



**SYSTEM FIELD REPORT
TRANSMISSION LINE AND ANTENNA**

**Radio Station WSCI-FM
Charleston, SC
89.3 MHz**

Antenna Type: Dielectric
Antenna Model: DCRM10CFE68RDT100F10
Transmission Line: Dielectric 4 $\frac{1}{16}$ " rigid transmission line
Line Length: Approximately 1510 ft. in Length
Line Section Lengths: 20 foot

Prepared for:
Dielectric Communications

Date of Service: September 30, 2016

By:

David N. Demos

Introduction

Antenna System Report

The following engineering statement and attached exhibits have been prepared for Dielectric Communications, and contain data and information regarding the check-out of the WSCI existing transmission line and new antenna in Charleston, SC.

All data contained in this report was acquired through the use of a Copper Mountain S5048 Vector Network Analyzer. This analyzer was calibrated on site according to the manufacturer's instructions for use at the frequency ranges of interest. In order to minimize the effects of the short test cable that was used, the calibration was performed using female standards connected at the far end of this cable. In order to present the most accurate data with the highest resolution possible, the network analyzer was operated in 1601-point mode. The velocity factor of 1.0 was entered into the VNA for the time domain measurements.

Measurements of the system were made using the unoptimized 4 $\frac{1}{16}$ " to type N adapter located on the unused port of the patch panel.

Observations and Conclusions

The FM antenna is side mounted approximately 2/3rds up a tall tower located on flat terrain. Numerous other broadcast antennas were noted on the tower. The line run from the ice bridge out is Dielectric 4 1/16" unbolt line. The line in the building including a short distance outside, up to the EIA to unbolt adapter, is Myat 4 1/16" line. Initial wideband time domain sweeps indicated two anomalies in the horizontal run. Investigation revealed that the first anomaly, located near the gas stop, to have a pinched o-ring and a bad solder joint on a soft solder flange. The flange was resoldered and the o-ring replaced. The second anomaly was located at the fourth elbow. The unbolt elbow electrical contact face was contaminated with oil and debris. The elbow was replaced with a good used elbow. Another pinched o-ring was found on the attached EIA to unbolt adapter, this o-ring was also replaced. The line run from the gas stop to the fourth elbow was cleaned to remove oil residue. There were also visual indications of a previous burn, some sooting, and minor corrosion. The line and antenna was purged with dry nitrogen gas and pressurized with nitrogen to around 4 psi once the installation was completed.

A standard oil lubricated air compressor is being used to pressurize the transmission line. From station personnel, it was learned that this compressor was initially plumbed into the proper dehydrator unit in an attempt to increase the units flow capacity as the old antenna has numerous leaks. The oil vapor quickly saturated the desiccant towers and subsequently contaminated the line with oil and oil vapor along with moisture. The compressor has since been removed from the dehydrator and plumbed into the transmission line using an external oil separator and two non regenerating desiccant packs. It has to be emphasized that oil lubricated compressors should not be used for transmission line pressurization. Failure of the complete removal of oil vapor and moisture will eventually incur costly repairs and possibly transmission line or antenna failure. With the new antenna installed, the transmission line and antenna should only be pressurized with dry nitrogen gas or a properly functioning dehydrator built for such use and properly sized for the system.

Several soft solder field flanges were noted to be installed outdoors. Factory cut pieces or hard silver solder flanges are the preferred types to be used outdoors to make up non standard lengths.

The variable transformer located near the antenna input was optimized during the checkout.

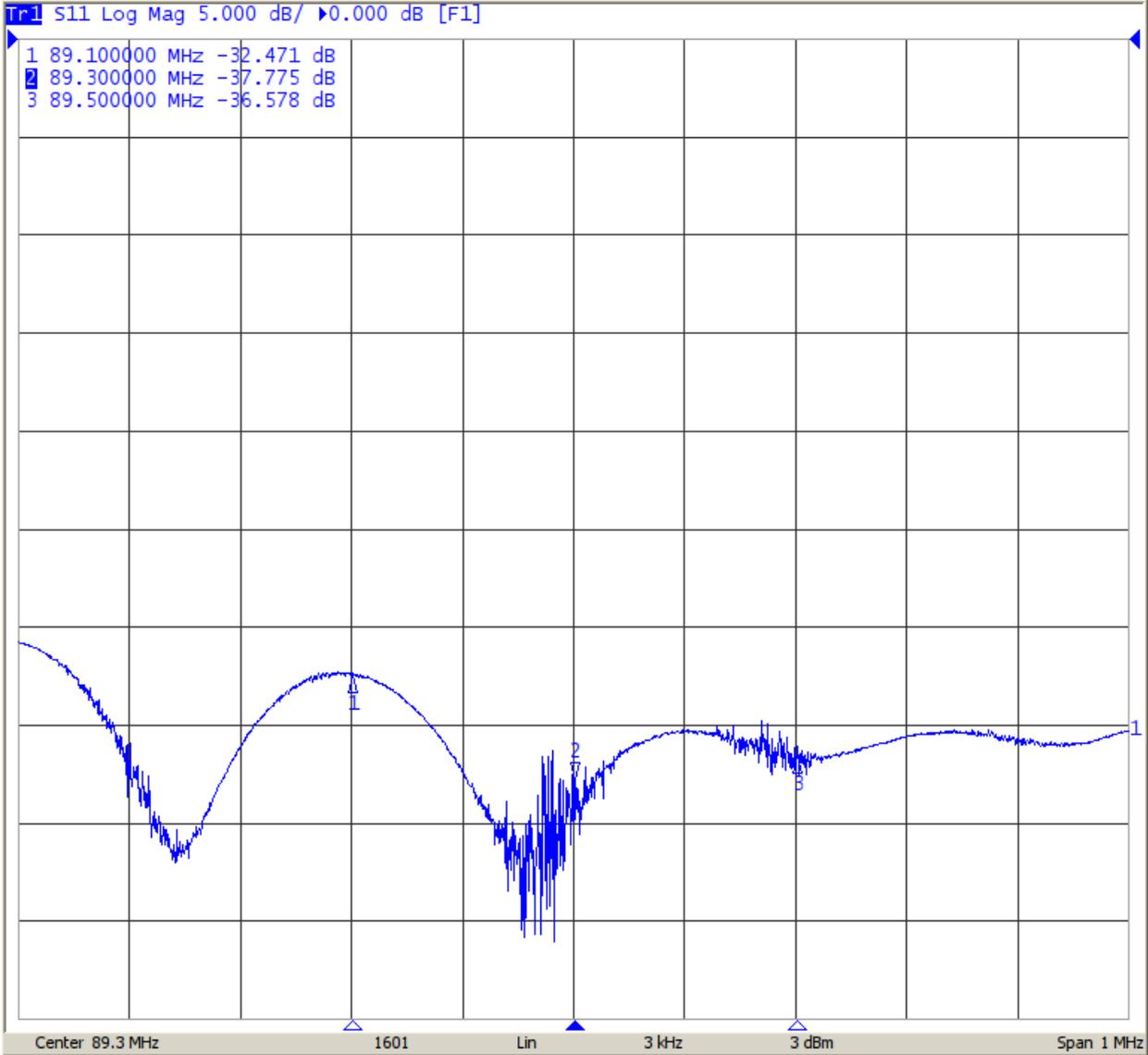
No other anomalies were noted.

All data contained in this report was prepared by me and is true and accurate to the best of my belief and knowledge.

David N. Demos, Field Engineer RF Analytical
1950 Green Hill Road NE
Leland, NC 28451
ddemos1963@gmail.com
(910)-367-5449

