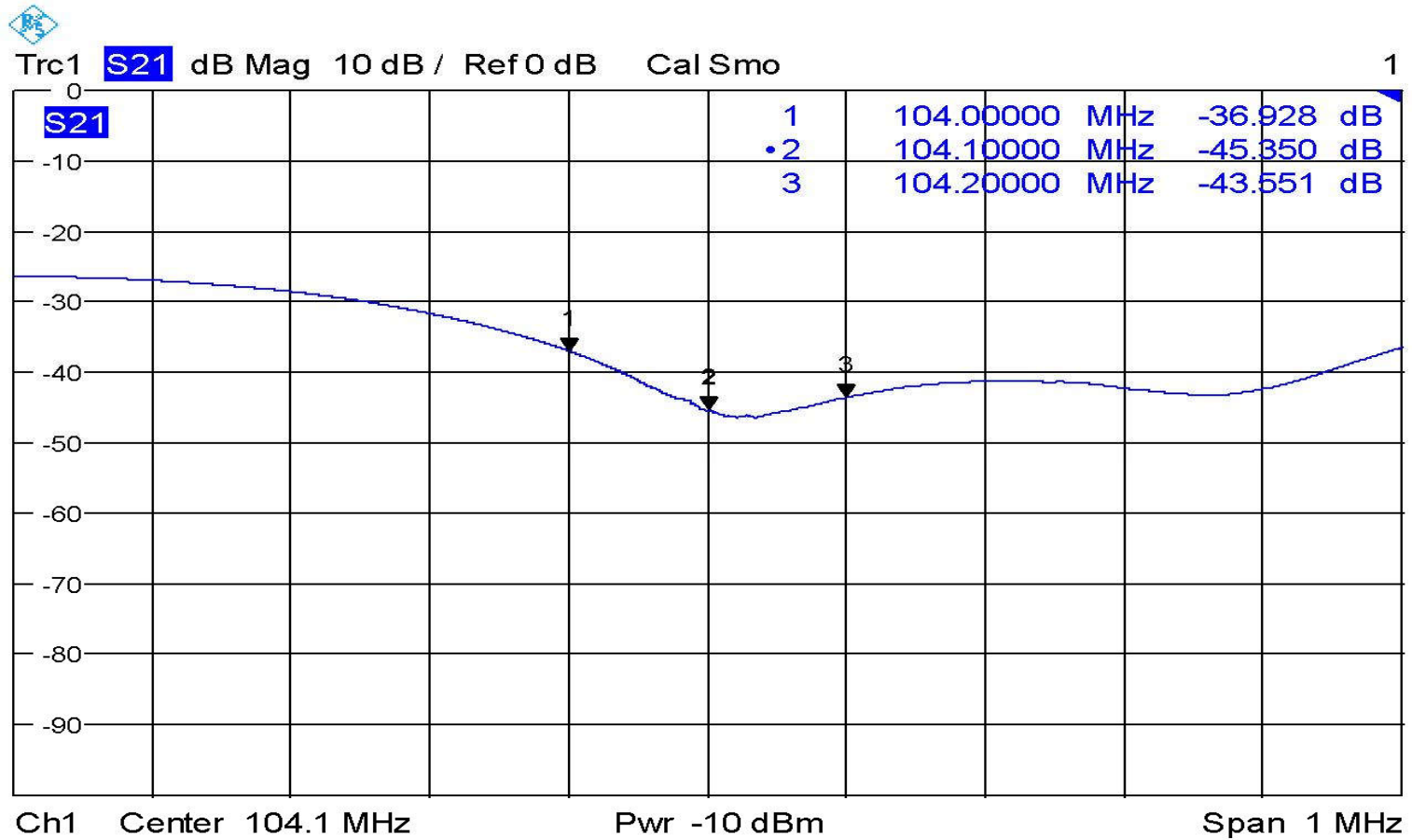


Date: 10.NOV.2023 13:36:55

Measurement 3: 1 MHz. Sweep of Antenna After Tuning 104.1 MHz.

Return Loss Measurement.

Final Antenna with 3/4" Slug @ 59 7/8" Bottom of Inner to Bottom of Slug in the 6' Matching Section.



Date: 10.NOV.2023 16:35:22

Measurement 4: 1 MHz. Sweep of Antenna After Tuning 104.1 MHz

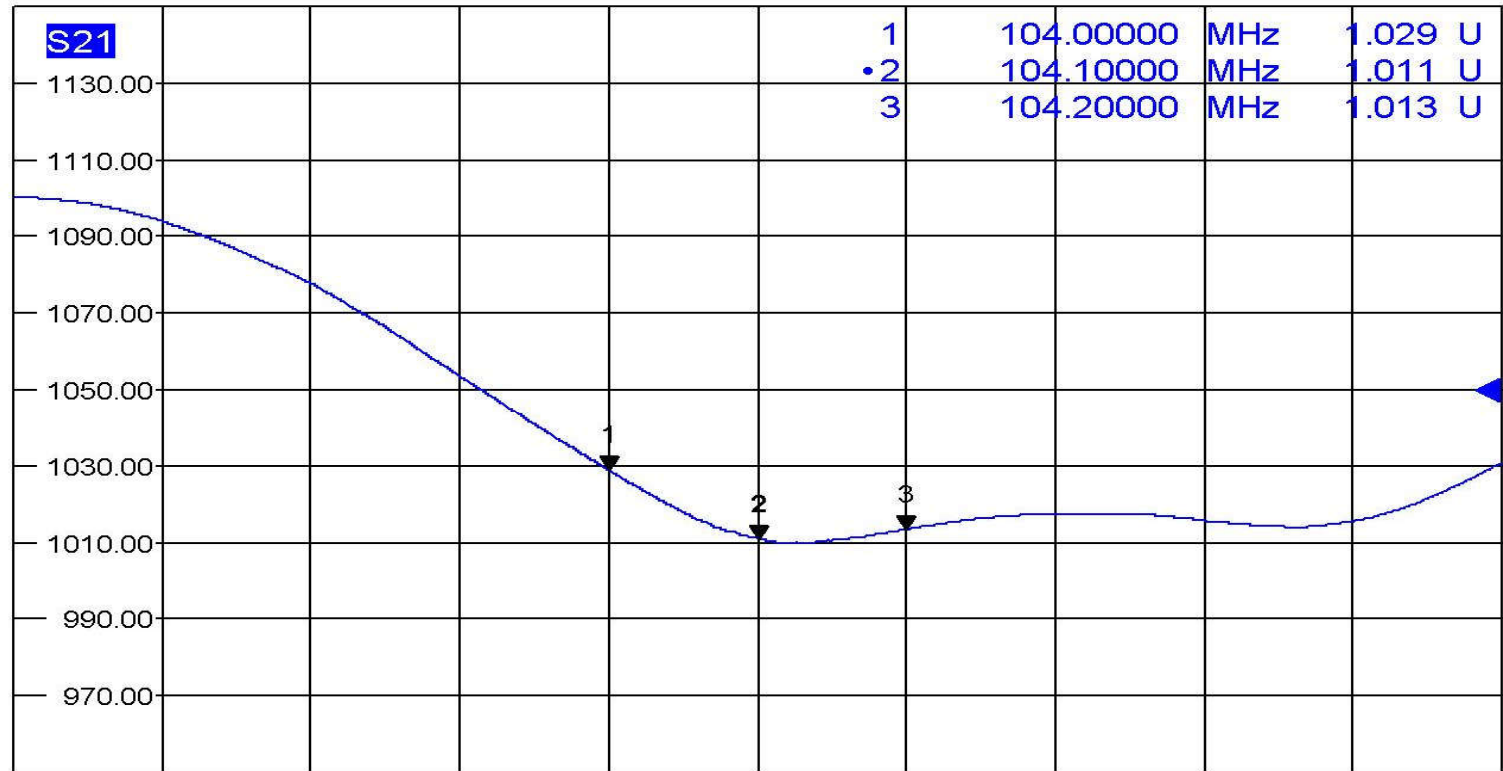
VSWR Measurement.

