ENGINEERING STATEMENT

OF

JOHN F.X. BROWNE, P.E.

IN SUPPORT OF APPLICATION

FOR

LICENSE TO COVER CONSTRUCTION PERMIT

WVGR-FM

GRAND RAPIDS, MI

Background

The Regents of The University of Michigan (UOM) is the licensee of WVGR-FM (BLH-19800420AB, Facility ID#66309) and holds a construction permit (BPED-20061005ACP) to move the WVGR-FM transmission facility to a new site. UOM in the instant application is filing for a "License to Cover" the construction permit and also requests Program Test Authority.

Special Operating Conditions or Restrictions:

The construction permit lists the 5 special operating conditions or restrictions that follow:

1. The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic fields in excess of FCC guidelines.

2. BEFORE PROGRAM TESTS ARE AUTHORIZED, permittee shall submit the results of a complete proof-of-performance to establish the horizontal plane radiation patterns for both the horizontally and vertically polarized radiation components. This proof-of-performance may beaccomplished using the complete full size antenna, or individual bays therefrom, mounted on a supporting structure of identical dimensions and configuration as the proposed structure, including all braces, ladders, conduits, coaxial lines, and other appurtenances; or using a carefully manufactured scale model of the entire antenna, or individual bays therefrom, mounted on an equally scaled model of the proposed supporting structure, including all appurtenances. Engineering exhibits should include a description of the antenna testing facilities and equipment employed, including appropriate photographs or sketches and a description of the testing procedures, including scale factor, measurements frequency, and equipment calibration.

3. BEFORE PROGRAM TESTS ARE AUTHORIZED, permittee shall submit an affidavit from a licensed surveyor to establish that the directional antenna has been oriented at the proper azimuth.

4. BEFORE PROGRAM TESTS ARE AUTHORIZED, permittee/licensee shall submit an affidavit that the installation of the directional antenna system was overseen by a qualified engineer. This affidavit shall include a certification by the engineer that the antenna was installed pursuant to the manufacturer's instructions and list the qualifications of the certifying engineer.

5. The relative field strength of neither the measured horizontally nor vertically polarized radiation component shall exceed at any azimuth the value indicated on the composite radiation pattern authorized by this construction permit. A relative field strength of 1.0 on the composite radiation pattern herein authorized corresponds to the following effective radiated power:

   96.0 kilowatts.

   Principal minima and their associated field strength limits:

   40 degrees True: 84.83 kilowatts
   120 degrees True: 26.56 kilowatts
   160 degrees True: 41.82 kilowatts
   220 degrees True: 18.59 kilowatts
   300 degrees True: 54.58 kilowatts

Statement on RFR Compliance

UOM agrees to comply with the Commission's requirements regarding power adjustments or cessation of operation as may be necessary to ensure a compliant environment for worker access. Workers will also be encouraged to wear personal RFR monitors when on the structure. A locked security fence will enclose the tower base and appropriate signage warning of RFR hazards will be put in place.

Exhibits and Tables

Attached to this statement are the following exhibits and tables required by the special operating conditions or restrictions:

Exhibit 1 is the antenna proof-of-performance.

Exhibit 2 is an affidavit from a licensed surveyor establishing that the directional antenna has been oriented at the proper azimuth.

Exhibit 3 is an affidavit that the installation of the directional system was overseen by a qualified engineer. It includes a certification by the engineer that the antenna was installed pursuant to the manufacturer's instructions and lists the qualifications of the certifying engineer.

Table 1 is a table showing a comparison of the relative field strengths and ERP in dBk of the antenna pattern authorized by the construction permit with the composite pattern of the measured horizontally and vertically polarized radiation components of the antenna.

Certification

I hereby certify that the foregoing report or statement was prepared by me but may include work performed by others under my supervision or direction. The statements of fact contained therein are believed to be true and correct based on personal knowledge, information and belief unless otherwise stated; with respect to facts not known of my own personal knowledge, I believe them to be true and correct based on their origin from sources known to me to be generally reliable and accurate. I have prepared this document with due care and in accordance with applicable standards of professional practice.

