

**Antenna System Field Report**

**WCLQ-FM  
89.5 mHz**

**Wausau, Wisconsin**

Antenna - ERI LP-5E-DA-SP  
Transmission Line - Andrew Corp. 3" 50 Ohm x 141'

*prepared for:*

**Christian Life Communications, Inc.**

**February 9, 2004**

**D. L. Markley & Associates, Inc.**  
*Consulting Engineers*  
2104 West Moss Avenue  
Peoria, Illinois 61604  
(309)673-7511  
Prepared By: Richard Wood

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## **Antenna System Field Report**

This report has been prepared for Christian Life Communications, Inc. and contains tests and measurements taken at the WCLQ-FM transmitter site located near Wausau, WI. The attached data plots were recorded on the afternoon of February 3, 2004.

Test equipment utilized on-site included a Hewlett-Packard 8753-E Network Analyzer. This instrument was calibrated on-site for the frequencies specific to WCLQ-FM, and in accordance with the manufacturer's written instructions. The calibration procedure established the reference plane at the input to the 3" to Type 'N' test transition provided by this office. The test transition was connected to the 3" rigid elbow that normally would be connected to the Harris transmitter harmonic filter output. To ensure maximum accuracy and data plot clarity, the Analyzer was set to the 1601 point mode.

WCLQ-FM purchased a new directional antenna system from Electronic Research Inc. This firm was contracted to perform final testing and tuning of the new antenna system, and verify the installation of the directional antenna for FCC filing. The next section describes the individual data plots in this report, followed by a Summary & Conclusion statement, and the last page contains the Affidavit of Installation for the antenna.

## Discussion of Individual Plots

Plot #1 shows the initial VSWR values of the antenna system before tuning the input fine-matcher. Marker One was placed at the center of the station's assigned frequency and showed an initial VSWR of 1.06 to 1. Marker Two was placed 100 kHz below Marker One and had a value of 1.05 to 1. Marker Three detailed the frequency 100 kHz above Marker One which had a reading of 1.08 to 1. Marker Four showed the minimum reading in the 10 mHz span of this test to have been 1.05 to 1.

Plot #2 is the first of eight measurements performed after tuning the antenna input fine-matcher. In this VSWR/Frequency Domain Markers One, Two, and Three showed readings of 1.08 to 1.

The 3<sup>rd</sup> Plot is a Log Magnitude test in the Frequency Domain. Marker One indicated a final Return Loss of 28.2 db, and was set to 89.5 mHz. Marker Two was placed 100 kHz below the assigned frequency, and had a reading of 28.0 db, Marker Three was placed 100 kHz above Marker One, and showed a value of 27.8 db.

Plot #4 shows a Smith Impedance Chart centered on 89.5 mHz with a 1 mHz span. The markers are placed as discussed in Plot #3, and showed impedance readings of  $54.0 -j 21.4 \text{ m}\Omega$ ,  $53.5 +j 2.1\Omega$ , and  $53.6 -j 2.17\Omega$ , respectively.

The 5<sup>th</sup> Plot is a Time Domain/VSWR test with a 1 mHz span. Marker One was set to the antenna-end of the system, and showed a reading of 1.09 to 1. Marker Two detailed the transmission line vertical run, with a value of 1.06 to 1.