Final Antenna with 3/4" Slug @ 59 7/8" Bottom of Inner to Bottom of Slug in the 6' Matching Section.



Trc1 **S21** SWR 20 mU/ Ref 1.05 U Cal Smo

1



Ch1 Center 104.1 MHz

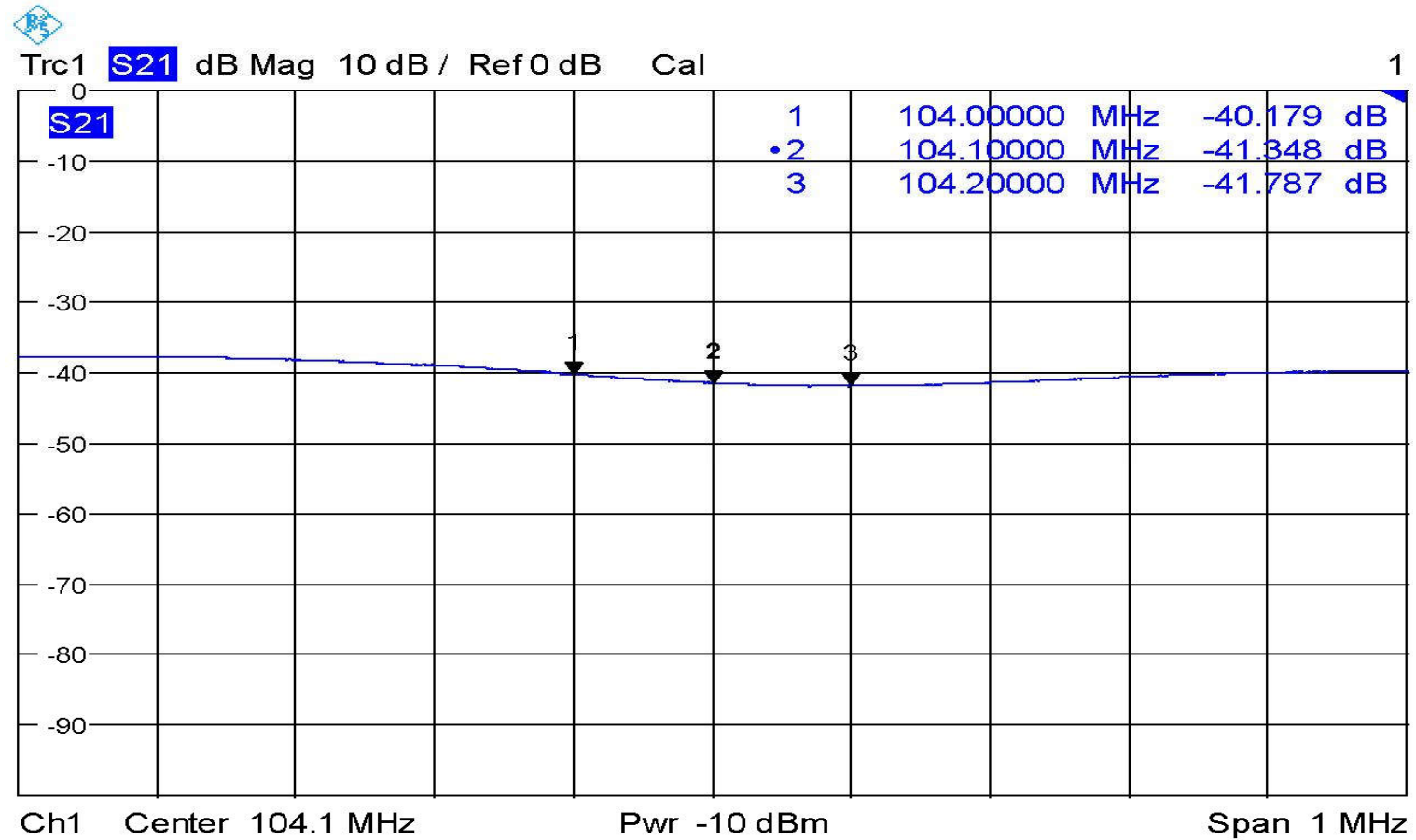
Pwr -10 dBm

Span 1 MHz

Date: 10.NOV.2023 16:35:42

Measurement 5: 1 MHz. Sweep of Feedline with 50-ohm Load.

Return Loss measurement.