WSCI-FM Charleston, SC System Return Loss 1 MHz

10/3/2016 11:22:58 AM

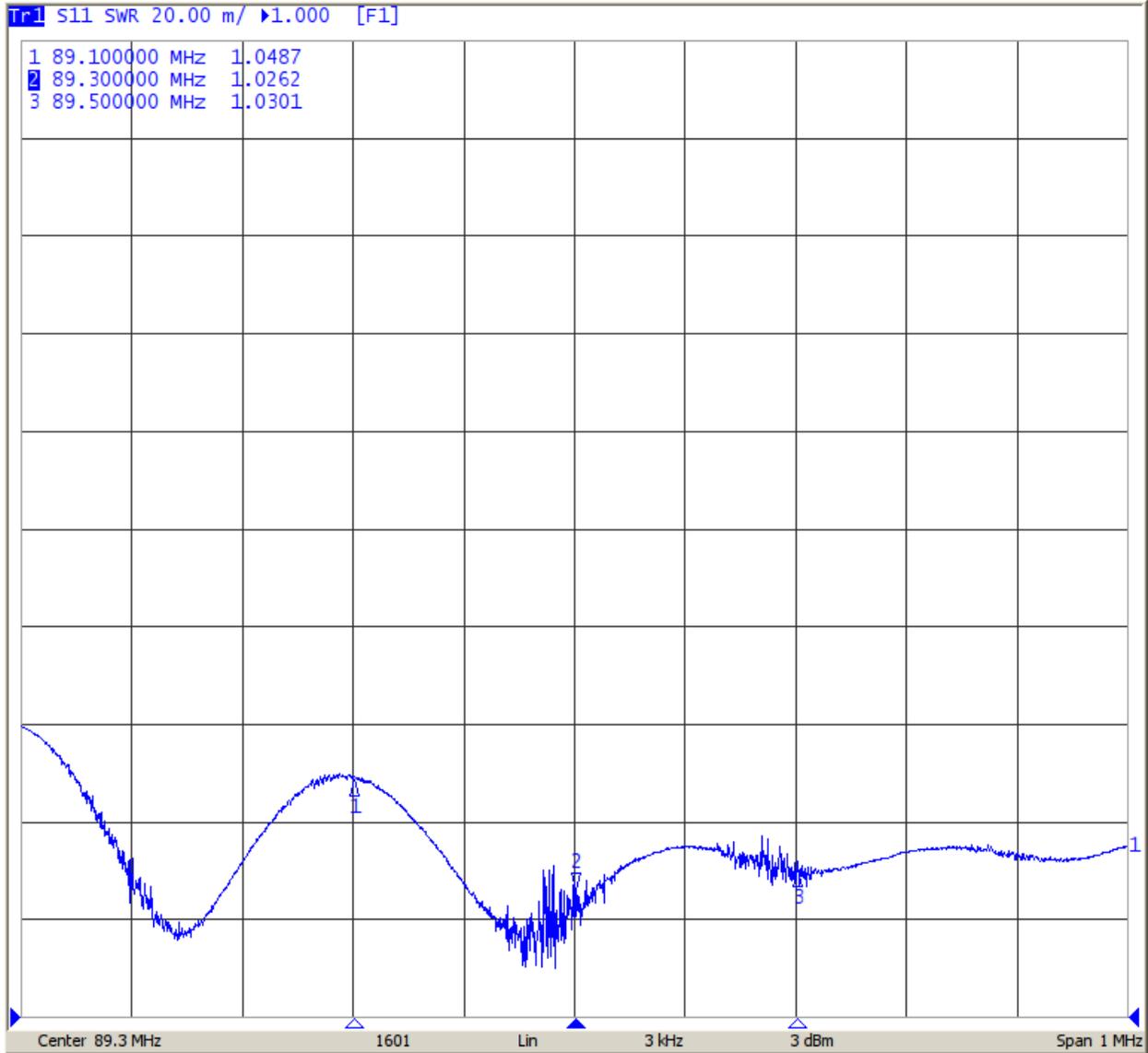


1 MHz span Log Magnitude Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC System VSWR 1 MHz

10/3/2016 11:23:28 AM

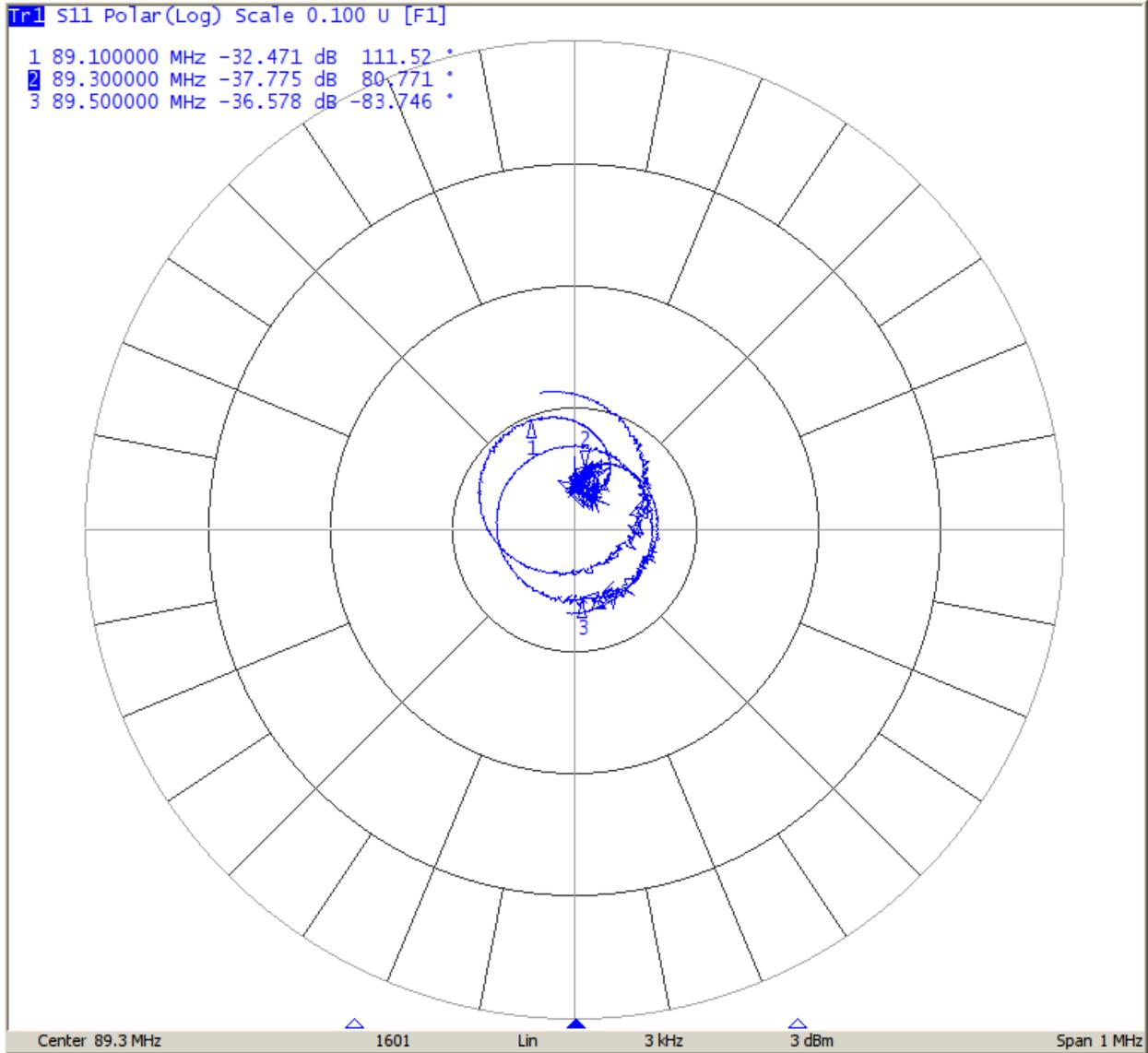


1 MHz VSWR Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC System Impedance 1 MHz Polar Plot

10/3/2016 11:24:09 AM

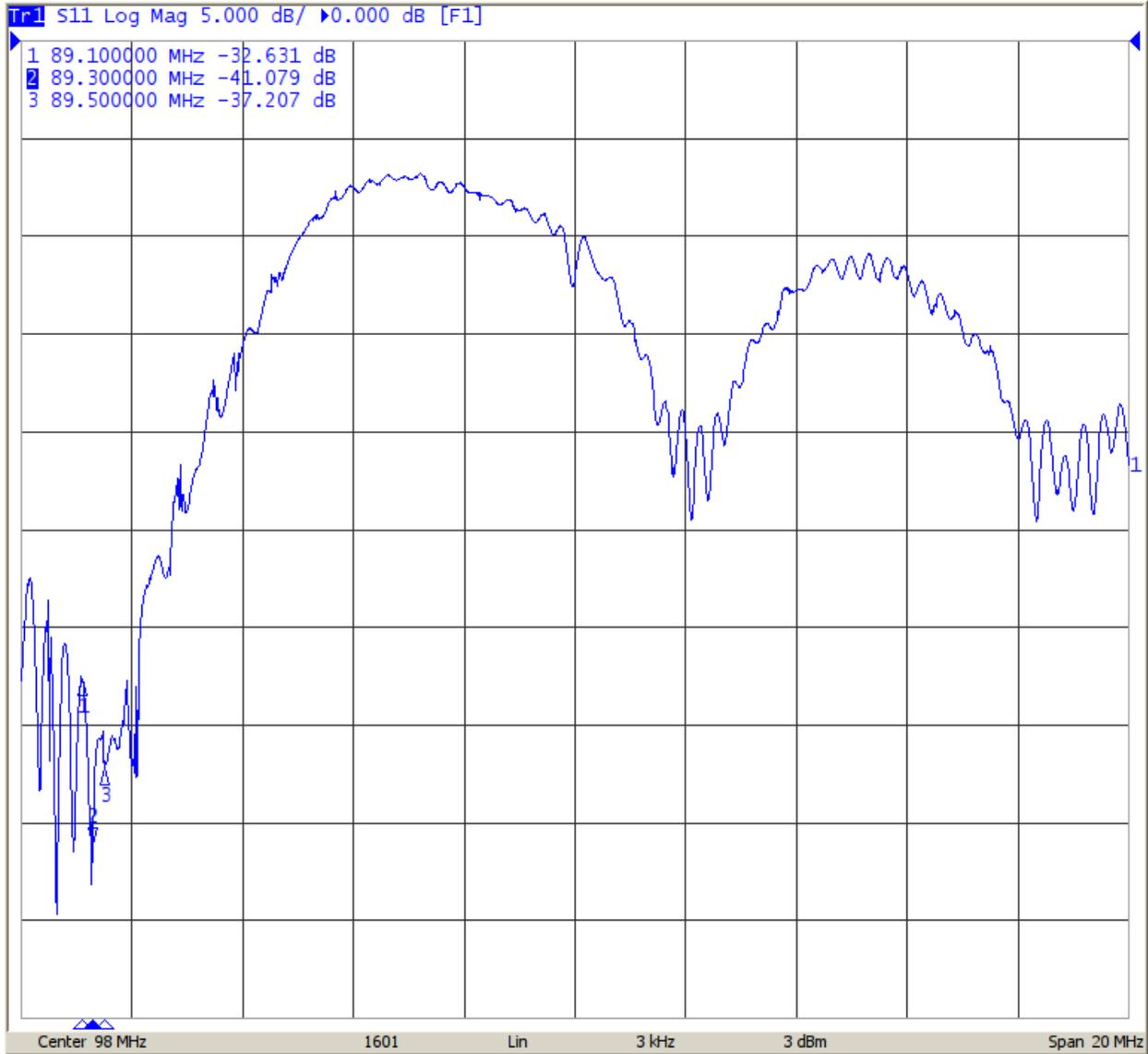


1 MHz Polar Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC System Return Loss 20 MHz

10/3/2016 11:24:56 AM



20 MHz span Log Magnitude Plot

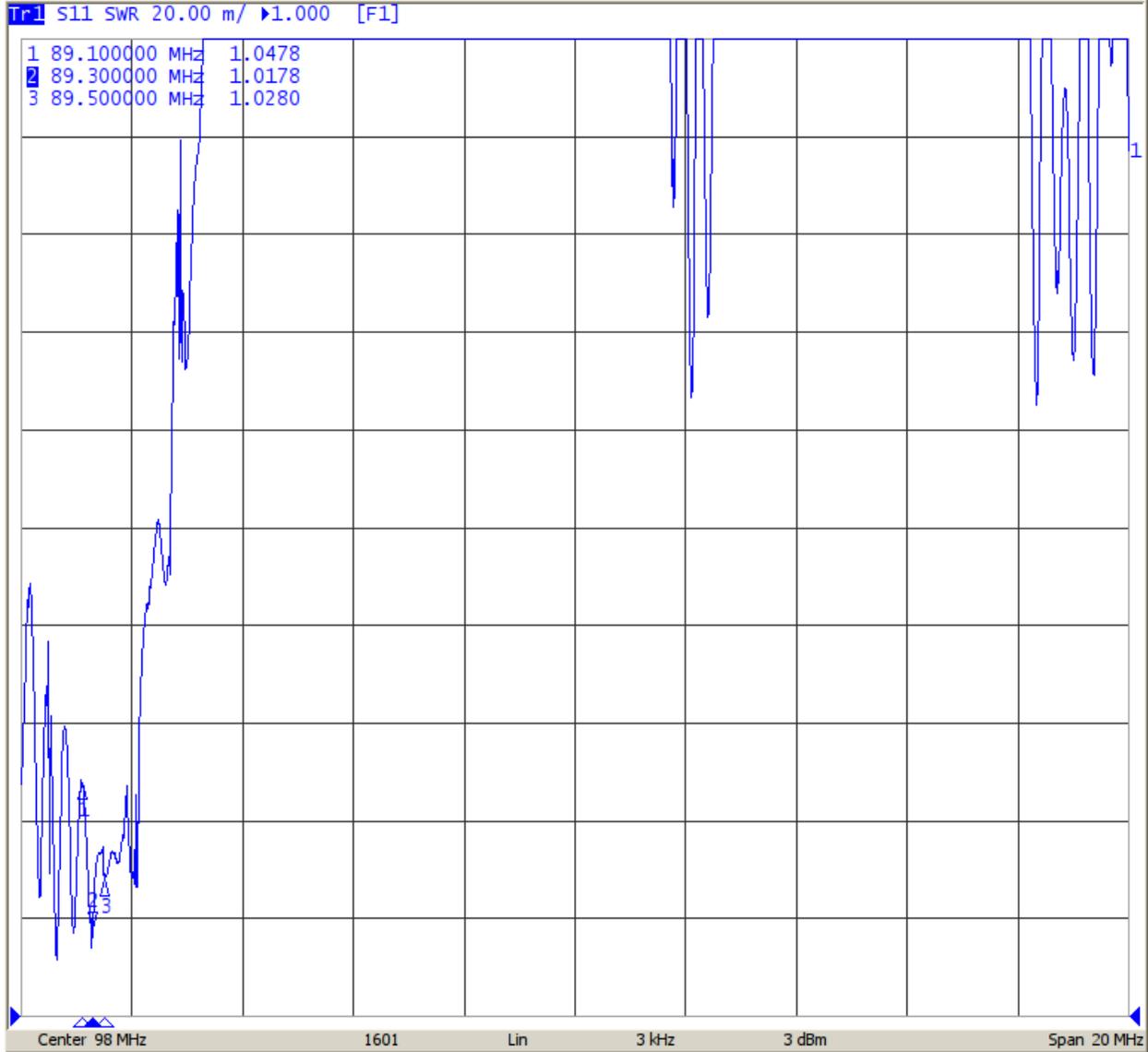
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Marker 2: Carrier

Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC System VSWR 20 MHz

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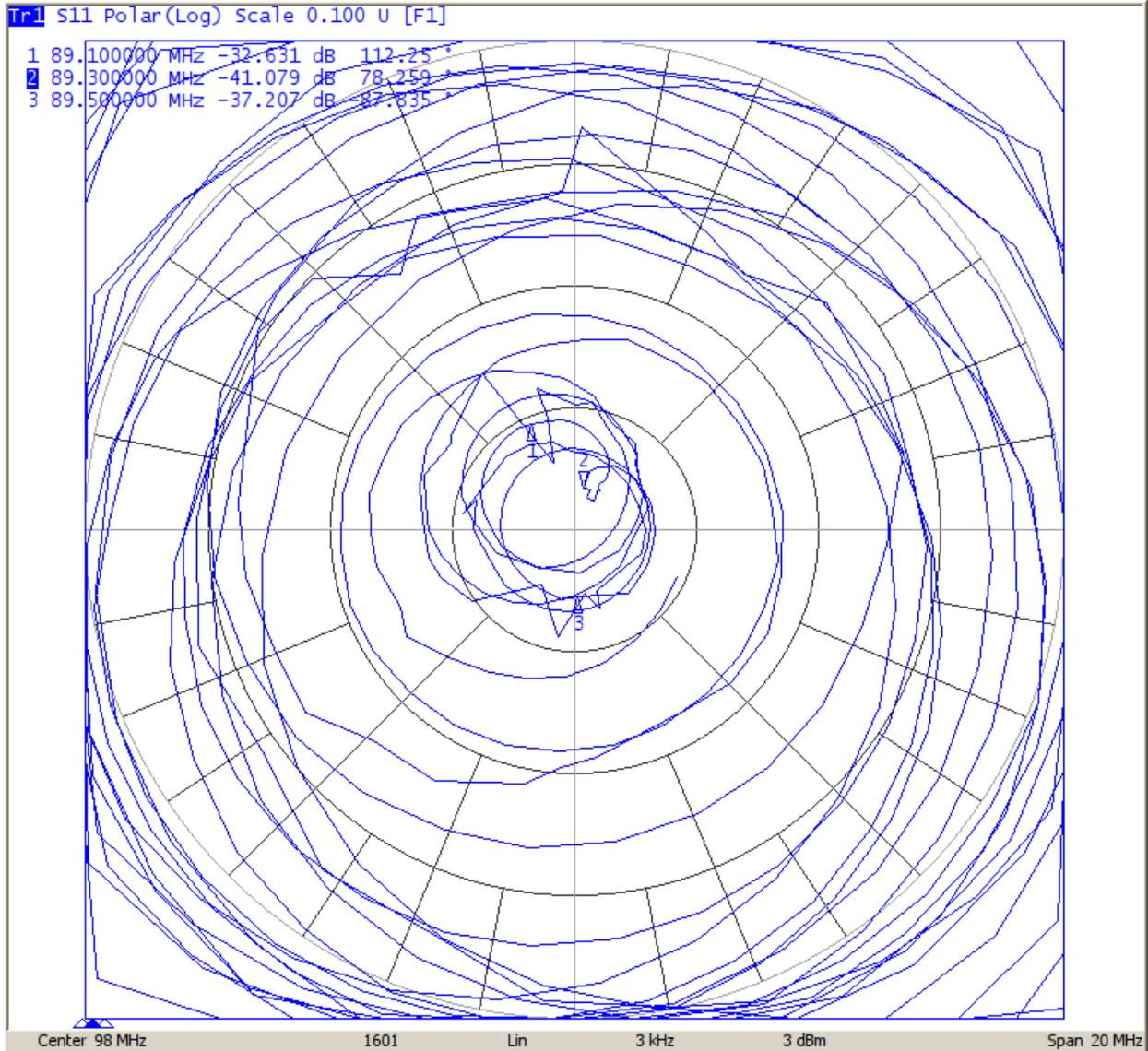