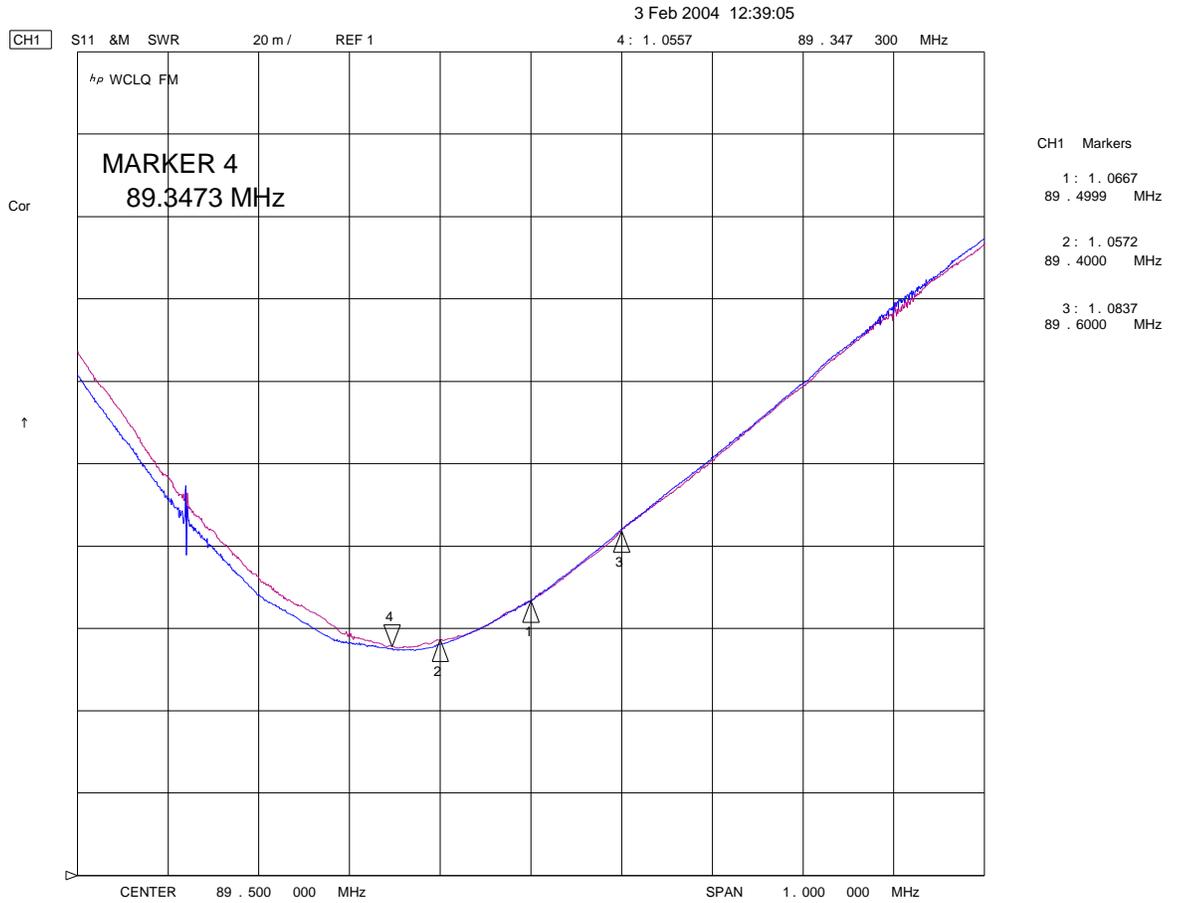
Plot #6 is a VSWR test in the Frequency Domain with a 10 mHz span. Marker One was set to 89.5 mHz, and had a reading of 1.08 to 1. Marker Two detailed the frequency of 89.4 mHz, and indicated a VSWR of 1.082 to 1. Marker Three was placed on 89.5 mHz and had a value of 1.085 to 1.

The 7<sup>th</sup> Plot is a Time Domain test in the VSWR format with a 10 mHz Frequency Span. Marker One showed the average VSWR at the antenna to have been 1.3 to 1. Marker Two was set near the antenna input, and showed a reading of 1.2 to 1. Marker Three was placed in the line vertical run and showed a value of 1.0097 to 1.

Plot #8 detailed a Time Domain/VSWR test with a 100 mHz span to provide more detail on the transmission line characteristics. Marker One was placed at the input to the antenna, and showed a value of 1.007 to 1. Marker Two was placed 10' down from Marker One, and had a reading of 1.004 to 1. Marker Three was set in the line vertical run, and had a value of 1.001 to 1. Marker Four was placed in the short rigid run from the test connection to the 'Heliac' input, and showed a VSWR of 1.005 to 1.