John F. X. Browne, P.E.
October 12, 2006

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PATTERN CERTIFICATION

Method of Measurement

The azimuth pattern for "WVGR", Dielectric Document Sketch #010, was measured in the following manner.

A single 4.4 to1 scale model "DCRC6EHD" bay radiator was mounted on a similarly scaled model of the tower according to information provided to Dielectric by the customer; refer to Dielectric Document Sketch #010. The antenna under test, all parasitics, all known tower appurtenances, and the tower section were rotated through 360 degrees while receiving a signal at the appropriate frequency from a linear cavity-backed source antenna. Both the horizontal and vertical polarization azimuth patterns were measured in an anechoic test range.

The transmit and scale model antennas are mounted at identical elevations and at opposite ends of the chamber. A Hewlett Packard model 8752C network analyzer was used to supply the RF signal to the source antenna at 4.4 times the fundamental FM frequency and to receive the signal intercepted by the antenna under test. The received signal was converted to a relative level, referenced to the source. This level was stored on a computer acting as the master controller. The computer controls the measurement system via IEEE-488 control bus through a GPIB card.

Statement of Qualifications

Keith L. Pelletier is a Senior Electrical Engineer here at Dielectric. He received a BS in Electrical Engineering Technology from the University of Maine in 1998. He has over 6 years experience in RF antenna engineering and has been employed by Dielectric Communications since 1997.

Signed By: _____

Date: _____

MSO NO: 82382

DATE: AUG 12, 2005

PATTERN NO: 010

FM AZIMUTH PATTERN APPROVAL

The azimuth pattern of the horizontal polarization and vertical polarization as supplied by Dielectric in the document labeled " Pattern 010 ", is acknowledged as acceptable. We understand that Dielectric does not guarantee or predict signal strength in any particular location.

_____
(Customer's name)

By: _____
(Name typed or printed)

Title: _____

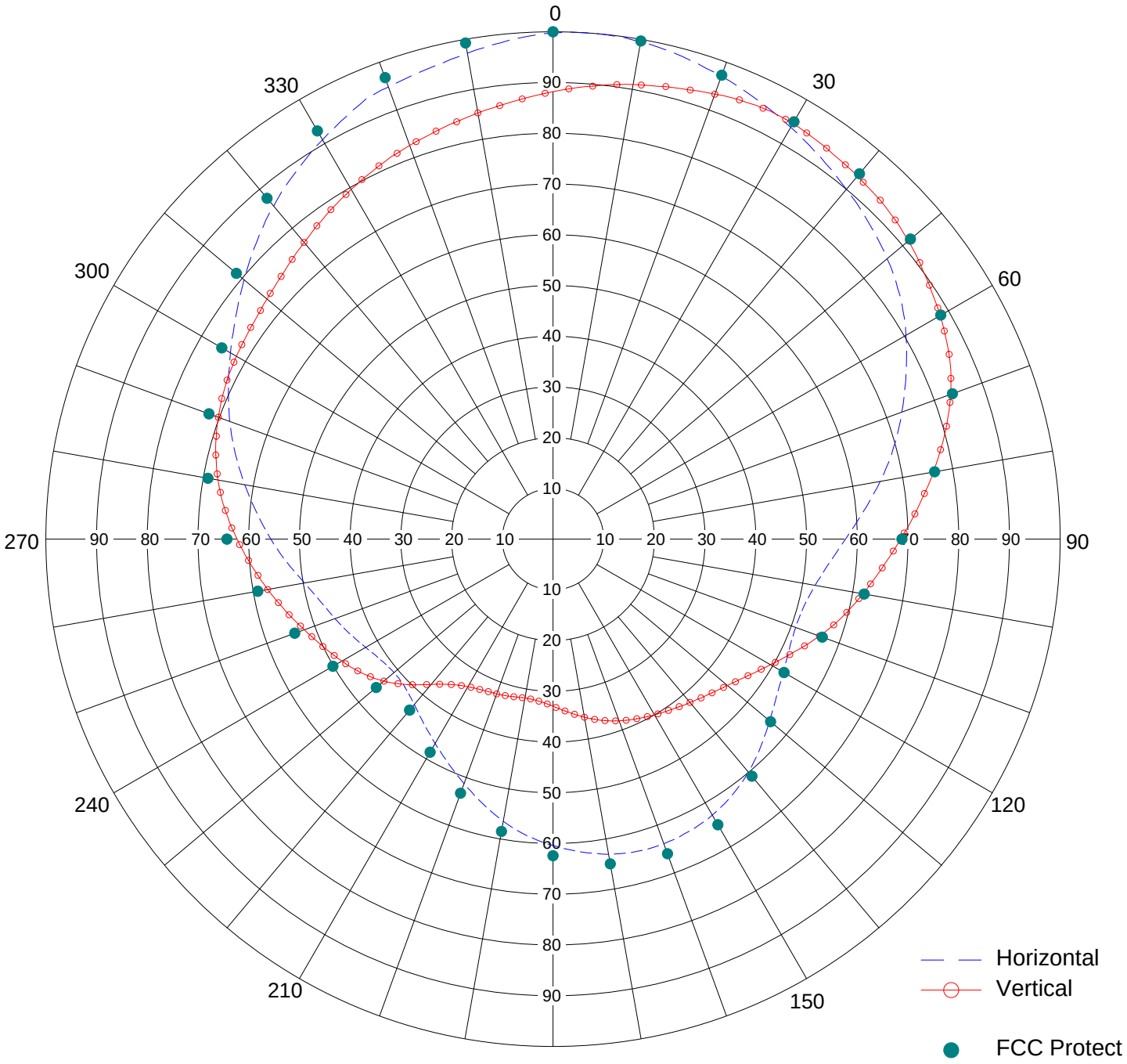
_____
(Signature)