20 MHz VSWR Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC System Impedance 1 MHz Polar Plot

10/3/2016 11:25:55 AM

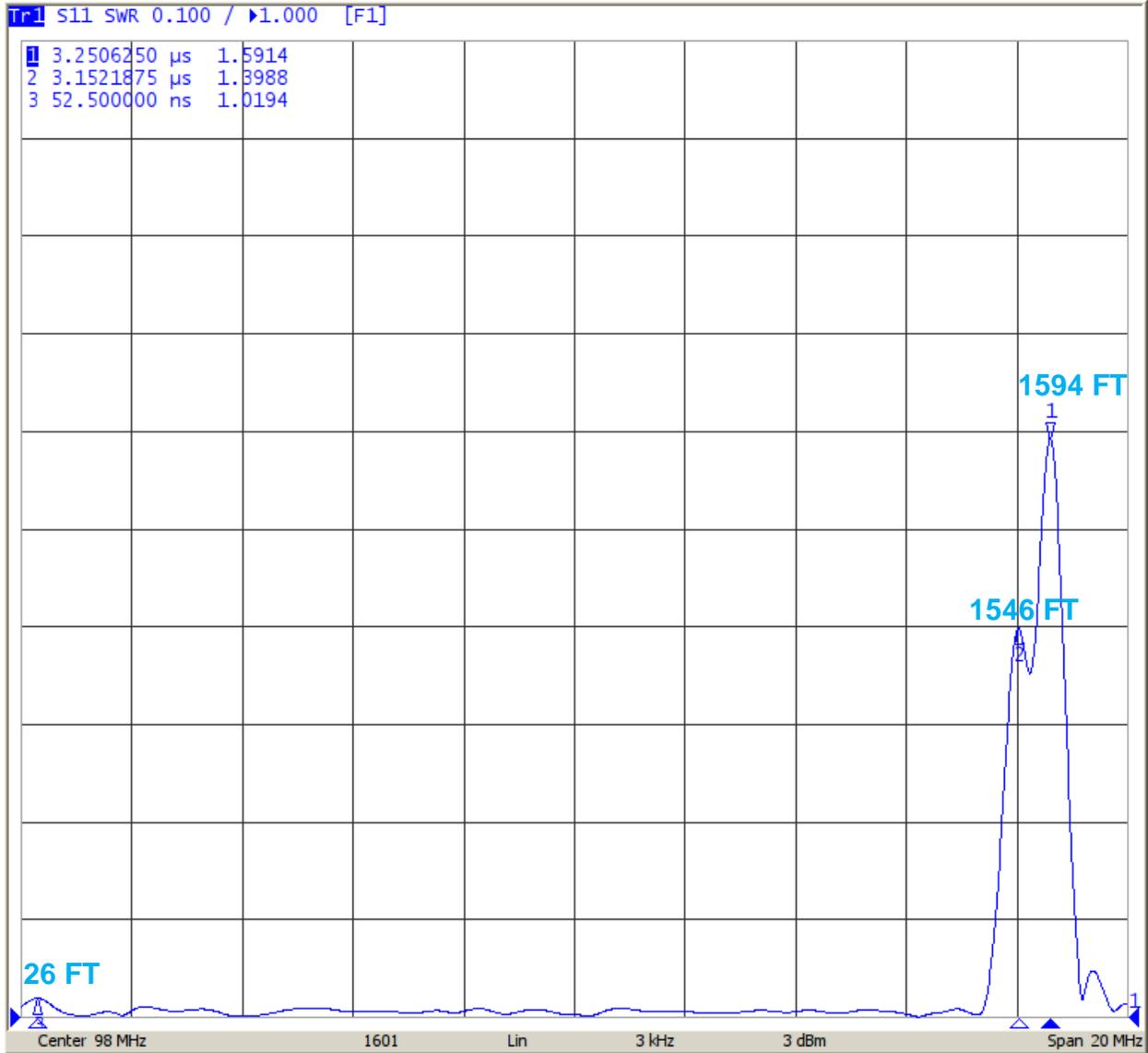


20 MHz Polar Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC TDR in VSWR 20 MHz

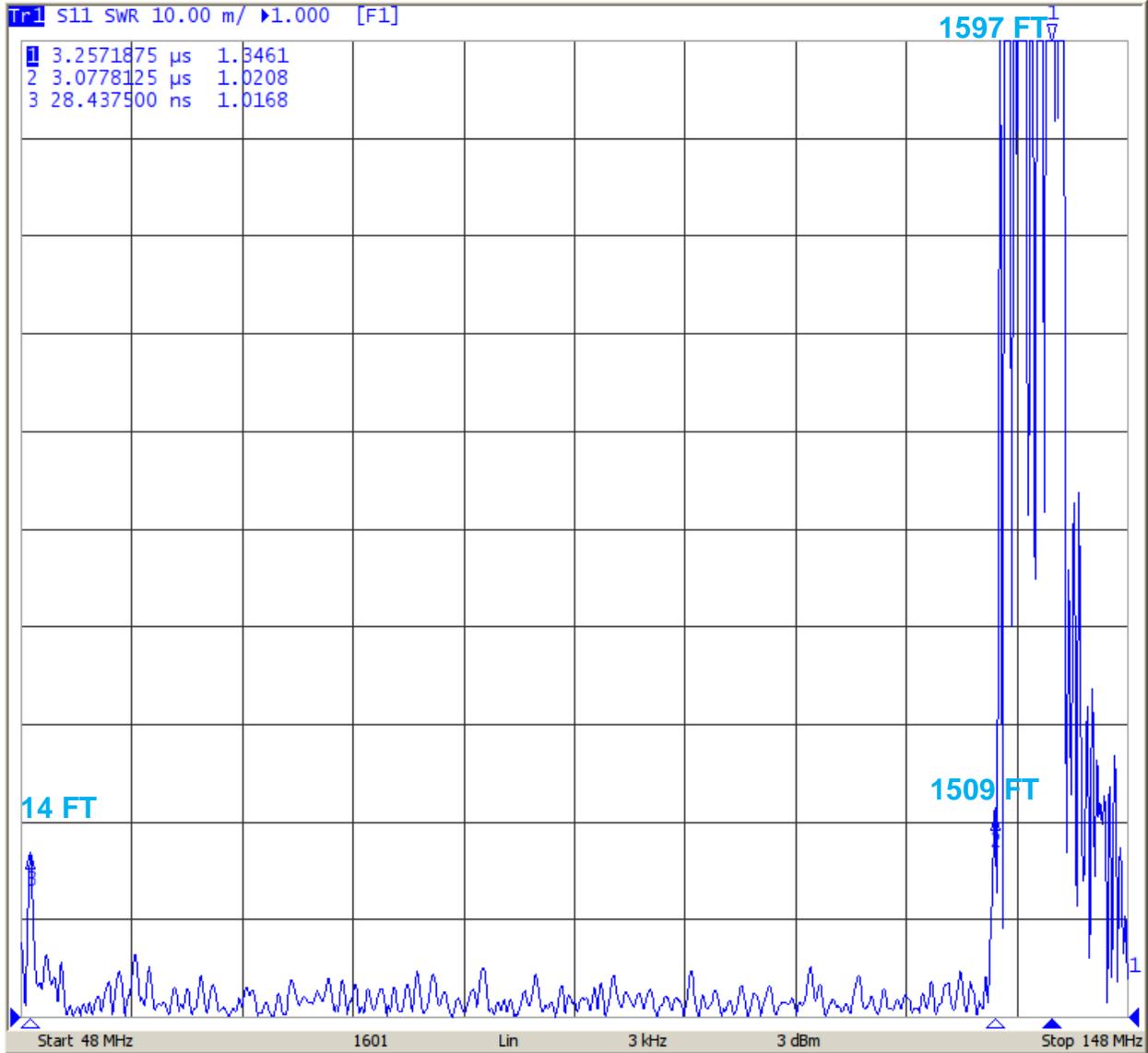
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TDR display from the test adapter to the antenna. (0 – 3.5 uS)

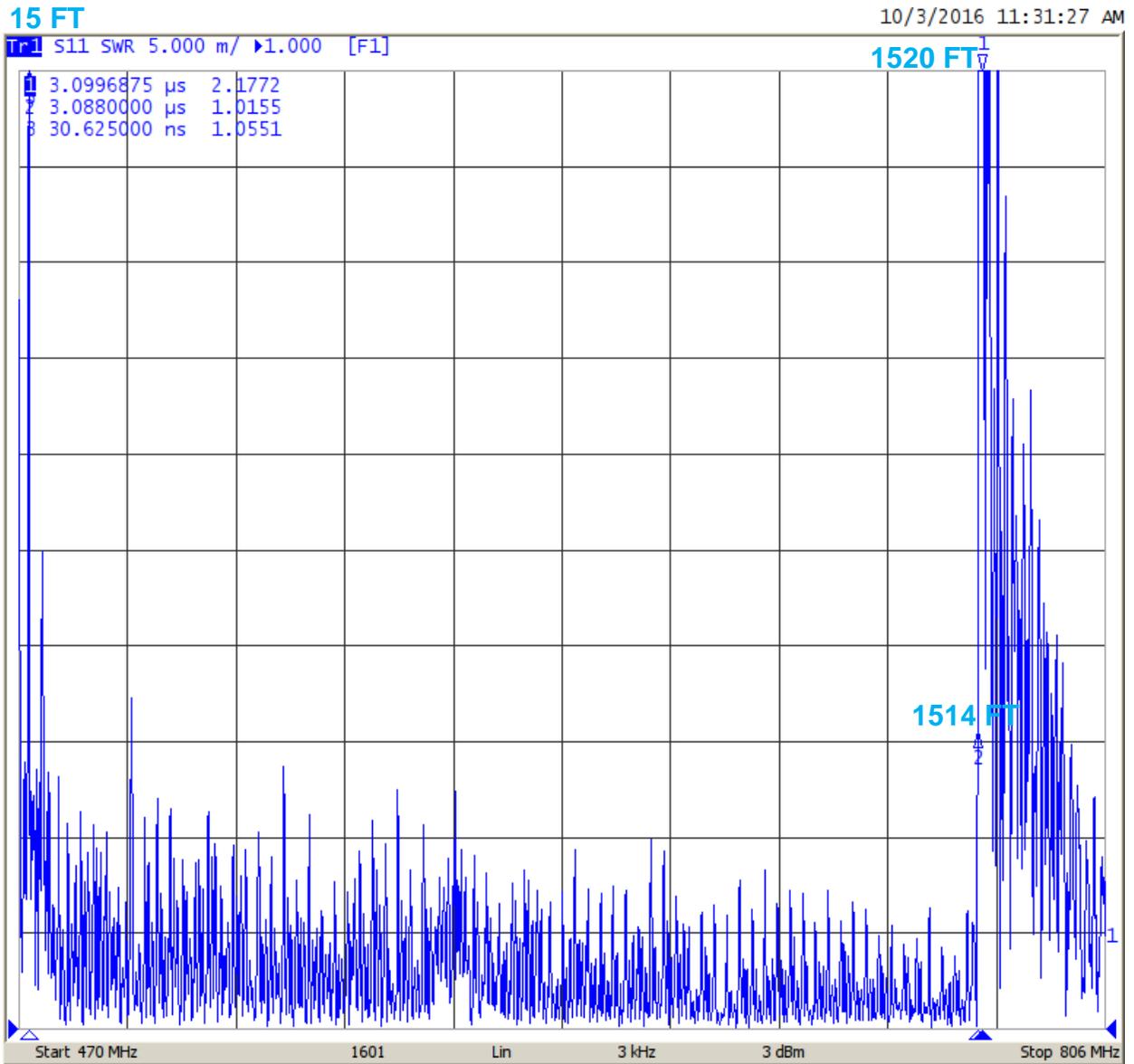
WSCI-FM Charleston, SC TDR in VSWR 100 MHz

10/3/2016 11:28:56 AM



TDR display from the test adapter to the antenna. (0 – 3.5 uS)

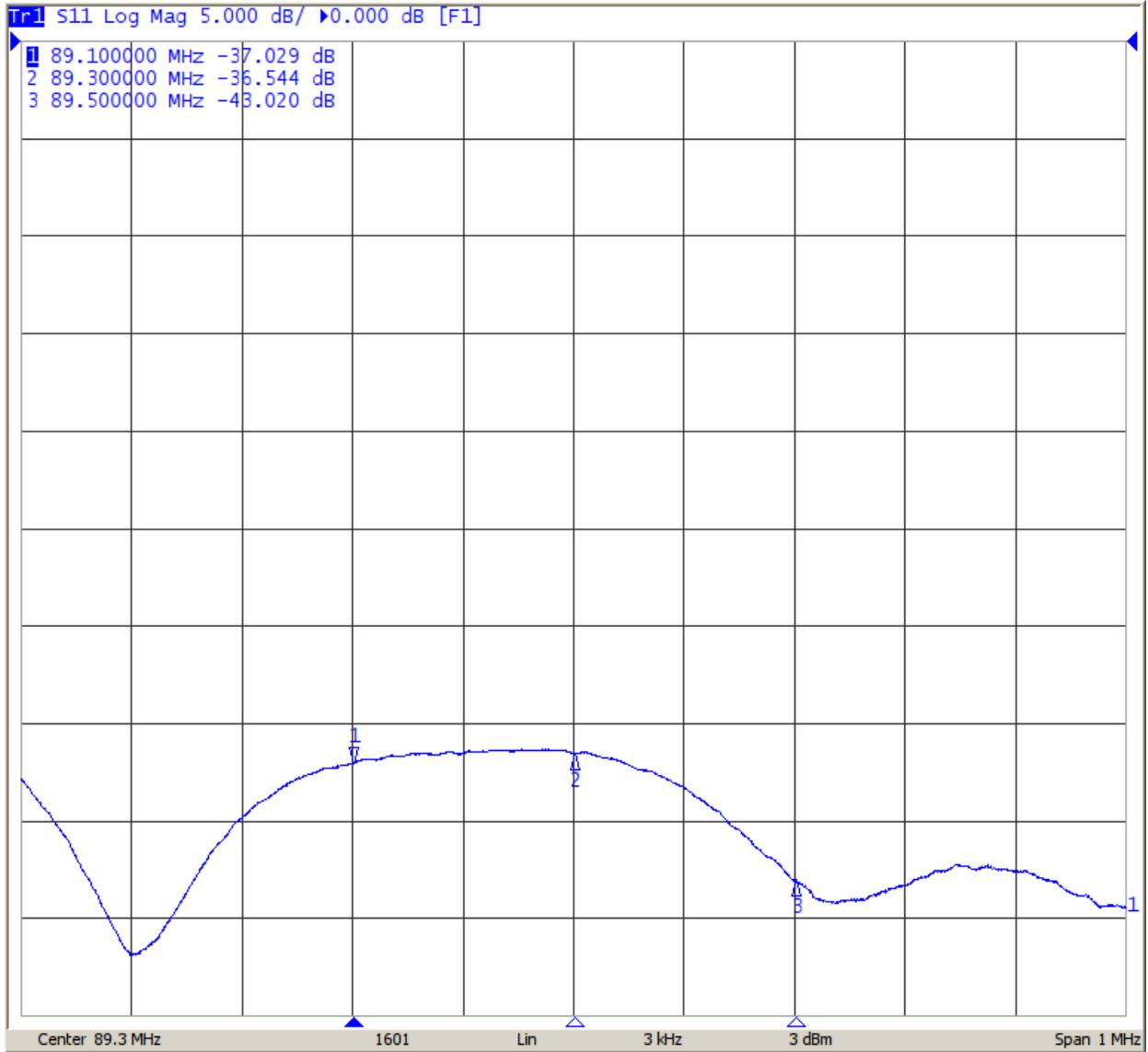
**WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz**



TDR display from the test adapter to the antenna. (0 – 3.5 uS)