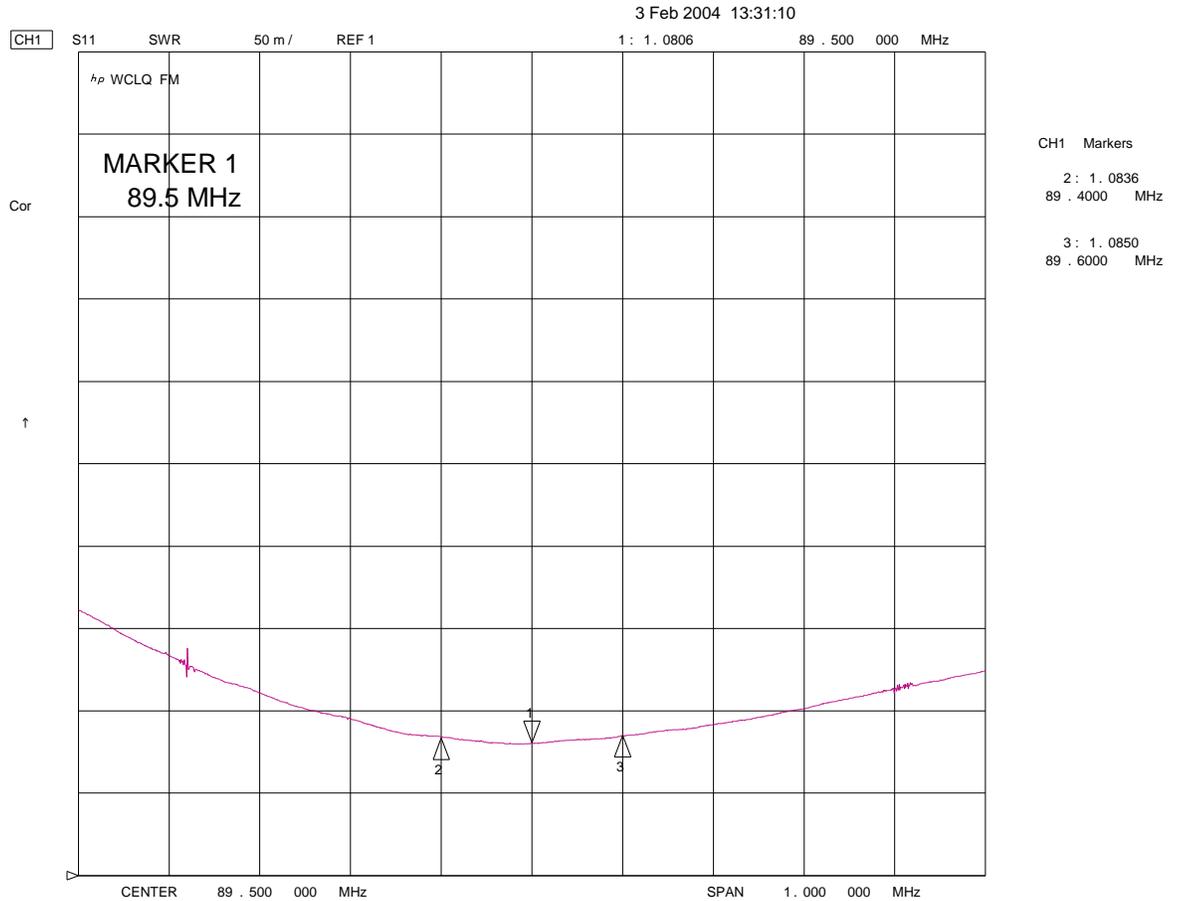
The last plot, #9, is a Time Domain test with a Wide Band Frequency Span, in the VSWR format. Marker One was placed at the top of the 'Heliac' run, and showed a reading of 1.002 to 1. Marker Two was placed 11' down from Marker One, and showed a reading of 1.006 to 1. Marker Three was set in the line vertical run 98' from the test connection, and had an average VSWR of 1.001 to 1. Marker Four showed the VSWR of the elbow placed on the 'Heliac' connector to have been 1.01 to 1.

# WCLQ-FM Antenna System



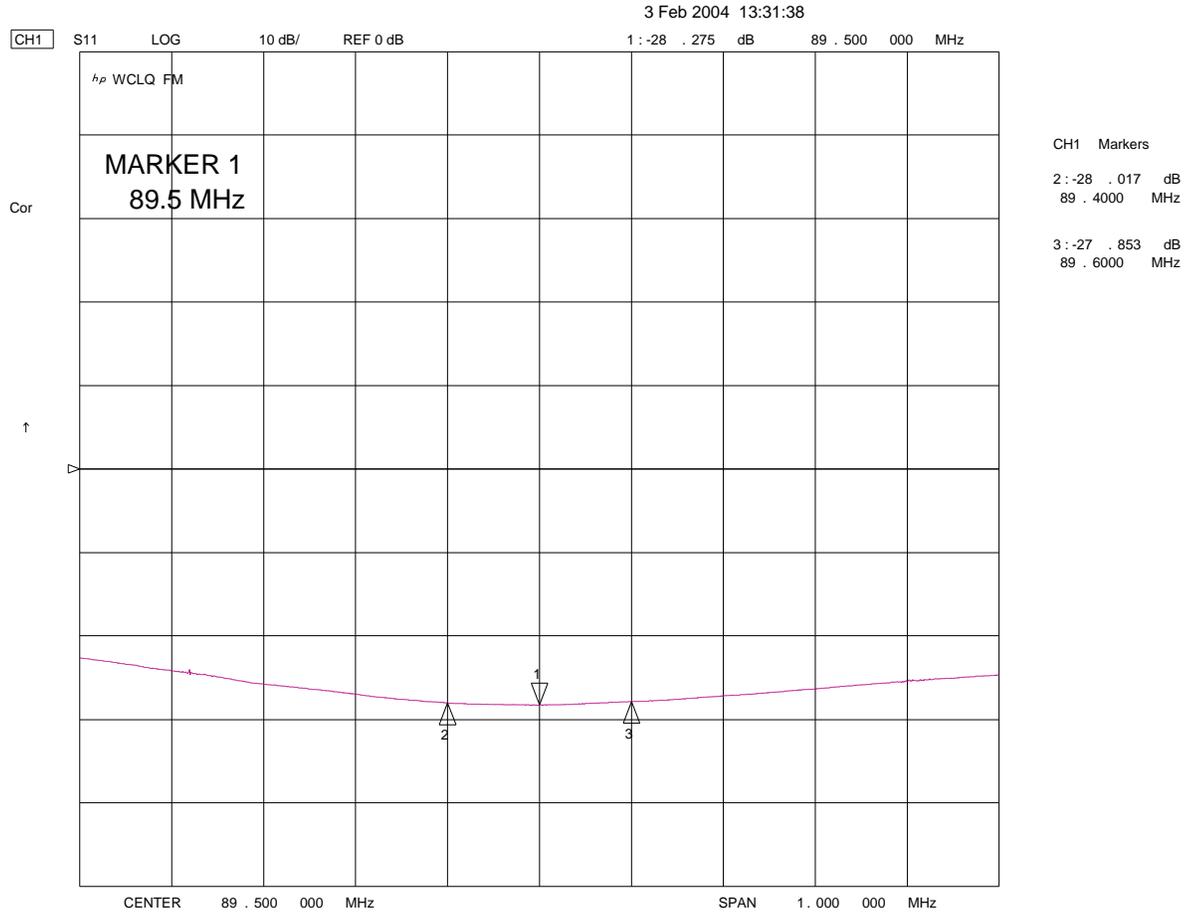
**Plot #1 Initial Frequency Domain VSWR  
10 MHz Frequency Span**