Date: 10.NOV.2023 14:07:32

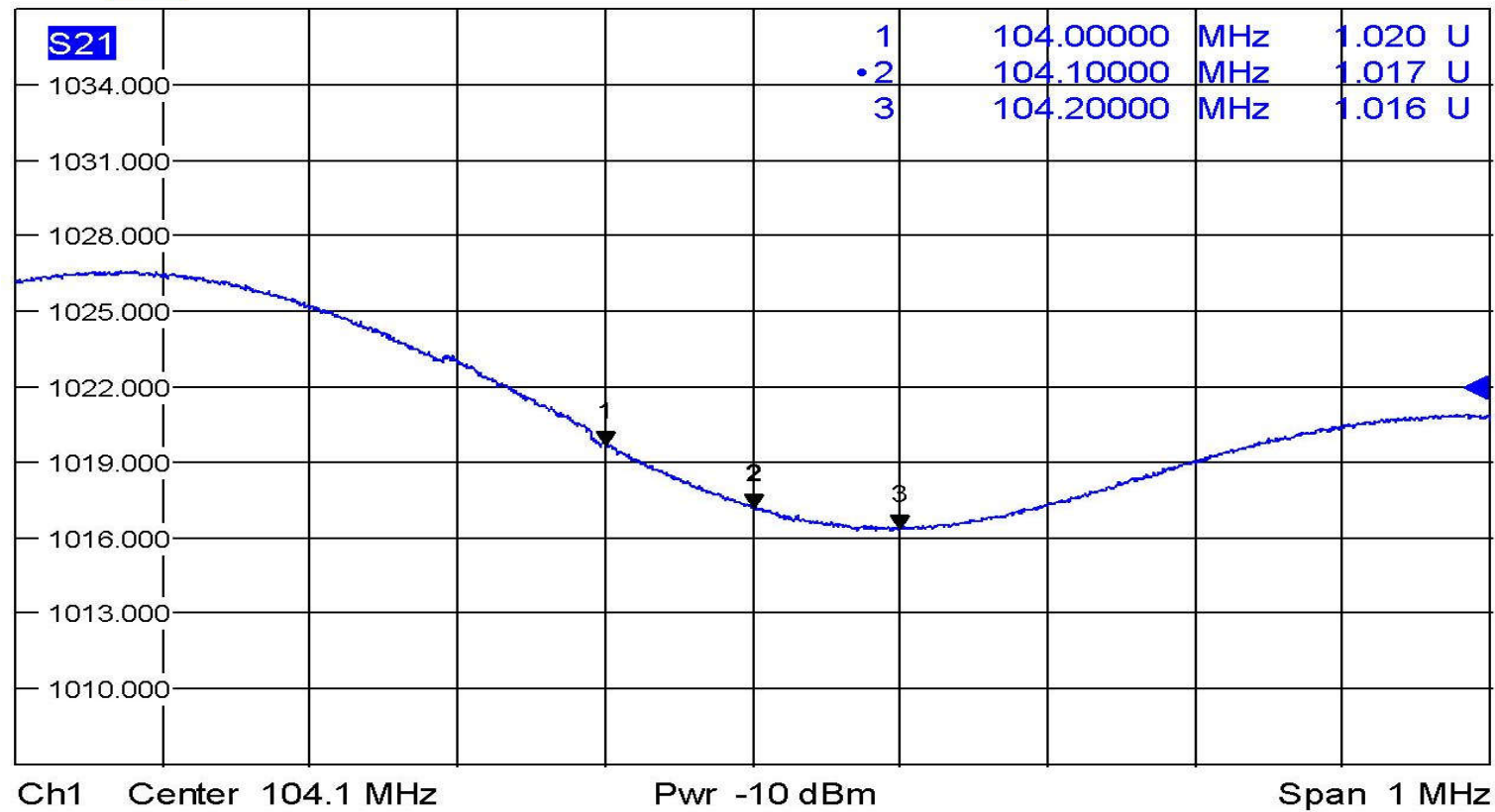
Measurement 6: 1 MHz. Sweep of Feedline with 50-ohm Load.

VSWR Measurement.