WSCI-FM Charleston, SC System Return Loss 1 MHz (Line Loaded)

10/3/2016 2:10:10 PM

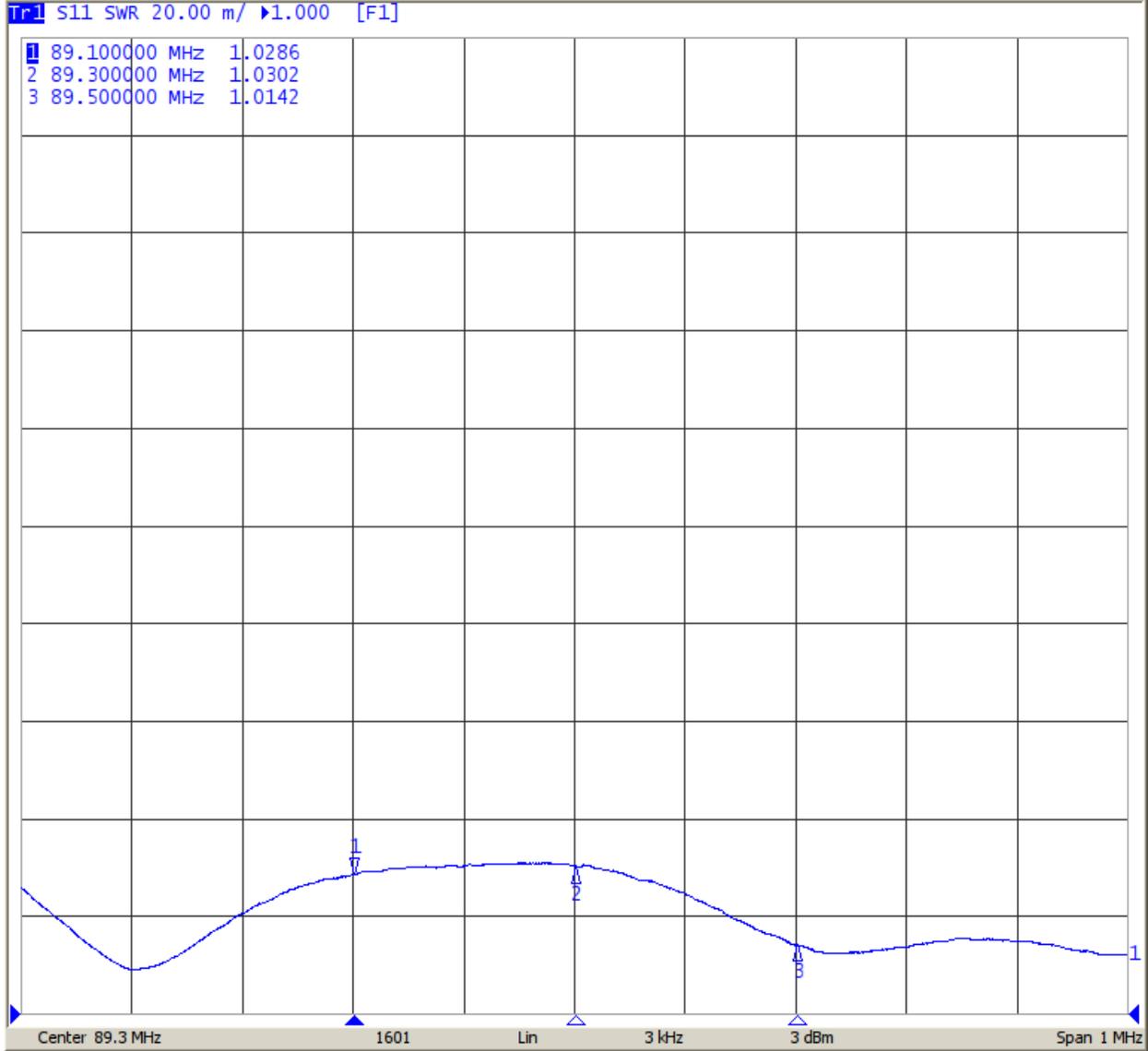


1 MHz span Log Magnitude Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC
System VSWR 1 MHz
(Line Loaded)

10/3/2016 2:11:29 PM

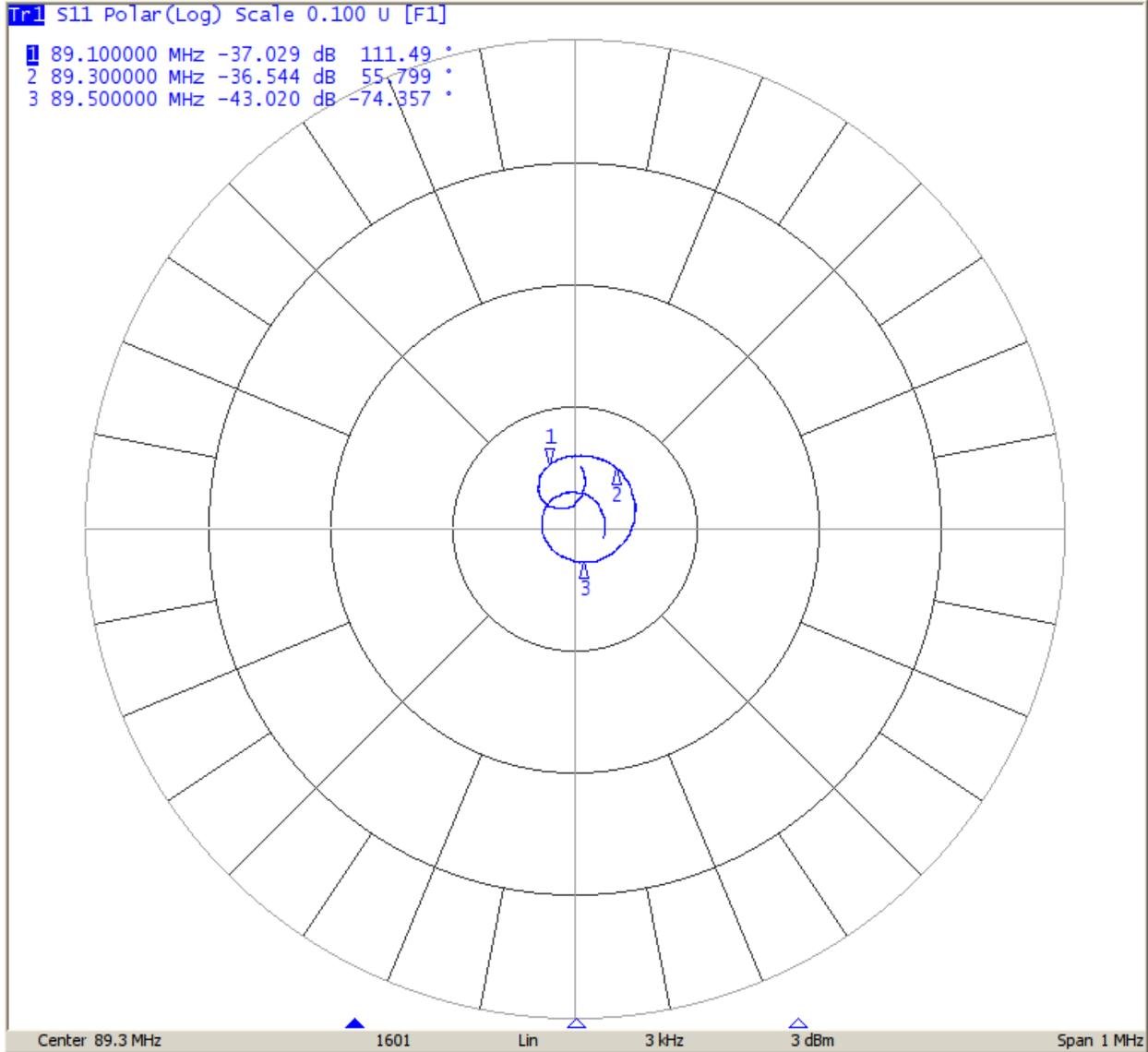


1 MHz VSWR Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

**WSCI-FM Charleston, SC
System Impedance 1 MHz Polar Plot
(Line Loaded)**

10/3/2016 2:11:53 PM

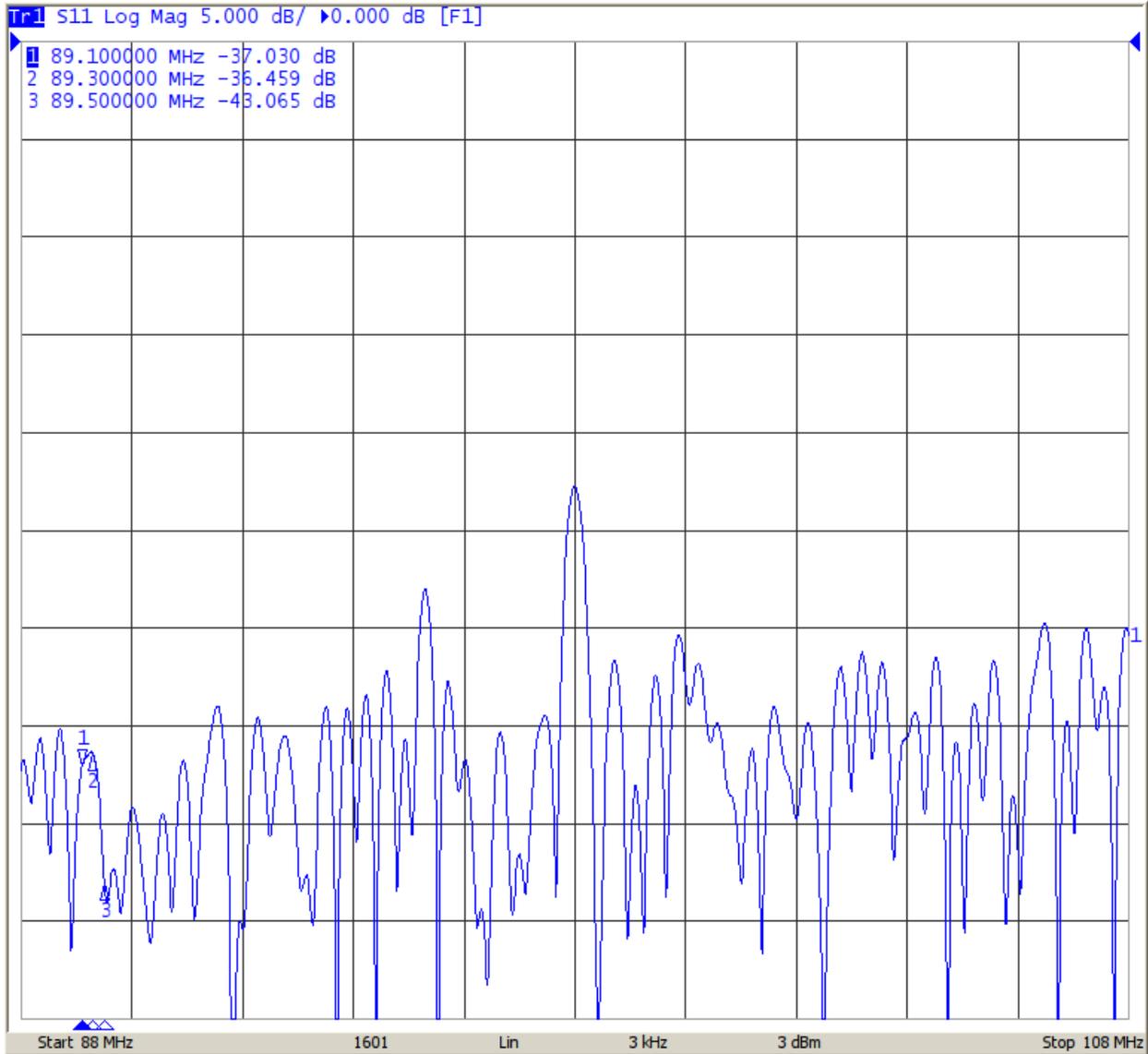


1 MHz Polar Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

**WSCI-FM Charleston, SC
System Return Loss 20 MHz
(Line Loaded)**

10/3/2016 2:12:42 PM

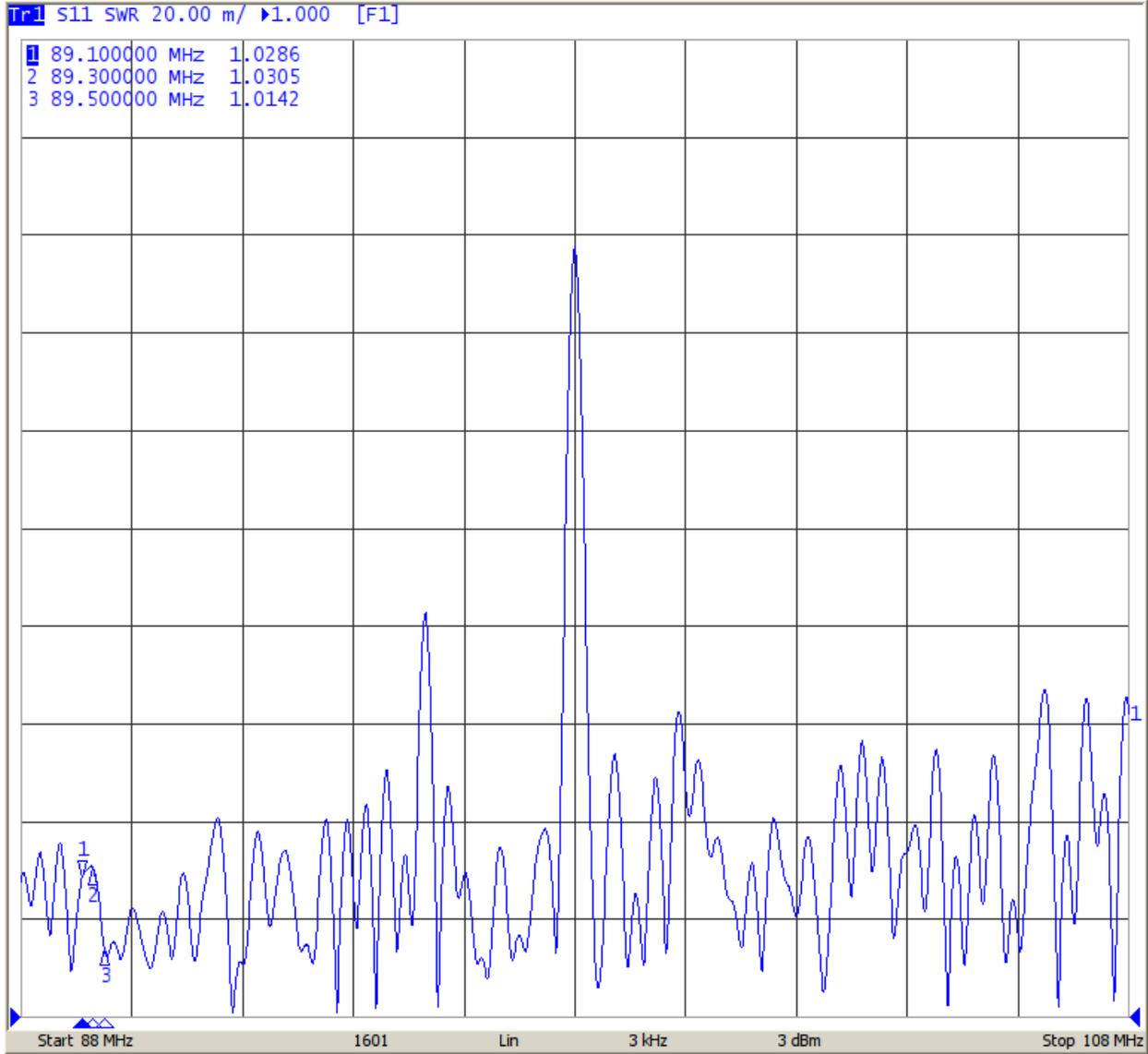