# WCLQ-FM Antenna System



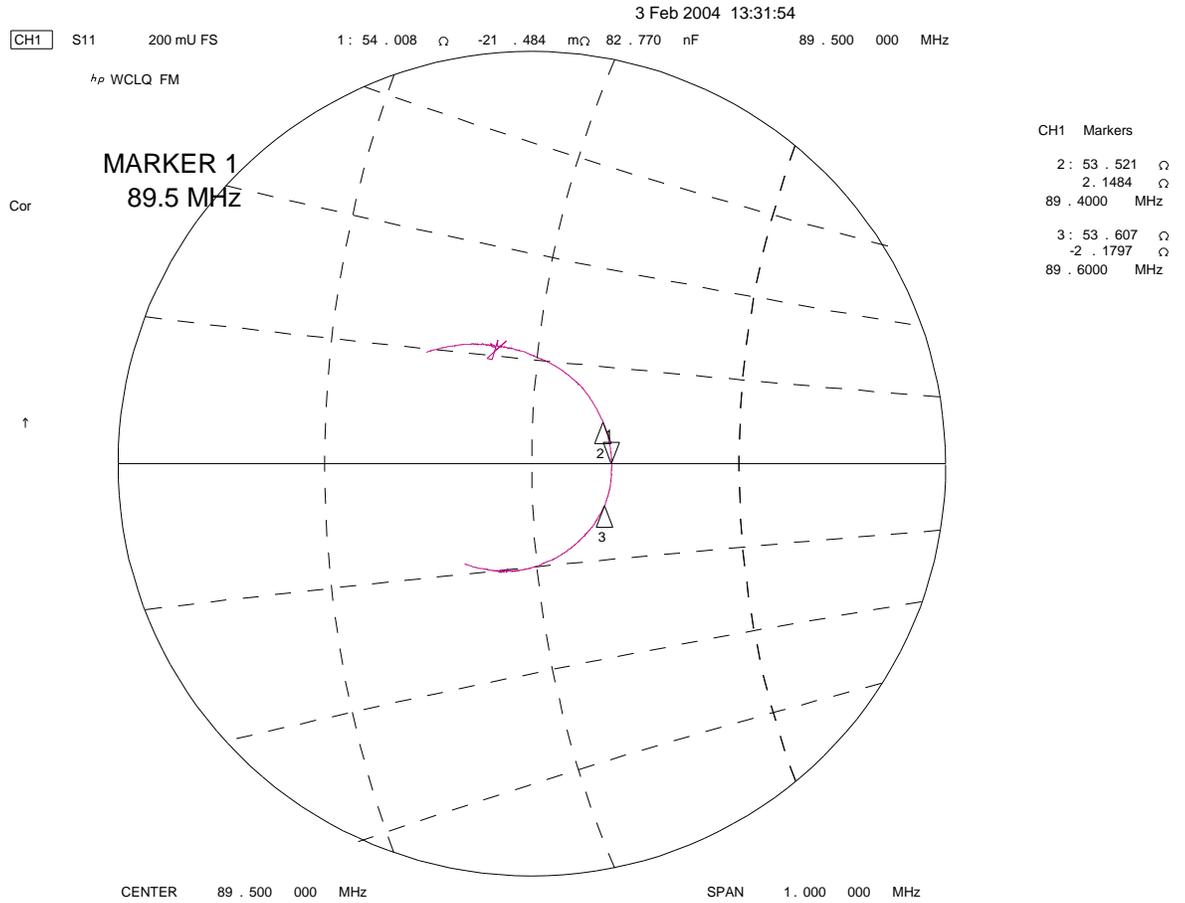
**Plot #2 Final Frequency Domain VSWR  
1 MHz Frequency Span**