Proposal Number	**82382**	Revision	**4**
Date	**Sep 22, 2006**		
Call Letters	**WVGR**		
Location	**Grand Rapids, MI**		
Customer	**University of Michigan**		
Antenna Type	**DCRC6EHD**		

AZIMUTH PATTERN

Ccov 98.4% - Hrms 51.4% - Vrms 48.6%

Gain	**2.02 (3.05) HPOL 2.02 (3.05) VPOL**	Frequency	**104.1 MHz**
Calculated / Measured	**Measured**	Drawing #	**010**



Dielectric

Proposal Number	**82382**
Date	**22-Sep-06**
Call Letters	**WVGR**
Location	**Grand Rapids, M**
Customer	**University of Michigan**
Antenna Type	**DCRC6EHD**
Frequency	**104.10 MHz**
Drawing #:	**10**

TABULATION OF HORIZONTAL AZIMUTH PATTERN

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.998	45	0.881	90	0.577	135	0.579	180	0.604	225	0.413	270	0.556	315	0.827
1	0.999	46	0.877	91	0.570	136	0.583	181	0.601	226	0.411	271	0.562	316	0.834
2	1.000	47	0.873	92	0.564	137	0.587	182	0.598	227	0.410	272	0.568	317	0.839
3	1.000	48	0.869	93	0.558	138	0.591	183	0.594	228	0.409	273	0.574	318	0.846
4	1.000	49	0.865	94	0.552	139	0.596	184	0.590	229	0.409	274	0.580	319	0.852
5	1.000	50	0.860	95	0.546	140	0.599	185	0.587	230	0.409	275	0.586	320	0.857
6	1.000	51	0.856	96	0.541	141	0.603	186	0.583	231	0.410	276	0.592	321	0.863
7	0.999	52	0.851	97	0.537	142	0.607	187	0.579	232	0.411	277	0.598	322	0.869
8	0.999	53	0.846	98	0.533	143	0.609	188	0.574	233	0.412	278	0.605	323	0.874
9	0.996	54	0.840	99	0.528	144	0.613	189	0.569	234	0.413	279	0.611	324	0.879
10	0.995	55	0.835	100	0.525	145	0.616	190	0.565	235	0.415	280	0.617	325	0.884
11	0.994	56	0.830	101	0.522	146	0.619	191	0.560	236	0.417	281	0.624	326	0.889
12	0.992	57	0.823	102	0.519	147	0.622	192	0.555	237	0.419	282	0.629	327	0.894
13	0.990	58	0.817	103	0.516	148	0.624	193	0.549	238	0.421	283	0.636	328	0.899
14	0.987	59	0.811	104	0.514	149	0.626	194	0.544	239	0.424	284	0.642	329	0.905
15	0.985	60	0.803	105	0.512	150	0.628	195	0.539	240	0.427	285	0.649	330	0.909
16	0.982	61	0.797	106	0.511	151	0.630	196	0.534	241	0.429	286	0.655	331	0.914
17	0.979	62	0.790	107	0.510	152	0.632	197	0.528	242	0.432	287	0.661	332	0.918
18	0.976	63	0.782	108	0.509	153	0.633	198	0.523	243	0.435	288	0.667	333	0.924