20 MHz span Log Magnitude Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

**WSCI-FM Charleston, SC
System VSWR 20 MHz
(Line Loaded)**

10/3/2016 2:12:55 PM

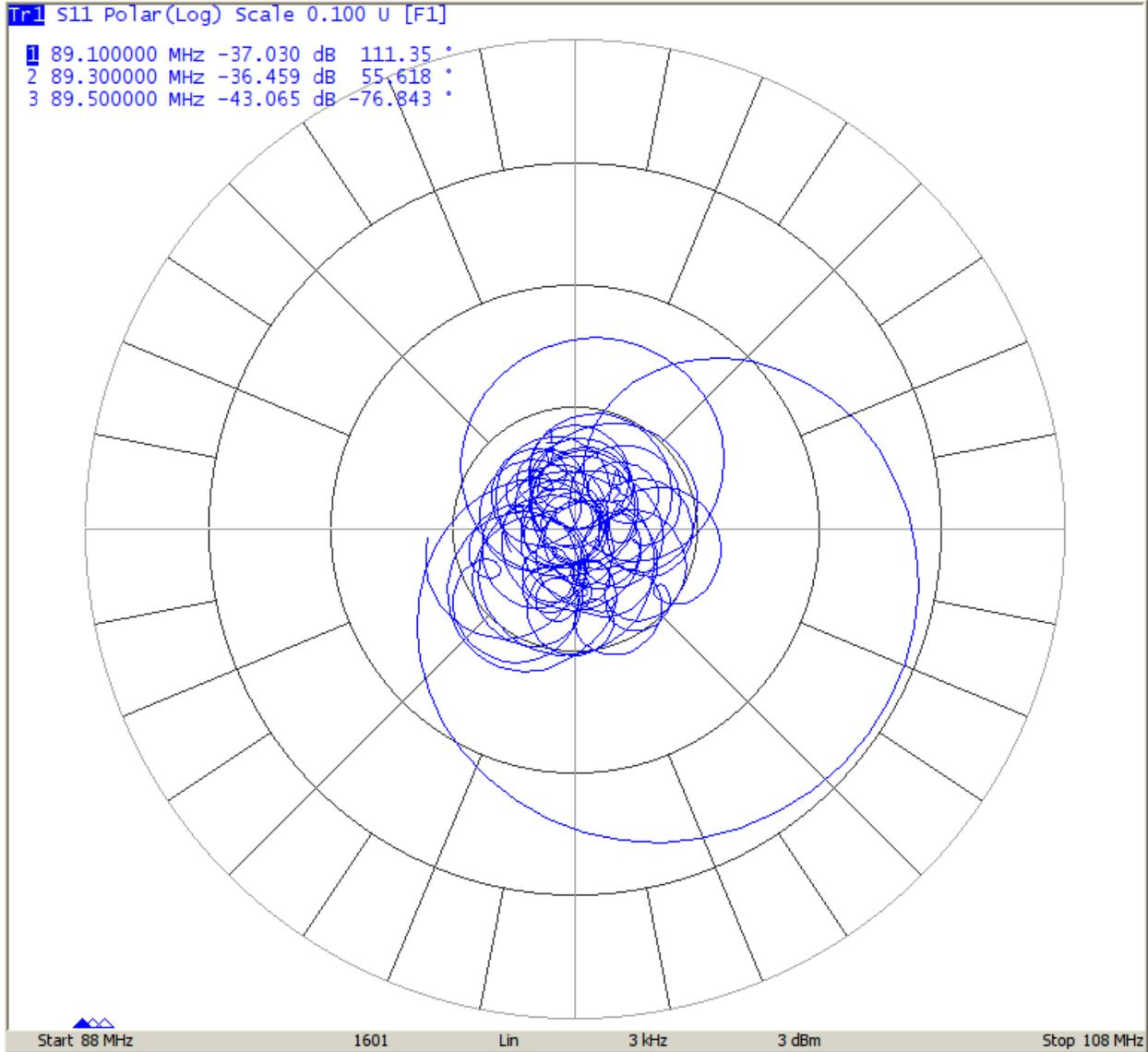


20 MHz VSWR Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

**WSCI-FM Charleston, SC
System Impedance 1 MHz Polar Plot
(Line Loaded)**

10/3/2016 2:12:25 PM

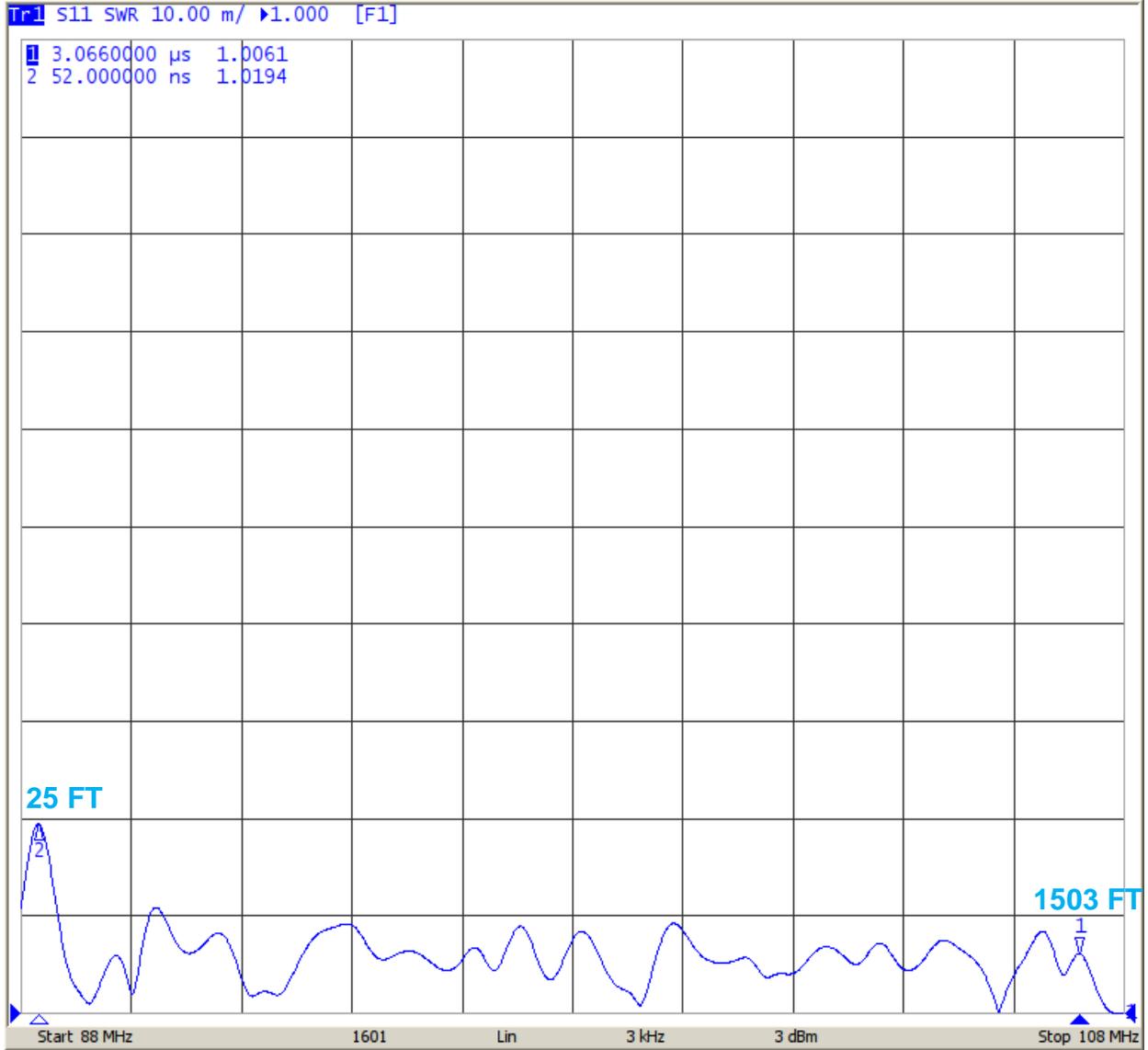


20 MHz Polar Plot

- Marker 1: Carrier -200 kHz
- Marker 2: Carrier
- Marker 3: Carrier +200 kHz

**WSCI-FM Charleston, SC
TDR in VSWR 20 MHz
(Line Loaded)**

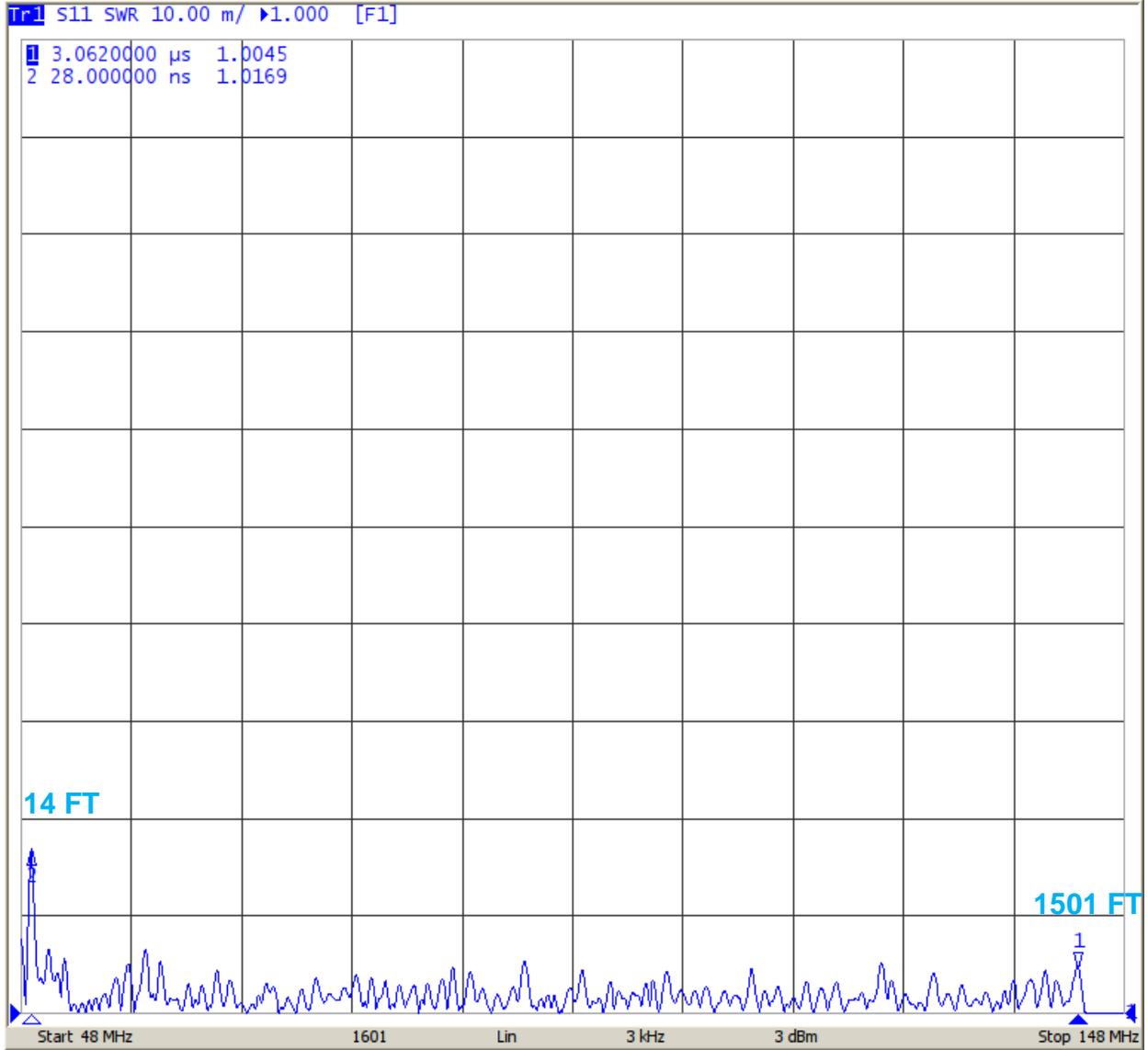
10/3/2016 2:14:02 PM



TDR display from the test adapter to the antenna. (0 – 3.2 uS)