# WCLQ-FM Antenna System



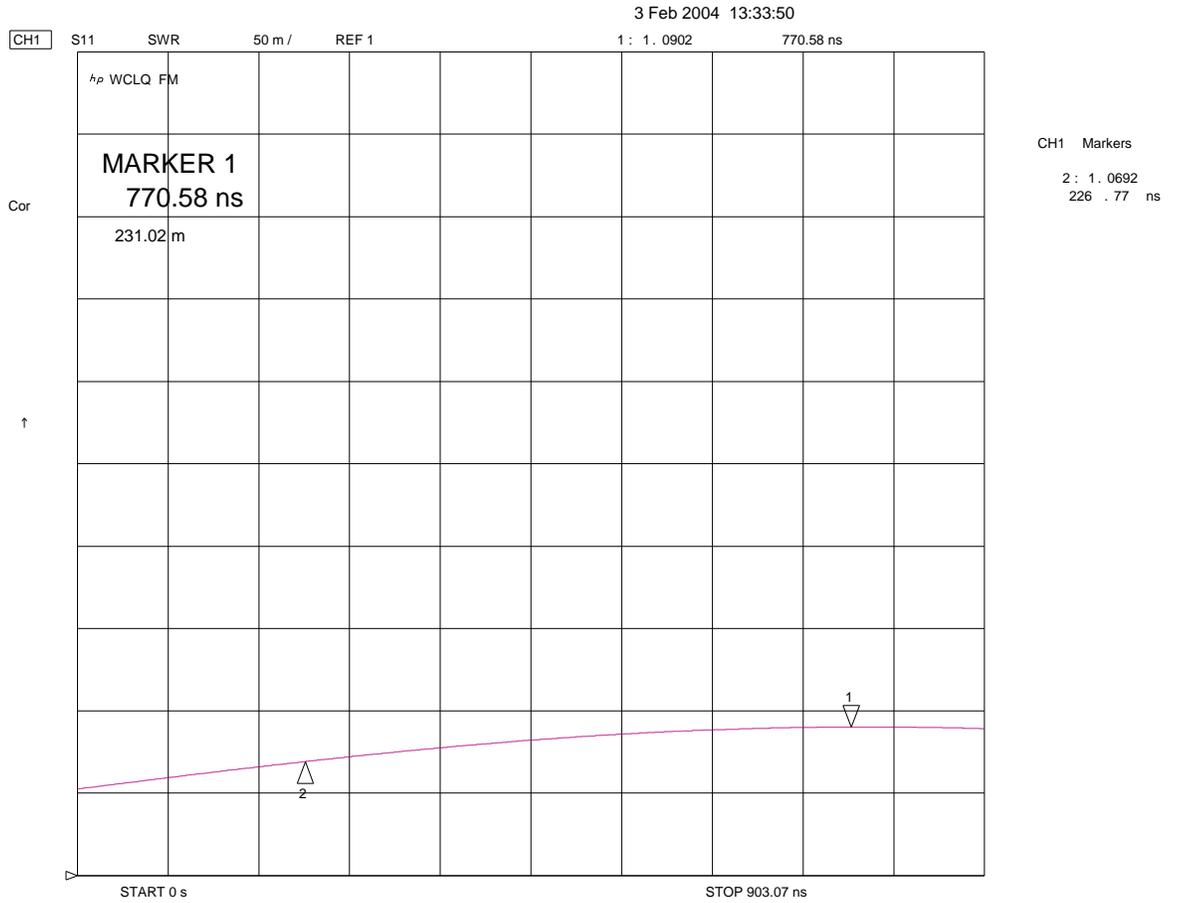
**Plot #3 Final Frequency Domain Return Loss  
1 MHz Frequency Span**