Trc1 S21 SWR 3 mU/ Ref 1.022 U Cal

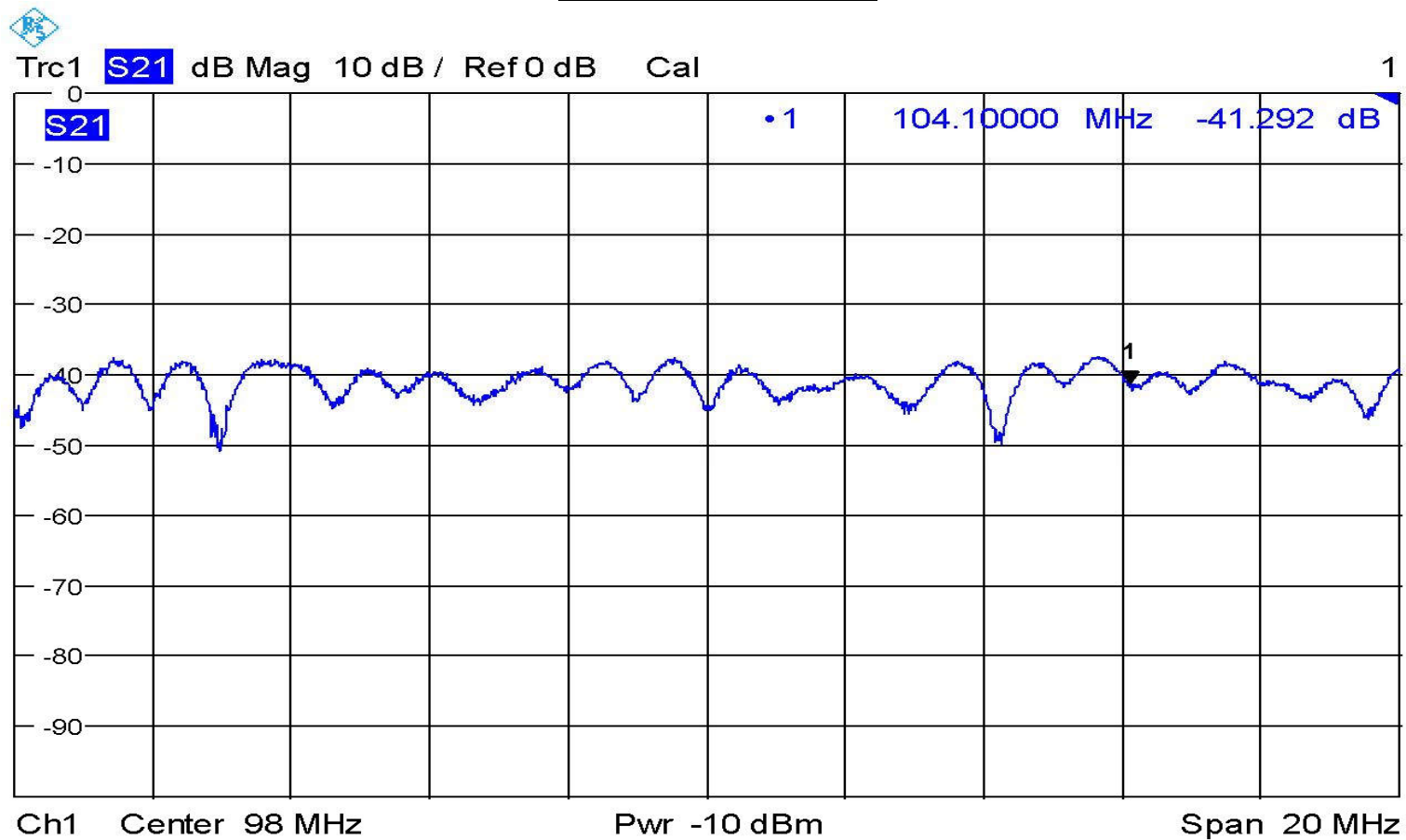
1



Date: 10.NOV.2023 14:08:09

Measurement 7: 88 to 108 MHz. Sweep of Feedline with 50-ohm Load.

Return Loss Measurement.



Date: 10.NOV.2023 14:10:49

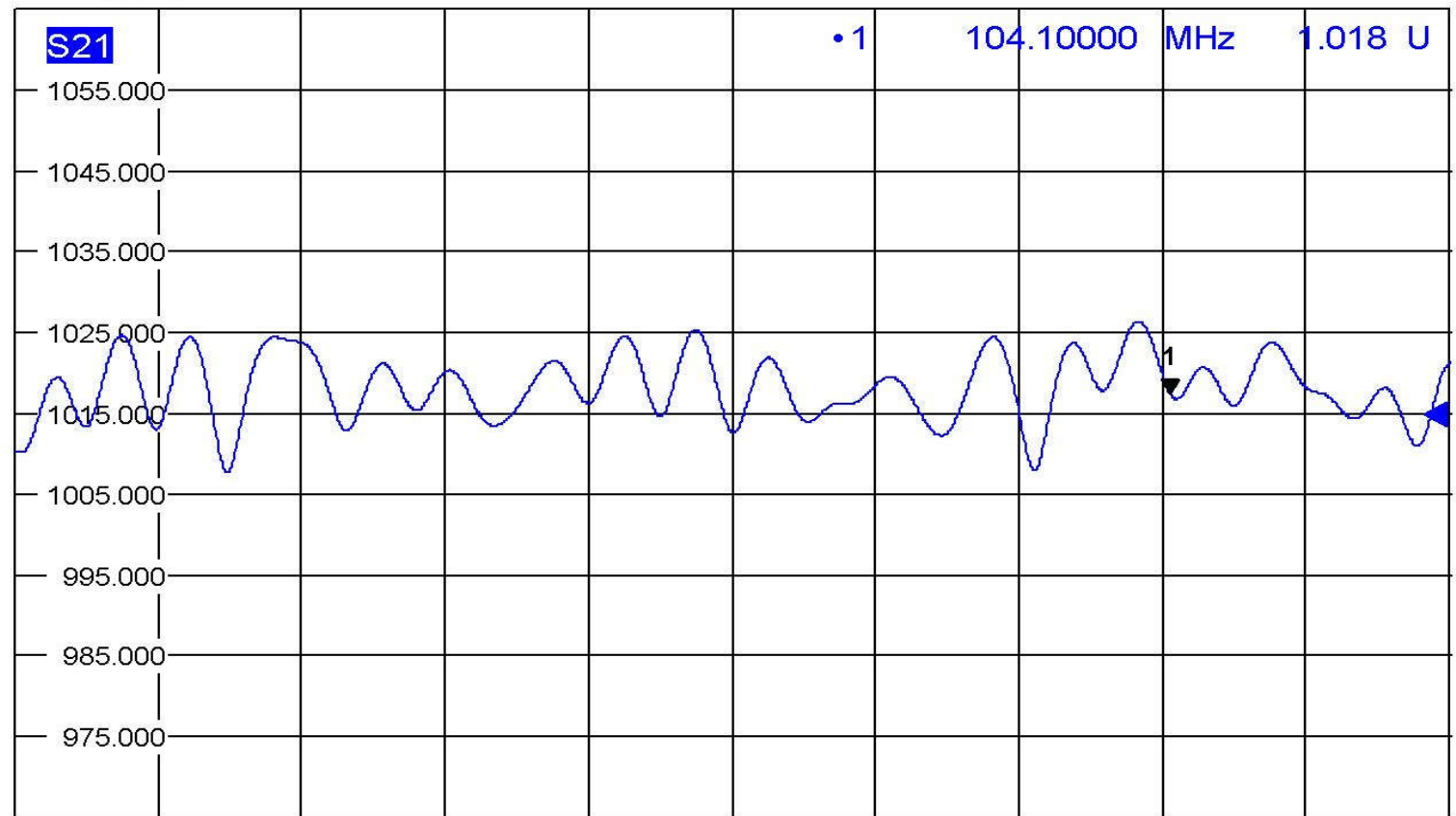
Measurement 8: 88 to 108 MHz. Sweep of Feedline with 50-ohm Load.

VSWR Measurement.