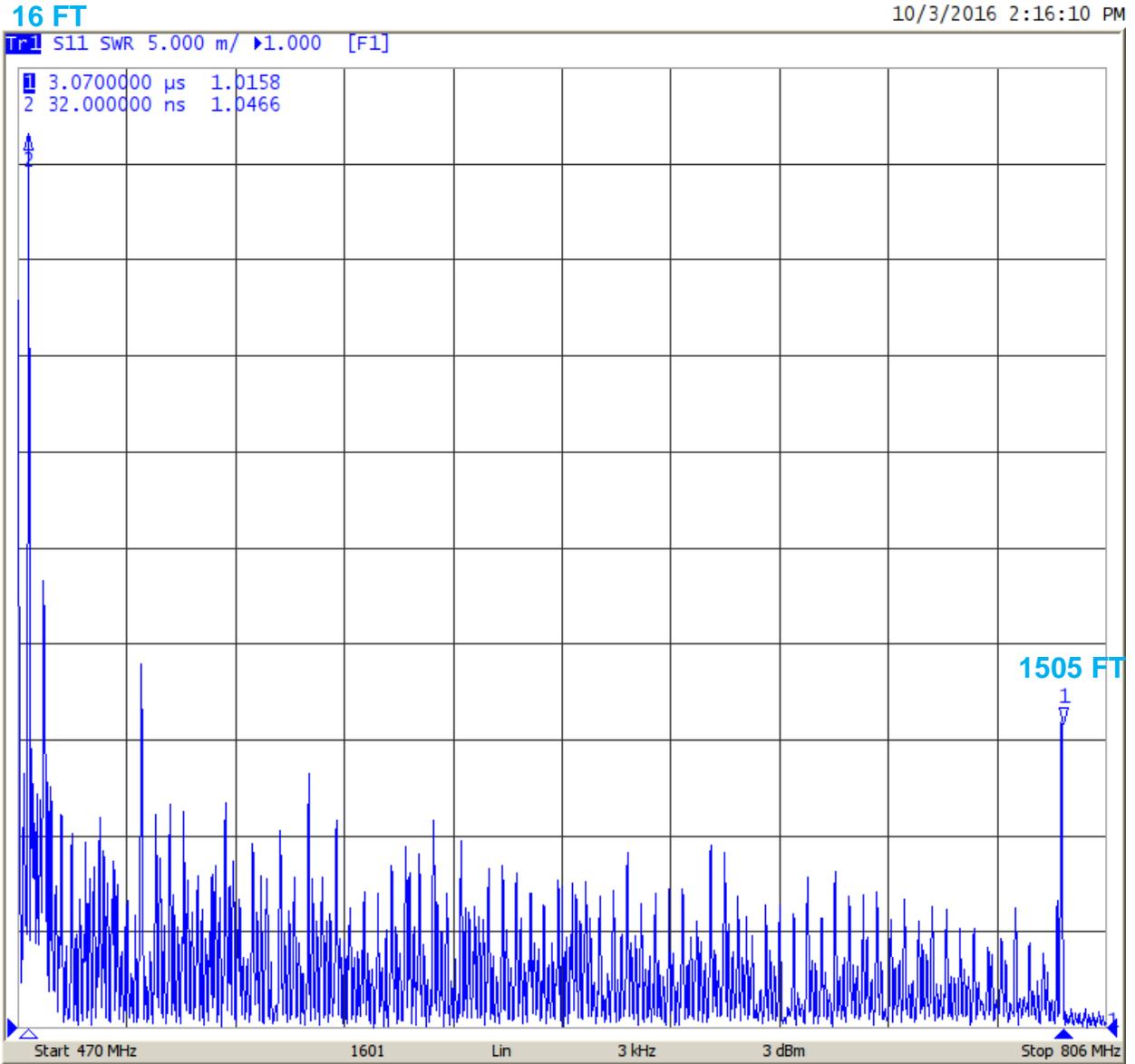
**WSCI-FM Charleston, SC
TDR in VSWR 100 MHz
(Line Loaded)**

10/3/2016 2:14:54 PM



TDR display from the test adapter to the antenna. (0 – 3.2 uS)

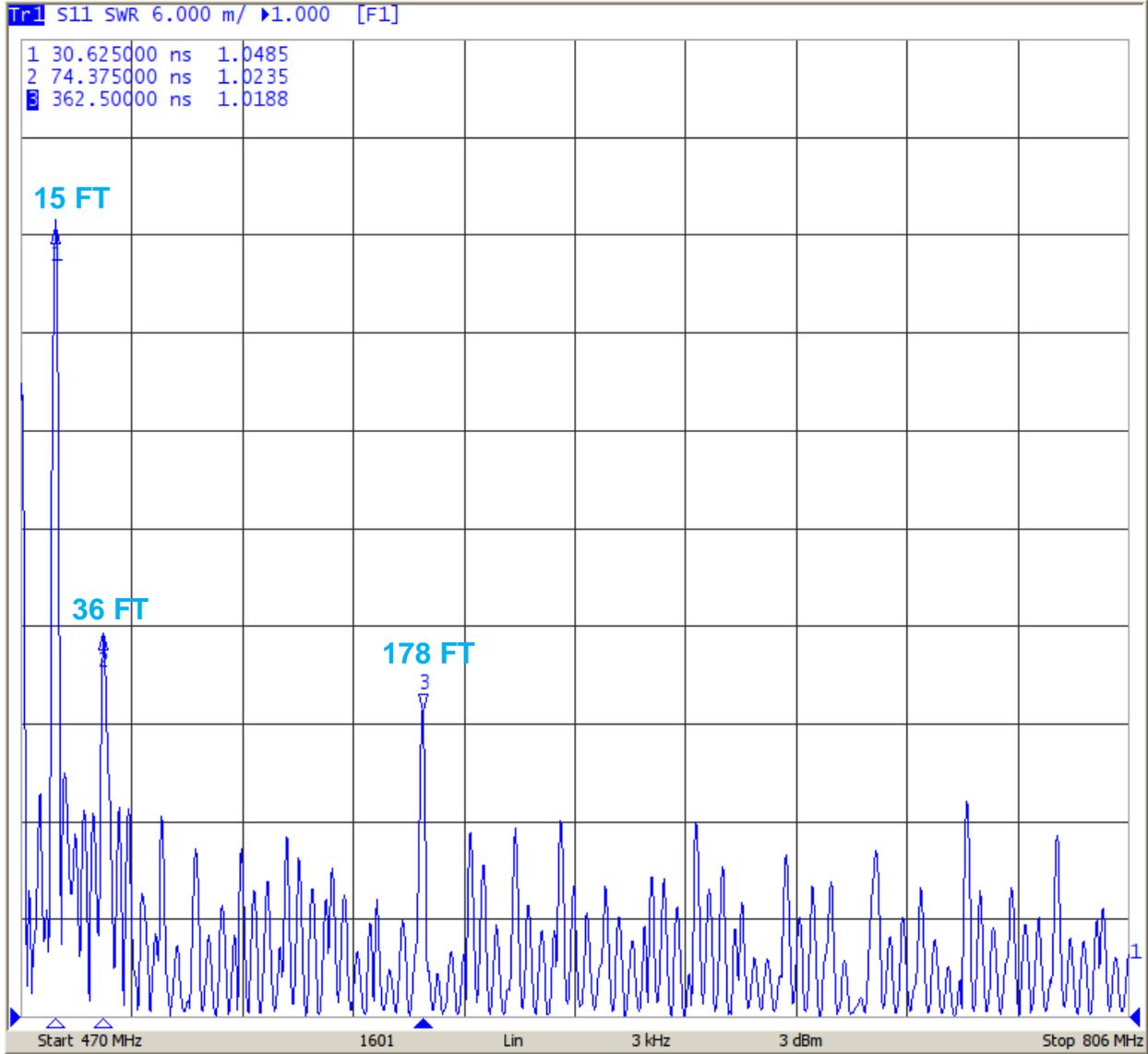
WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)



TDR display from the test adapter to the antenna. (0 – 3.2 uS)

WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)

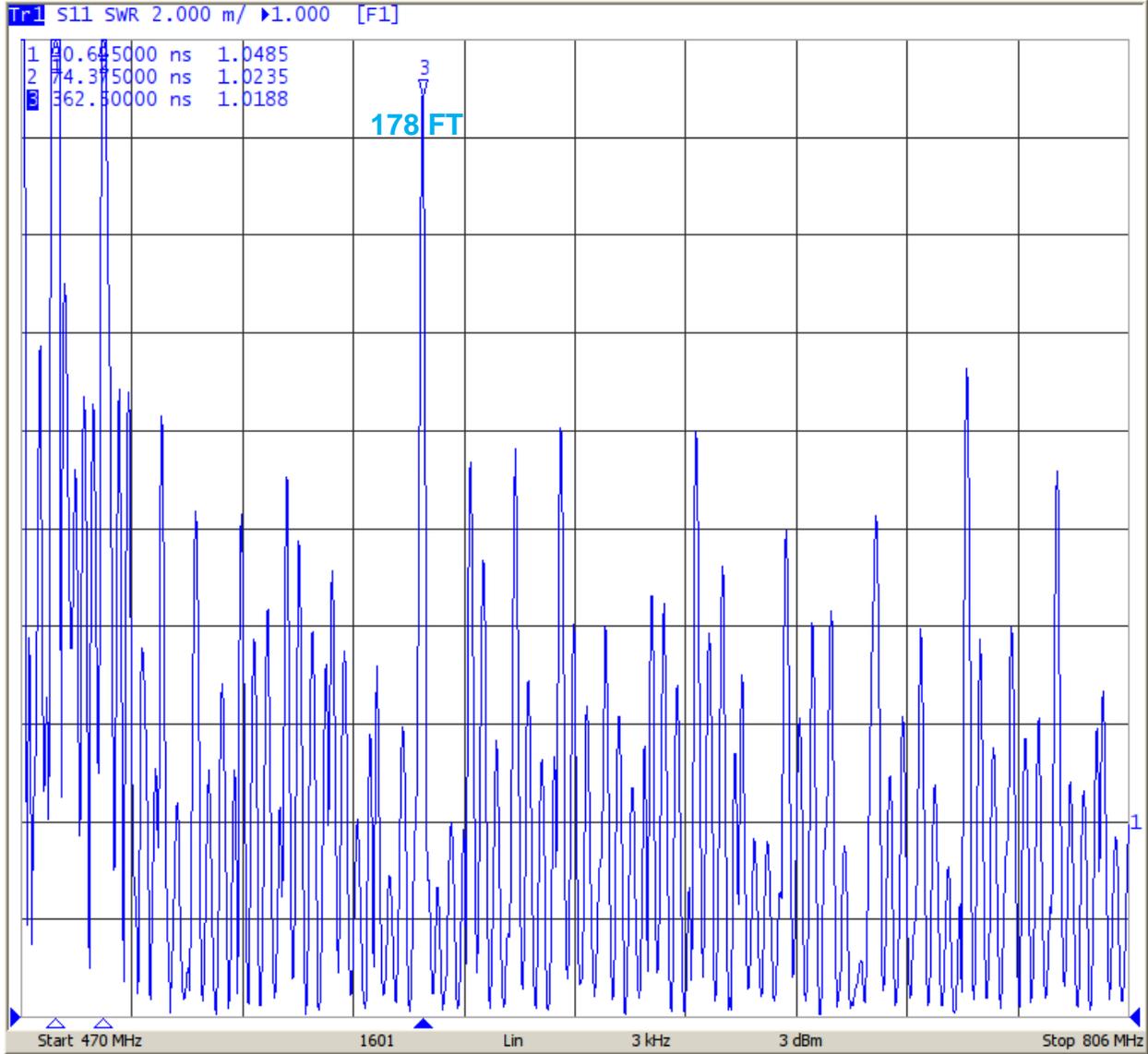
10/3/2016 2:18:43 PM



TDR display from the test adapter to 1 uS in the run.

**WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded) Lower Scale**

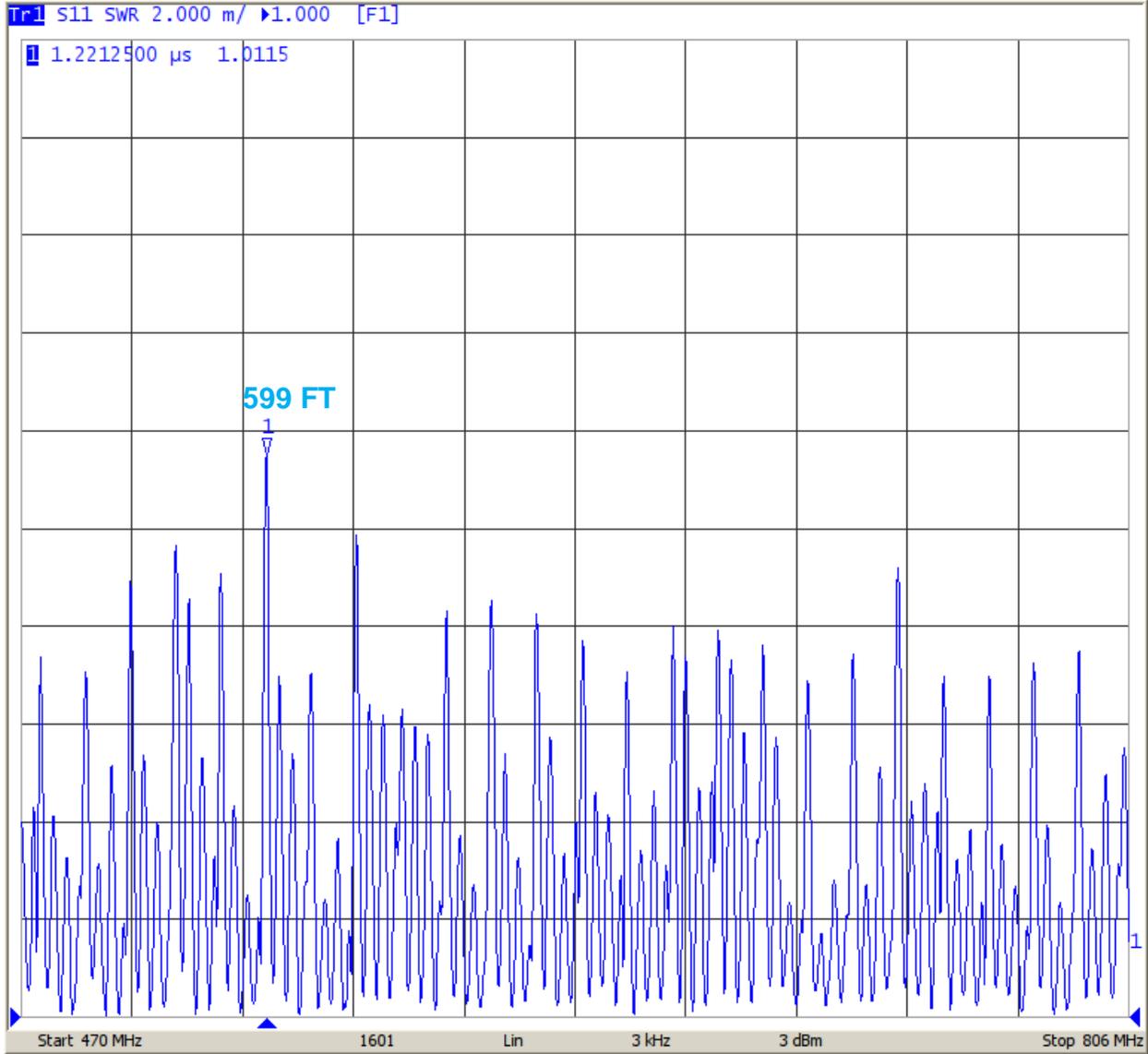
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TDR display from the test adapter to 1 uS in the run.

**WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)**

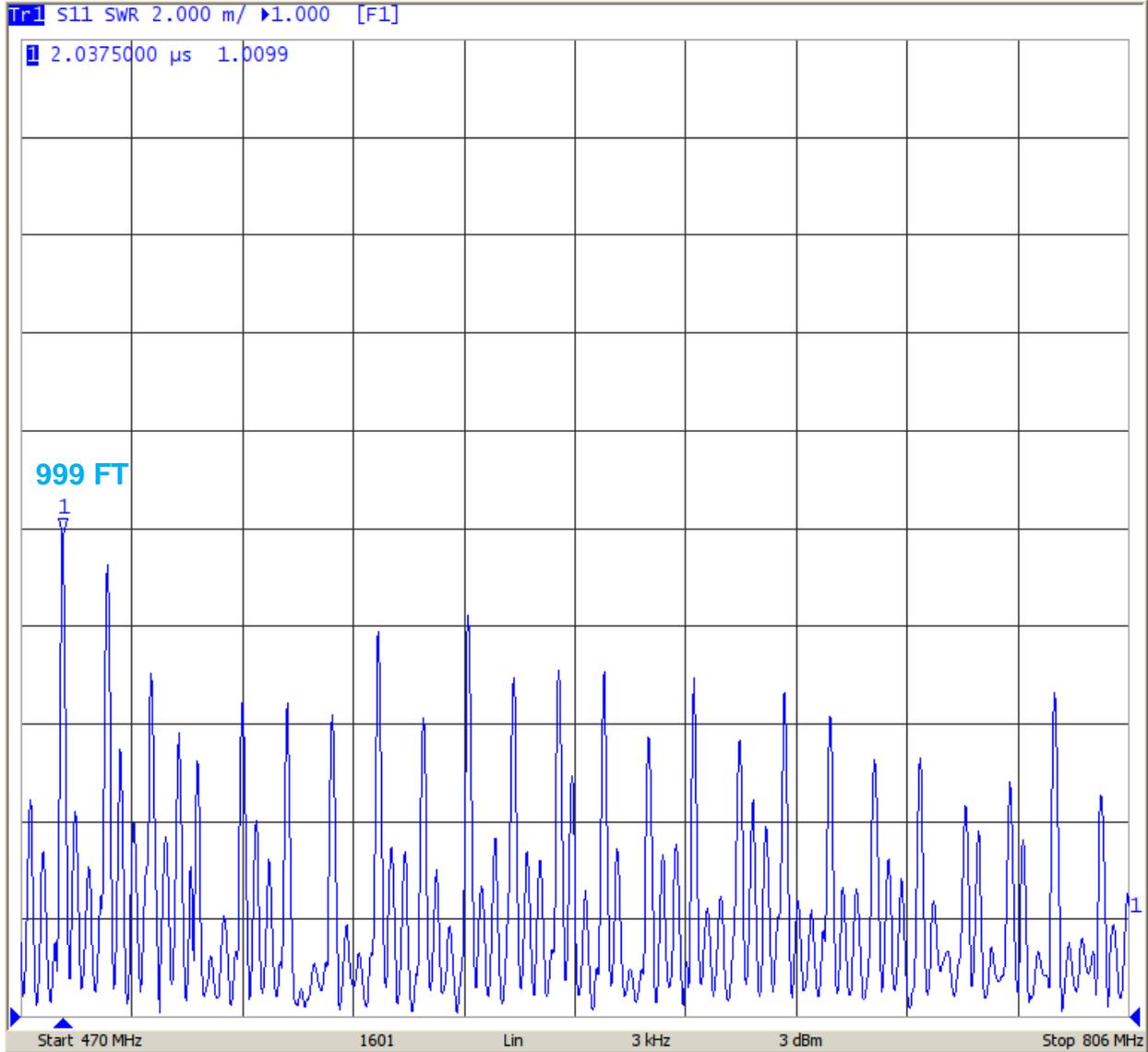
10/3/2016 2:19:50 PM



TDR display from 1 uS to 2 uS in the run

**WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)**

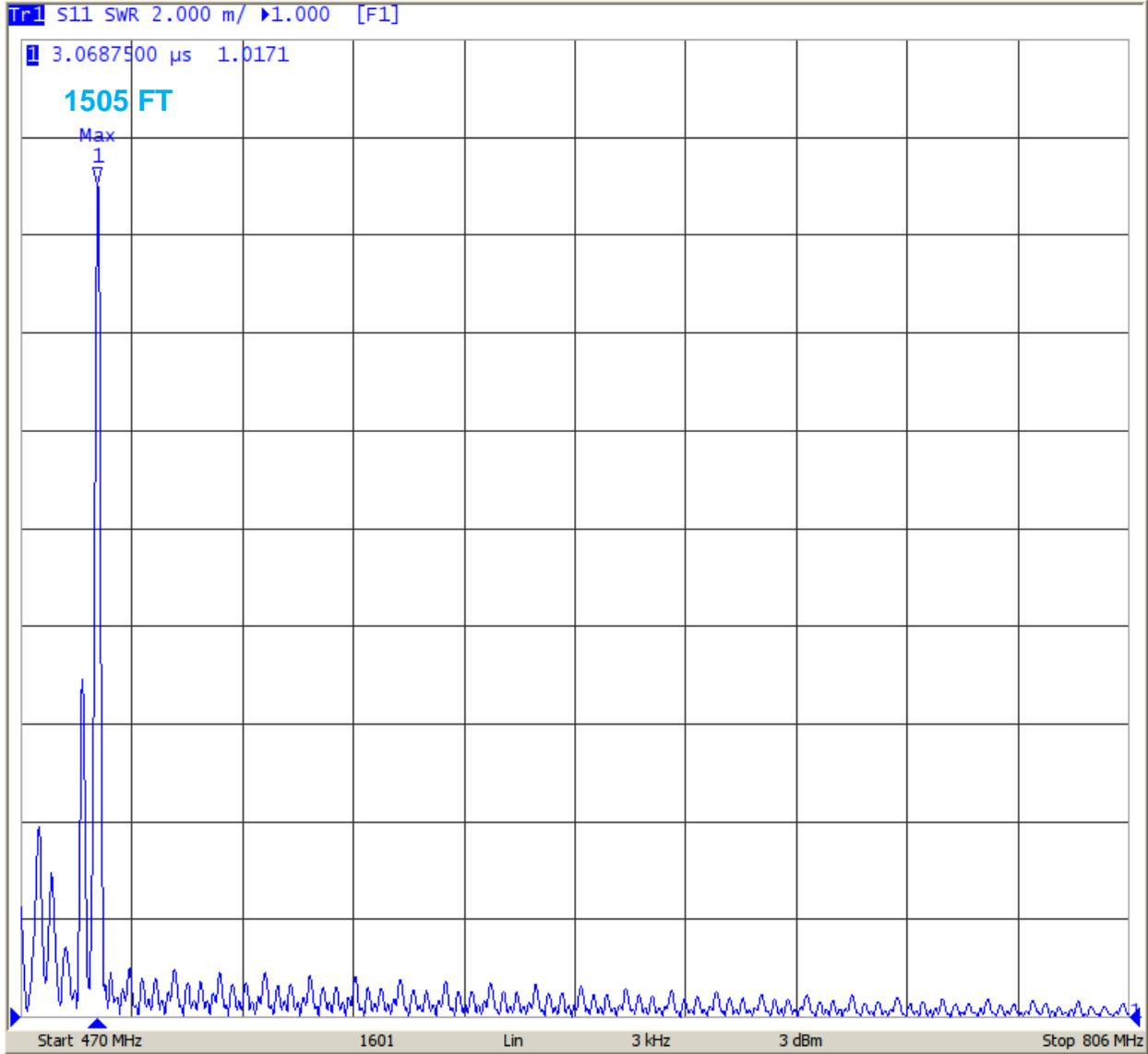
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TDR display from 2 uS to 3 uS in the run.

**WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)**

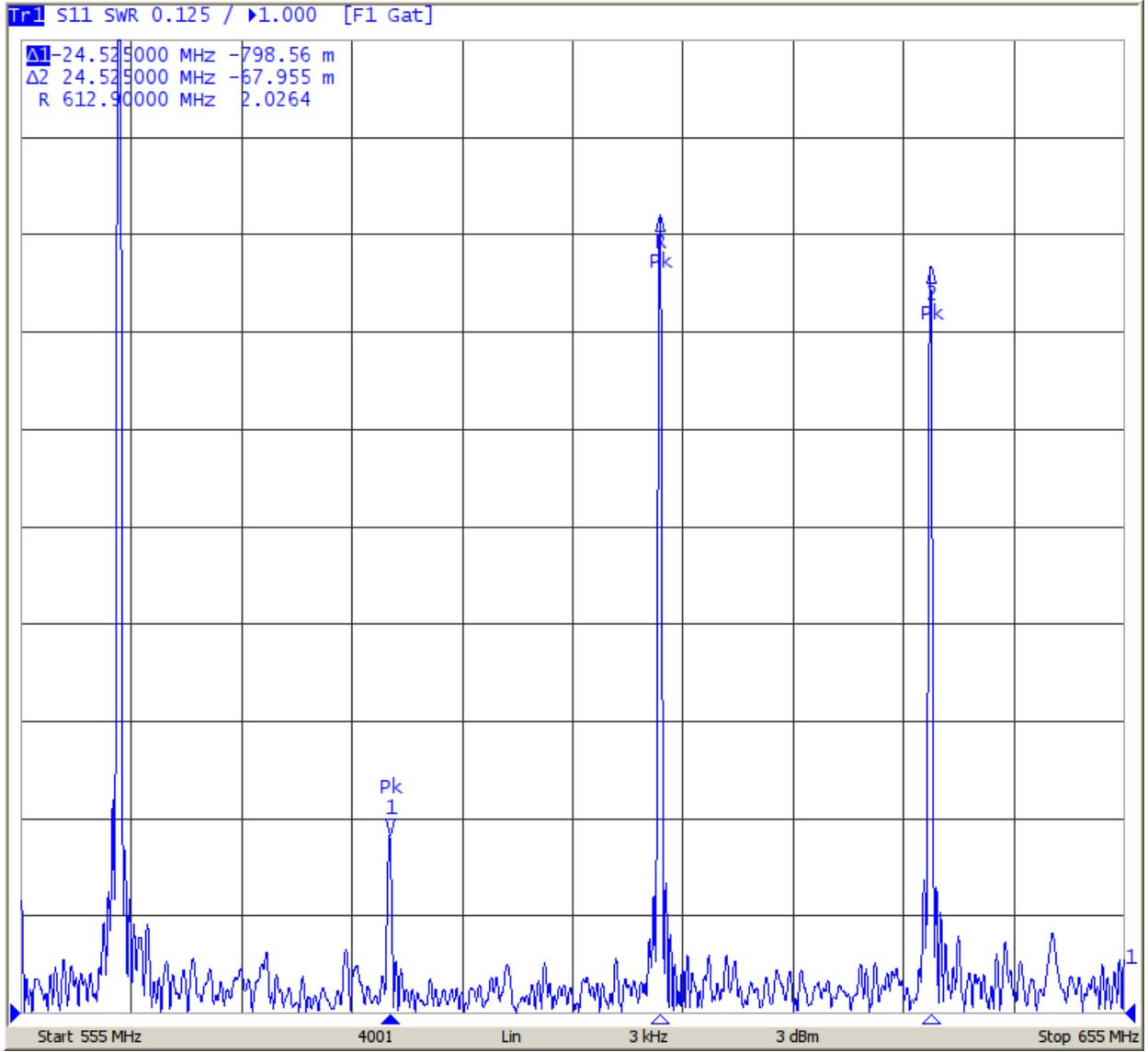
10/3/2016 2:21:13 PM



TDR display from 3 uS to the test load.

**WSCI-FM Transmission Line Flange Summing
VSWR Frequency Domain UHF High Band
Load and Bottom Complex Gated Out (0.375 uS to 3 uS)
Line Sections Length Determination**

10/3/2016 2:24:11 PM



Critical frequency: 24.525 MHz
Line Sections Length: 20 foot

Dielectric

Acceptance Test Form

Project/MSO Number: 43168 Customer/Call Sign: WSCI

Customer/Site Contact: John Castaldo

Antenna VSWR Acceptable:

DND Dielectric Representative

J.P. Customer Representative

Transmission Line Acceptable: DND Dielectric Representative

J.P. Customer Representative

RF System Acceptable: N/A Dielectric Representative

J.P. Customer Representative

Comments:

found 3 pinched o-rings, 1 bad elbow & 1 bad
field soft solder flange on old transmission line
run.