# WCLQ-FM Antenna System



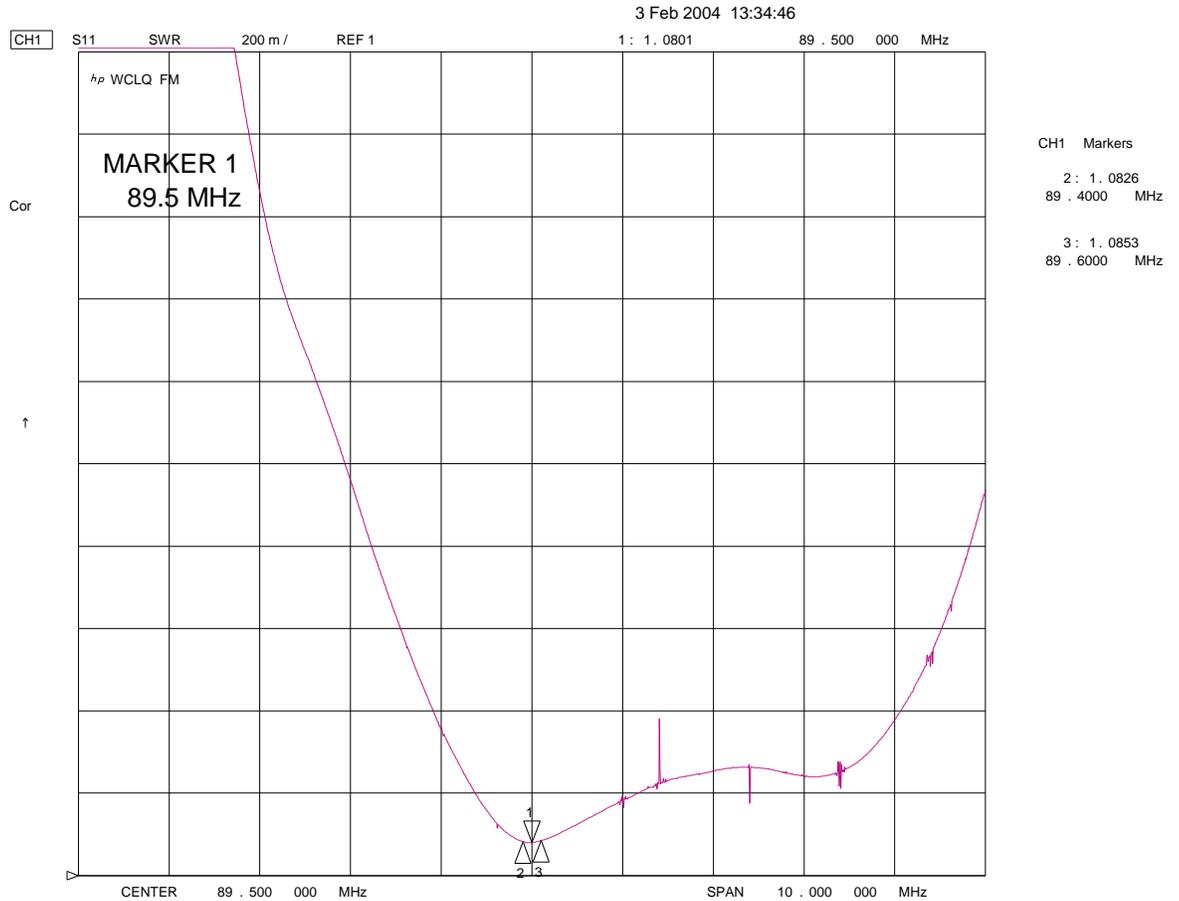
**Plot #4 Final Frequency Domain Smith Chart  
1 MHz Frequency Span**

# WCLQ-FM Antenna System



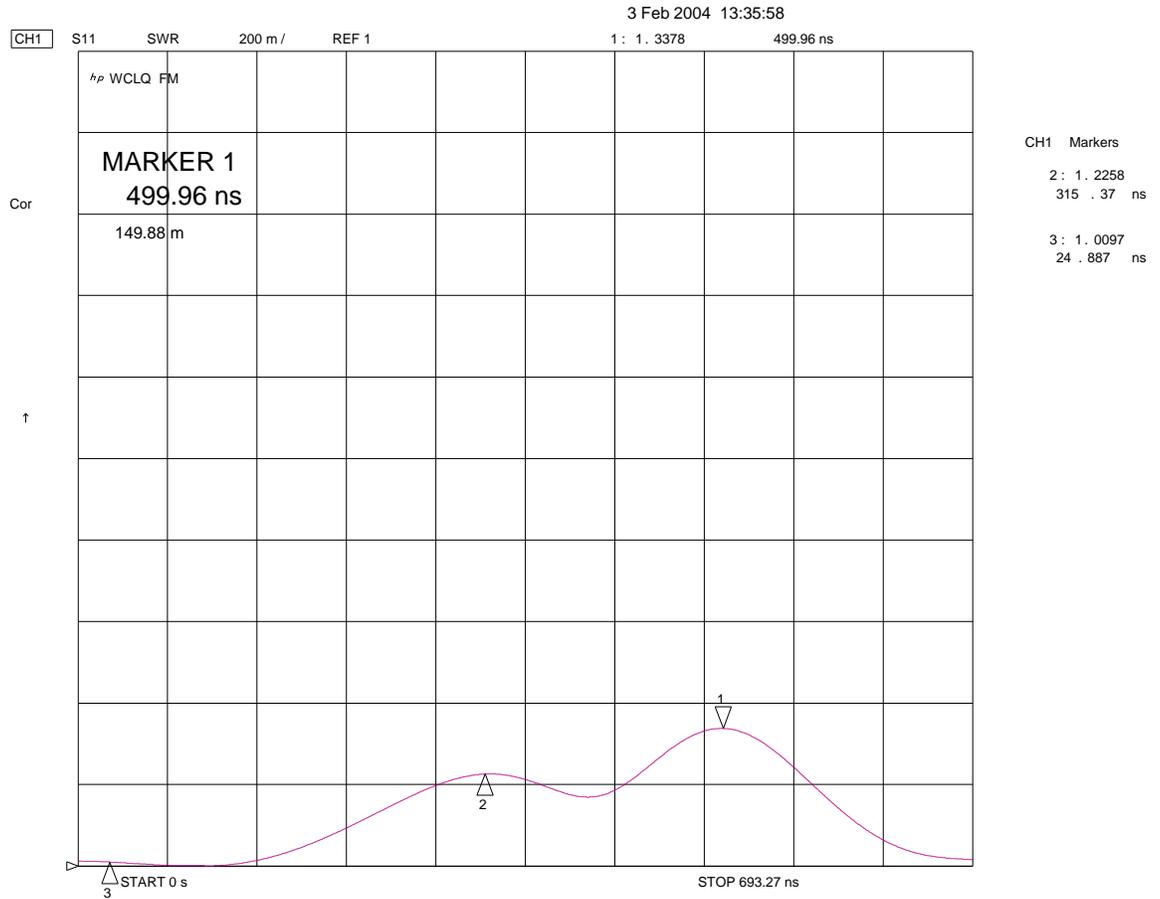
**Plot #5 Final Time Domain VSWR  
1 mHz Frequency Span**