Trc1 **S21** SWR 10 mU/ Ref 1.015 U Cal Smo

1



Ch1 Center 98 MHz

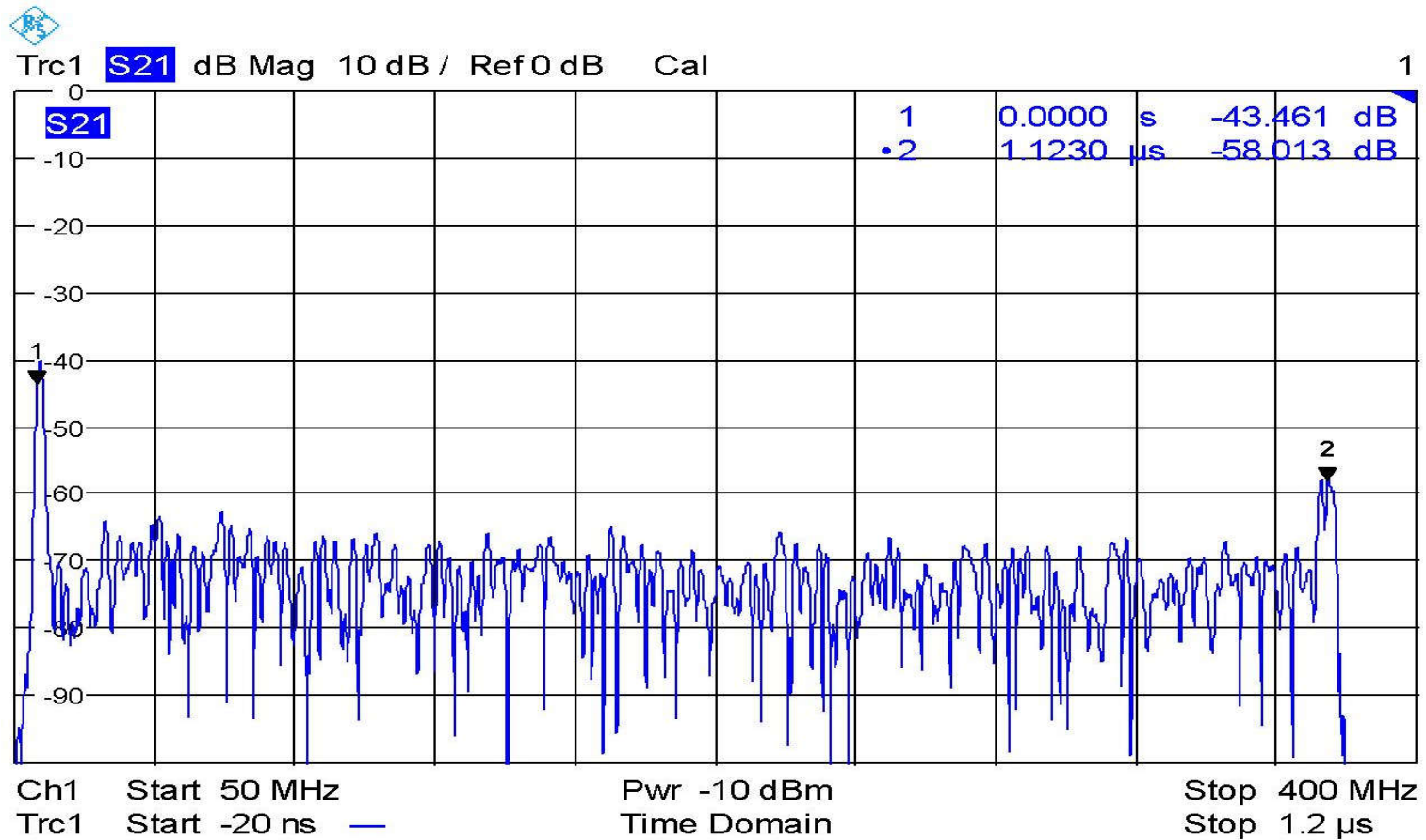
Pwr -10 dBm

Span 20 MHz

Date: 10.NOV.2023 14:11:25

Measurement 9: 50 to 400 MHz Sweep of Feedline with 50-ohm Load.

TDR Return Loss Measurement.
Mkr#1 is Test location @ Zero Feet.
Mkr#2 is the 50-ohm Load @ Approx. 530 Feet.



Date: 10.NOV.2023 14:14:18

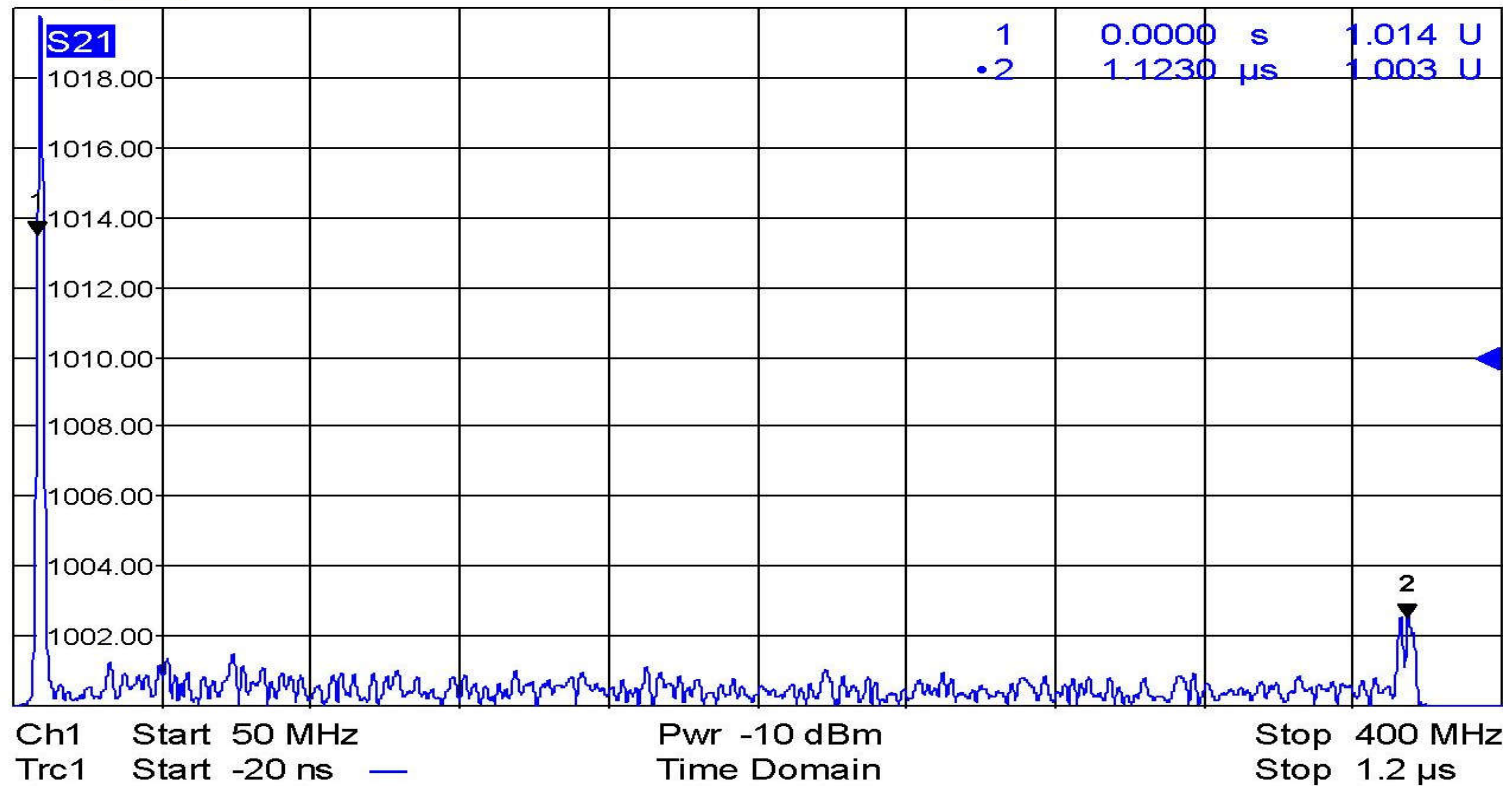
Measurement 10: 50 to 400 MHz Sweep of Feedline with 50-ohm Load.