Dielectric Representative

Dan O. Oms

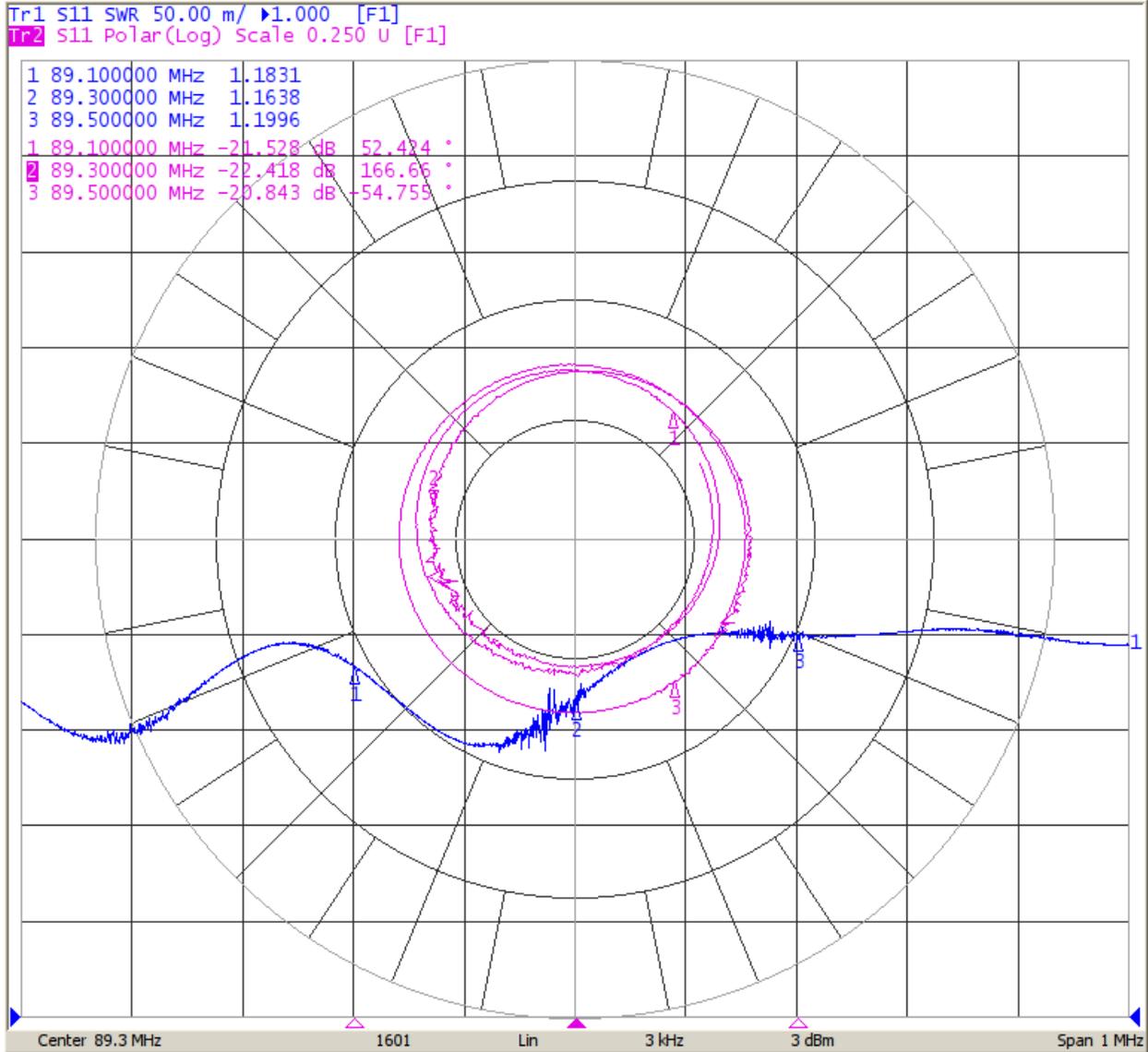
Customer Representative

John Castaldo

Date: 9/30/2016

**WSCI-FM Charleston, SC
System Response 1 MHz
Before Antenna Variable Transformer Adjustment (all probes out)**

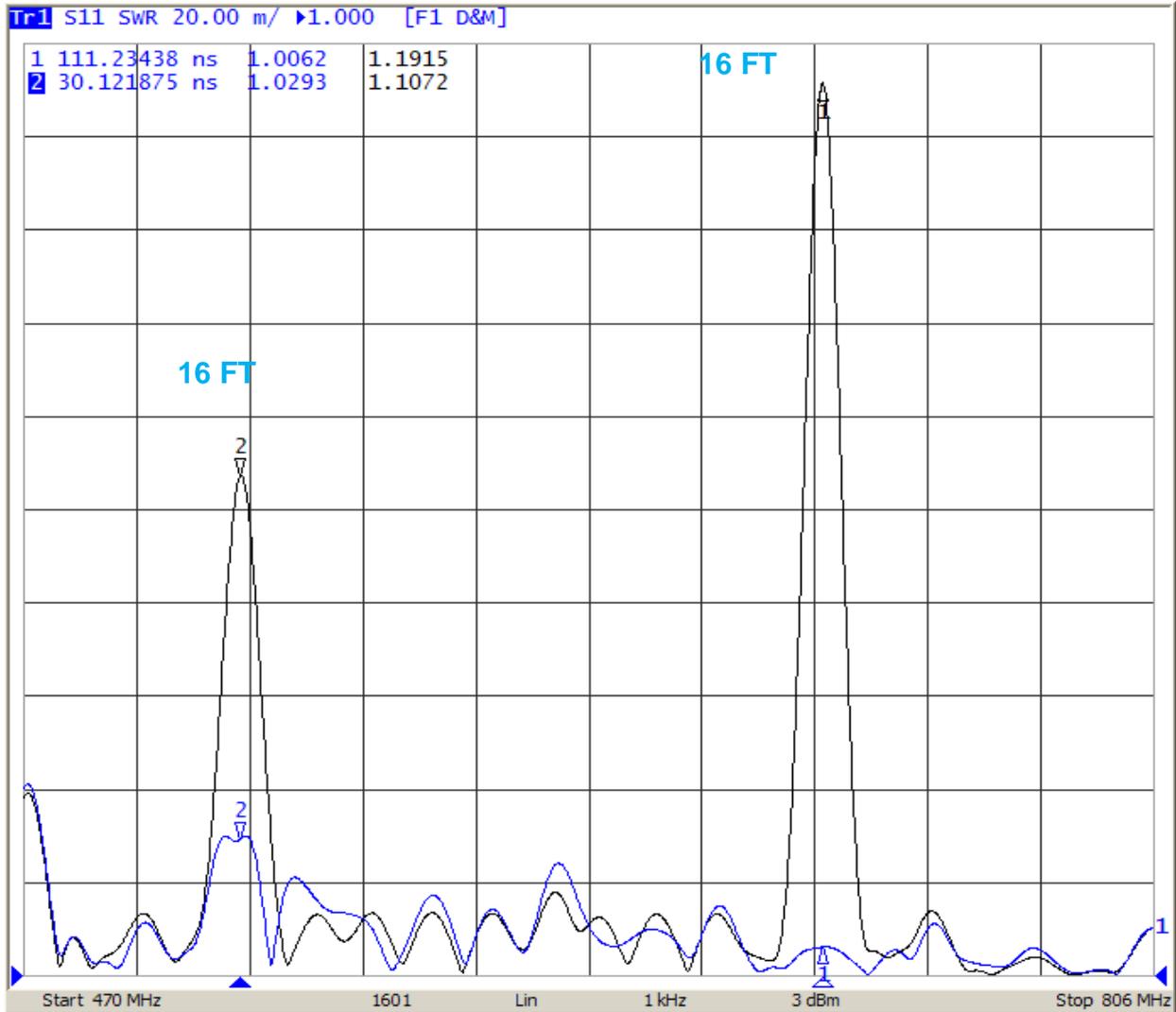
10/3/2016 2:56:55 PM



Marker 1: Carrier -200 kHz
Marker 2: Carrier
Marker 3: Carrier +200 kHz

WSCI-FM Charleston, SC
TDR in VSWR 470 to 806 MHz
(Line Loaded)

10/1/2016 5:37:53 AM



TDR display from the test adapter to 0.125 uS in the run
 Memory Trace = Before Line Repairs
 Data Trace = After Line Repairs

Site Photos



HARRIS

GATES®

MODEL: HPX40 DATE: 1/20/2012
PART NO: HARHPX40FLX ID: V-HPX-FMHD
SERIAL NO: G010001891-007 OTHER ID: IC 122L-08202010
FREQUENCY: 89.3 MHZ
CHANNEL: _____
POWER OUT: 42 KW _____ AVG _____ PK
208 VAC 3 PHASE 60 HZ 60 KW MAX

HARRIS CORPORATION
BROADCAST COMMUNICATIONS DIVISION Quincy, Illinois, USA



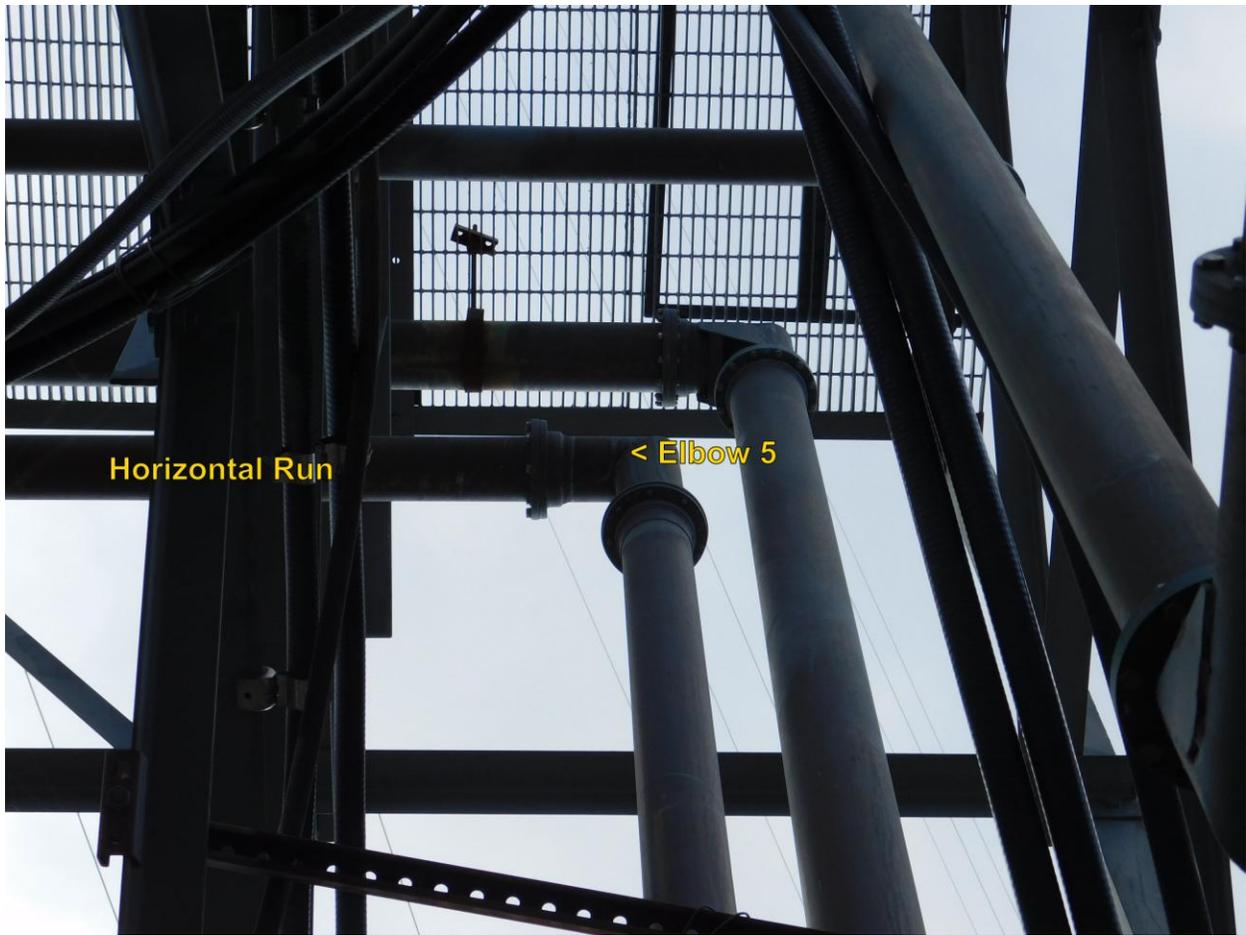










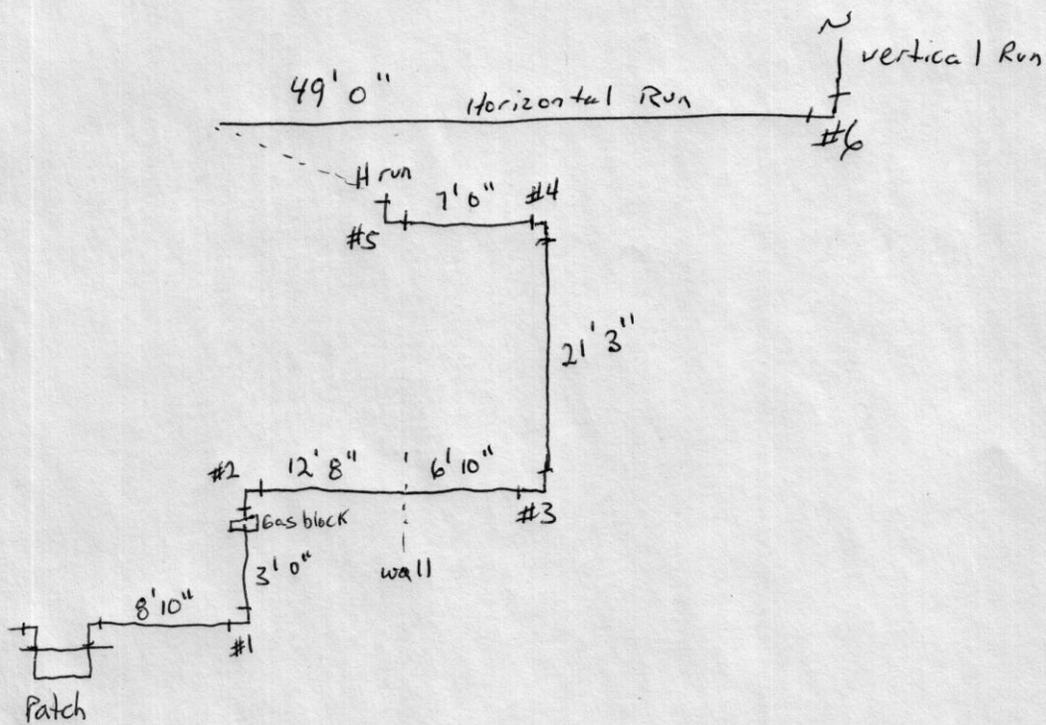








WSCI 9-30-2016
Line layout and approximate lengths





One of pinched o-rings



Unibolt elbow with contaminated RF lip