# WCLQ-FM Antenna System



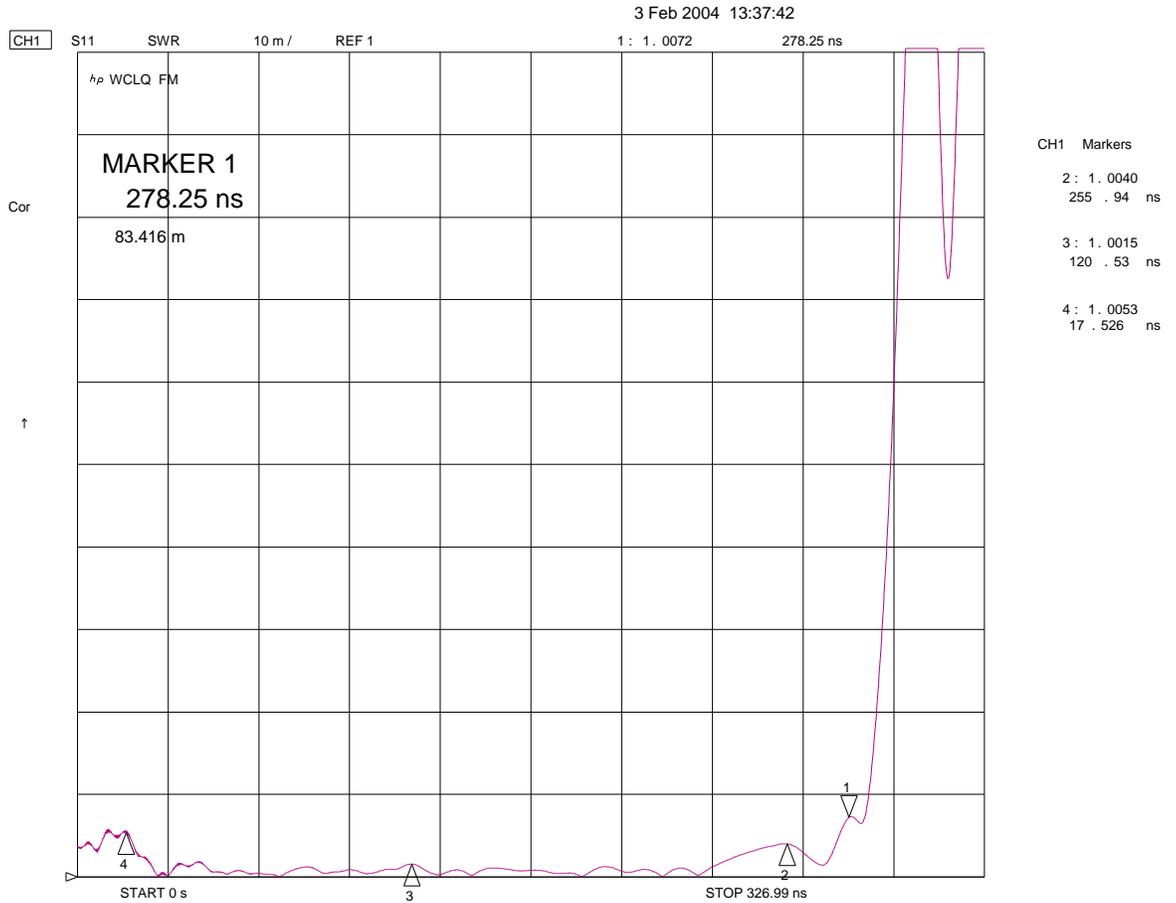
**Plot #6 Final Frequency Domain VSWR  
10 mHz Frequency Span**