TDR VSWR Measurement.
Mkr#1 is Test location @ Zero Feet.
Mkr#2 is the 50-ohm Load @ Approx. 530 Feet.



Trc1 S21 SWR 2 mU/ Ref 1.01 U Cal

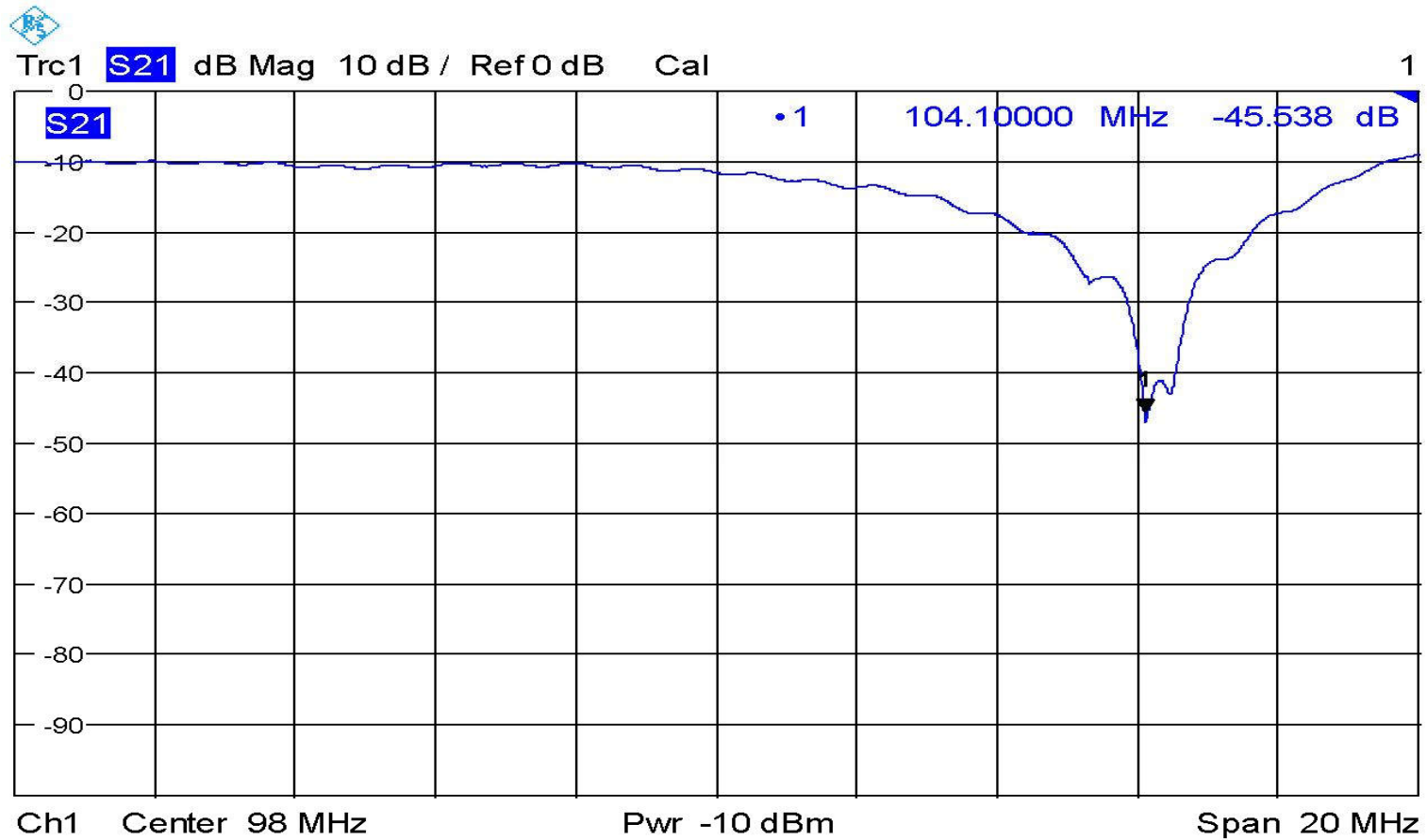
1



Date: 10.NOV.2023 14:14:33

Measurement 11: 88 to 108 MHz. Sweep of Feedline and Antenna After Tuning.

Return Loss Measurement.



Date: 10.NOV.2023 16:38:42

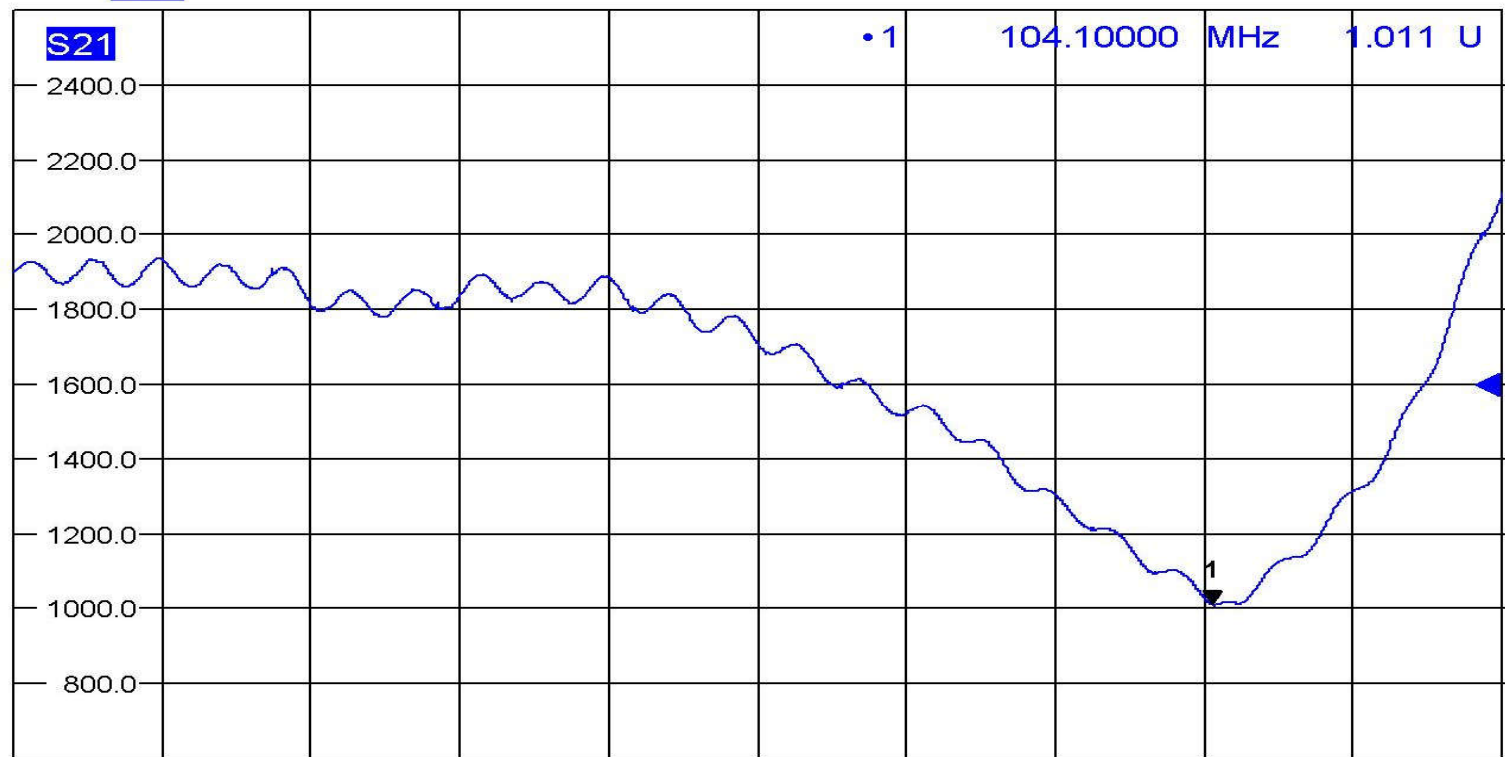
Measurement 12: 88 to 108 MHz. Sweep of Feedline and Antenna After Tuning.

VSWR Measurement.



Trc1 S21 SWR 200 mU/ Ref 1.6 U Cal

1



Ch1 Center 98 MHz

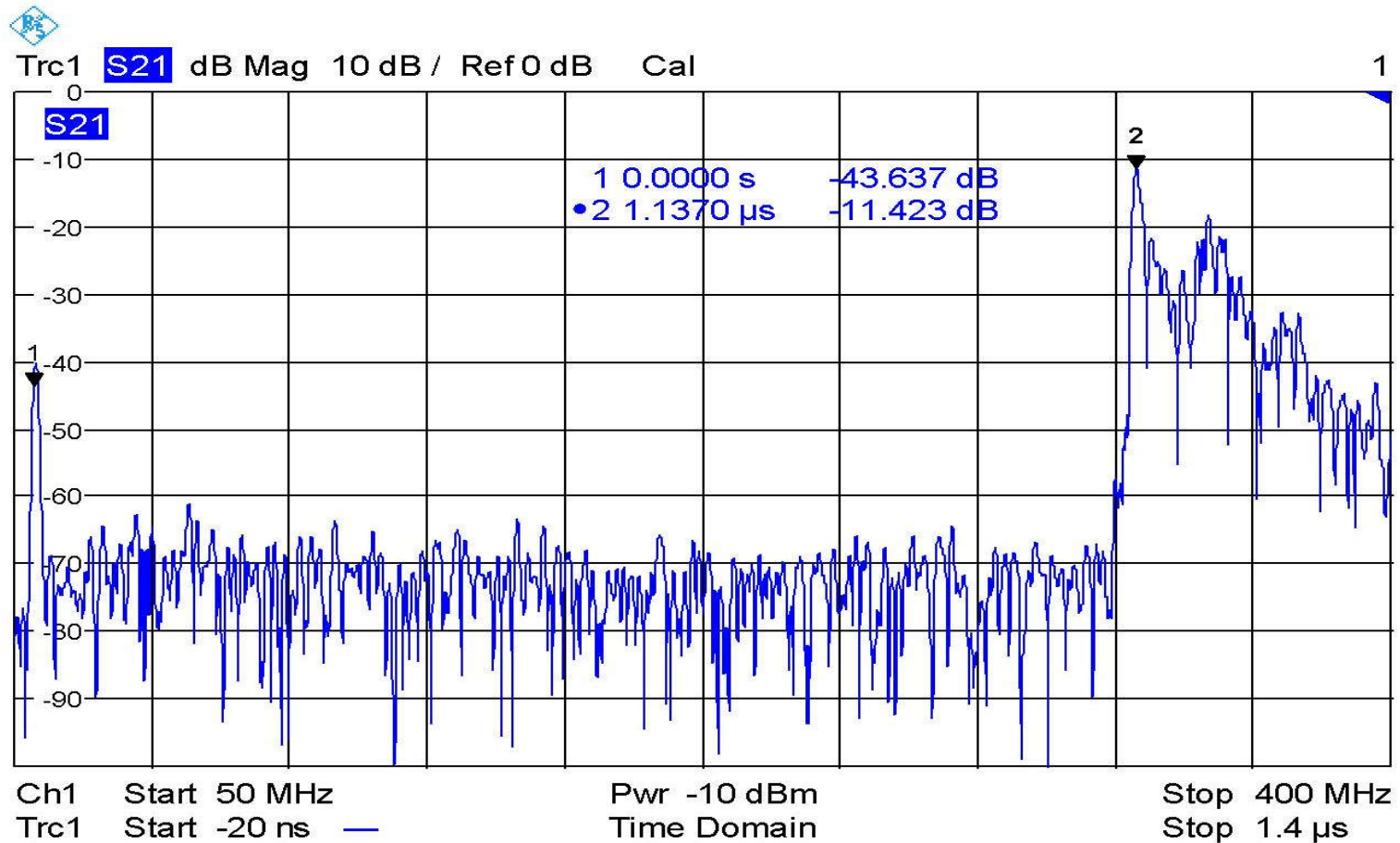
Pwr -10 dBm

Span 20 MHz

Date: 10.NOV.2023 16:39:07

Measurement 13: 50 to 400 MHz. Sweep of Feedline & Antenna After Tuning.