# WCLQ-FM Antenna System



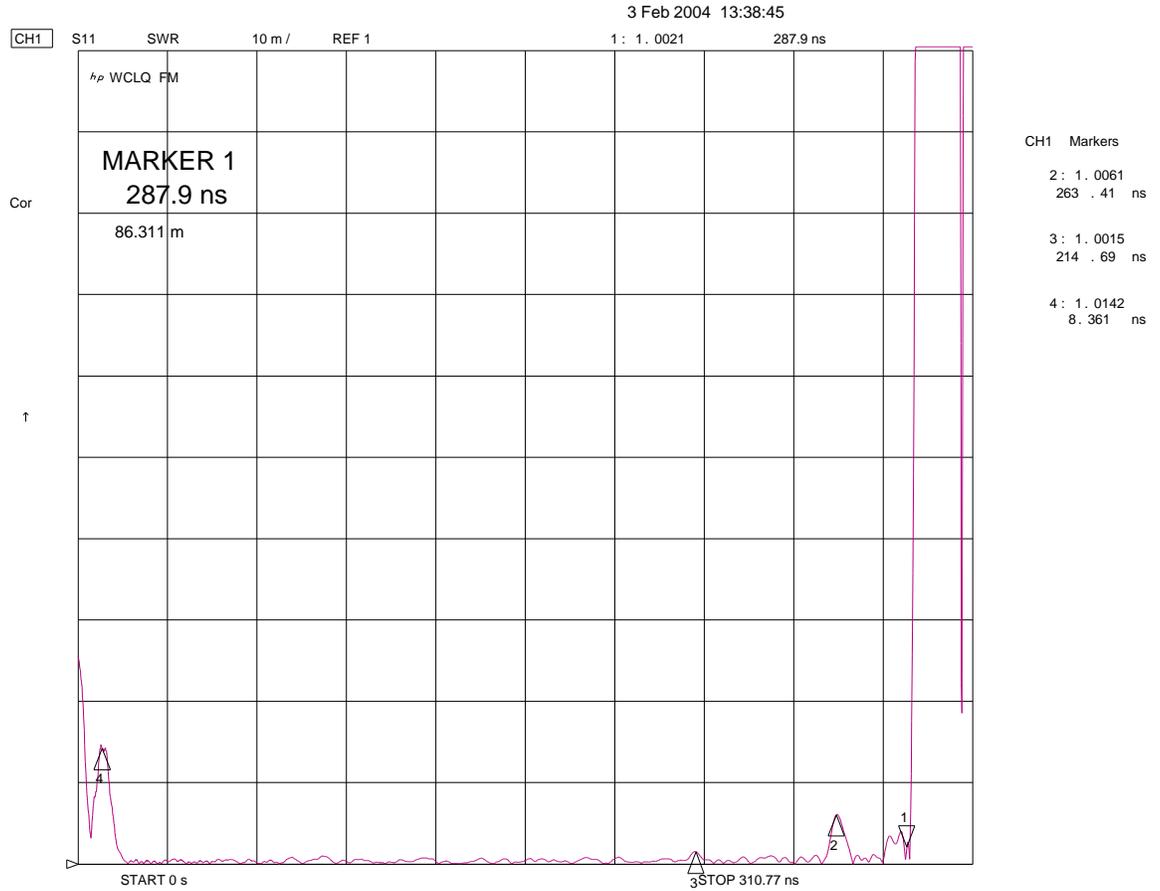
**Plot #7 Final Time Domain VSWR  
10 mHz Frequency Span**

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**Plot #8 Final Time Domain VSWR  
100 mHz Frequency Span**

# WCLQ-FM Antenna System



**Plot #9 Final Time Domain VSWR  
Wide Band (350 mHz) Frequency Span**

## **Summary & Conclusion**

By the tests and measurements performed on the WCLQ-FM antenna system it appeared to have VSWR values acceptable for FM radio operations. The final adjusted reading was 1.08 to 1 at the assigned frequency, and 1.08 to 1 for +/- 100 kHz from center which should allow for varying conditions, and HD radio transmission.

This report was prepared by me, or under my direction, and the statements contained herein are true and accurate to the best of my belief and knowledge.

*Richard Wood*  
Staff Engineer  
**D. L. Markley & Associates, Inc.**  
February 9, 2004

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**Telephone 673-7511**  
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**Directional Antenna Installation Affidavit**

*Station-WCLQ-FM*

**Frequency- 89.5 mHz**

**Channel- 208**

**Directional Antenna- Electronic Research, Inc Model LP-5E-DA-SP**

**Sirs:**

**I have inspected the Directional FM antenna installation for the above listed station and found it to be pursuant with the manufacturer's instructions and installation drawings.**

**Richard H. Wood**  
**FCC General Class Radio Telephone License # PG-18-28010**  
**Staff Engineer**  
**D. L. Markley & Associates, Inc.**  
**February 5, 2004**