TDR Return Loss Measurement.
Mkr#1 is Test location @ Zero Feet.
Mkr#2 is the Center Feed of the Antenna @ Approx. 536 Feet.



Date: 10.NOV.2023 16:41:42

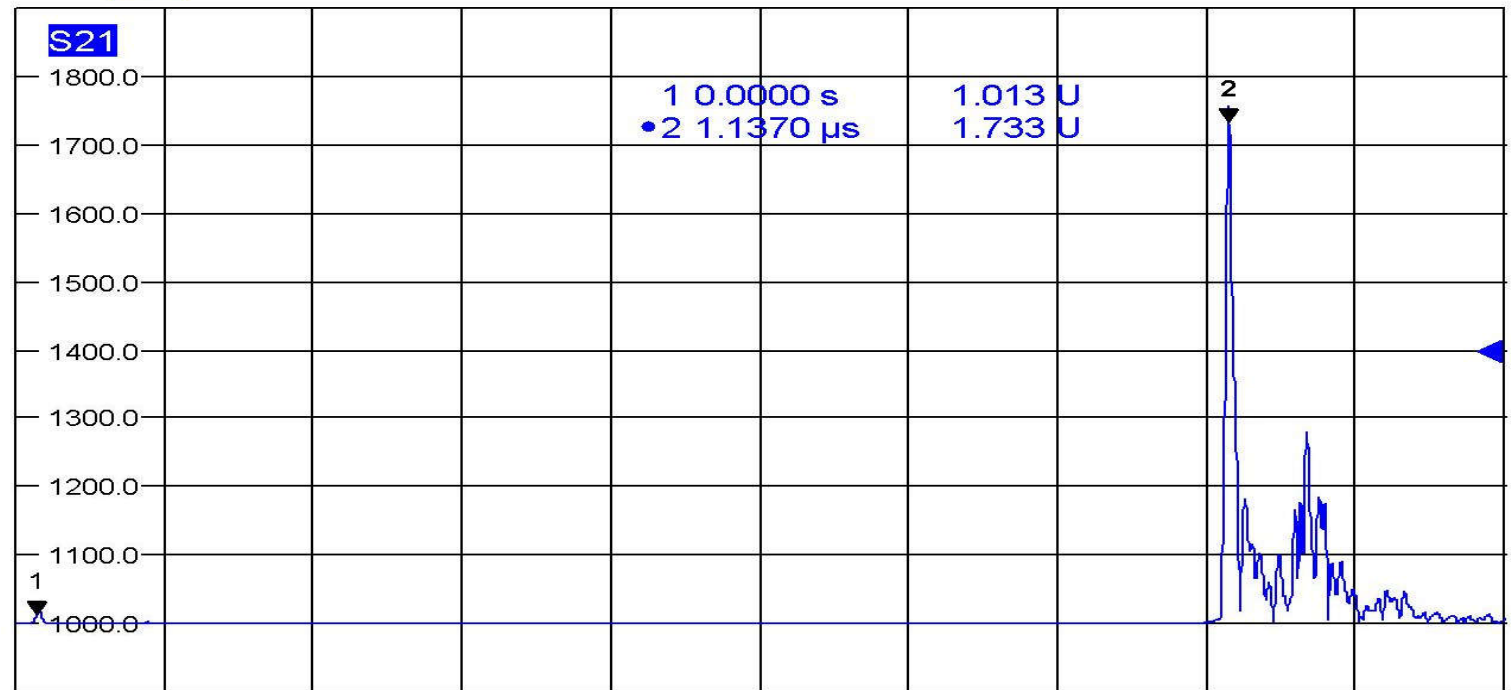
Measurement 14: 50 to 400 MHz. Sweep of Feedline & Antenna After Tuning.

TDR Return Loss Measurement.
Mkr#1 is Test location @ Zero Feet.
Mkr#2 is the Center Feed of the Antenna @ Approx. 536 Feet.



Trc1 **S21** SWR 100 mU/ Ref 1.4 U Cal

1



Ch1 Start 50 MHz
Trc1 Start -20 ns —

Pwr -10 dBm
Time Domain

Stop 400 MHz
Stop 1.4 μs

Date: 10.NOV.2023 16:41:58

Photo 1: Test Measurement Location.



Photo 2: Flex Outside the Transmitter Room.



Photo 3: Drip Loop at Tower Base for 95.5 and 104.1 MHz. Antennas.



Table 1: Power Analysis for 104.1 MHz.

Antenna Model:	SHPX-6AE-HW-DA	
	<i>Analog</i>	
Call Letters:	WHHL	
Frequency:	104.1 MHz	Channel 281
ERP:	50.000 kW	16.990 dBk
Polarization:	Circular	
Antenna RMS Gain:	2.974 Numeric	4.733 dB
Antenna Input Power:	16.812 kW	12.256 dBk
Peak Voltage:	1,297 volts	
Transmission Line Type - Vertical Run:	RFS HCA300	
Vertical Run Length:	530 feet	161.5 meters
Vertical Run Attenuation:	0.131 dB/100-feet	0.430 dB/100-meters
Transmission Line Type - Horizontal Run:	HCA33050J RFA	
Horizontal Run Length:	0 feet	0.0 meters
Horizontal Run Attenuation:	0.131 dB/100-feet	0.430 dB/100-meters
Line Loss:	-2.915 kW	0.694 dB
Line Efficiency:	85.226%	
Power Output from Combiner:	19.727 kW	12.951 dBk
Peak Voltage:	1,405 volts	
Combiner Losses:	0.000 kW	0.000 dB
Transmitter Power Output:	19.727 kW	12.951 dBk