19	0.974	64	0.775	109	0.509	154	0.635	199	0.518	244	0.438	289	0.672	334	0.928
20	0.970	65	0.768	110	0.509	155	0.635	200	0.513	245	0.442	290	0.678	335	0.933
21	0.968	66	0.761	111	0.509	156	0.636	201	0.508	246	0.445	291	0.684	336	0.937
22	0.965	67	0.753	112	0.510	157	0.637	202	0.503	247	0.448	292	0.689	337	0.943
23	0.961	68	0.746	113	0.511	158	0.638	203	0.498	248	0.451	293	0.695	338	0.945
24	0.958	69	0.740	114	0.512	159	0.638	204	0.493	249	0.454	294	0.701	339	0.947
25	0.955	70	0.732	115	0.514	160	0.639	205	0.488	250	0.458	295	0.706	340	0.948
26	0.952	71	0.725	116	0.516	161	0.639	206	0.483	251	0.461	296	0.712	341	0.950
27	0.948	72	0.718	117	0.518	162	0.639	207	0.479	252	0.464	297	0.718	342	0.953
28	0.945	73	0.710	118	0.519	163	0.639	208	0.474	253	0.467	298	0.723	343	0.955
29	0.941	74	0.703	119	0.522	164	0.638	209	0.469	254	0.471	299	0.729	344	0.957
30	0.937	75	0.695	120	0.524	165	0.637	210	0.465	255	0.475	300	0.734	345	0.959
31	0.934	76	0.688	121	0.527	166	0.637	211	0.461	256	0.479	301	0.740	346	0.961
32	0.930	77	0.680	122	0.530	167	0.635	212	0.456	257	0.483	302	0.746	347	0.964
33	0.927	78	0.671	123	0.532	168	0.634	213	0.452	258	0.487	303	0.752	348	0.967
34	0.922	79	0.664	124	0.535	169	0.632	214	0.448	259	0.493	304	0.758	349	0.969
35	0.919	80	0.655	125	0.538	170	0.631	215	0.444	260	0.498	305	0.764	350	0.973
36	0.915	81	0.647	126	0.542	171	0.629	216	0.440	261	0.503	306	0.770	351	0.976
37	0.912	82	0.638	127	0.546	172	0.626	217	0.436	262	0.509	307	0.776	352	0.978
38	0.908	83	0.630	128	0.549	173	0.624	218	0.432	263	0.515	308	0.782	353	0.982
39	0.904	84	0.622	129	0.553	174	0.622	219	0.429	264	0.521	309	0.789	354	0.984
40	0.900	85	0.614	130	0.557	175	0.619	220	0.426	265	0.527	310	0.795	355	0.987
41	0.896	86	0.606	131	0.562	176	0.616	221	0.423	266	0.533	311	0.802	356	0.990
42	0.893	87	0.598	132	0.566	177	0.613	222	0.420	267	0.539	312	0.808	357	0.992
43	0.889	88	0.591	133	0.570	178	0.610	223	0.417	268	0.544	313	0.815	358	0.994
44	0.885	89	0.583	134	0.575	179	0.607	224	0.415	269	0.551	314	0.821	359	0.996

Dielectric

Proposal Number	**82382**
Date	**22-Sep-06**
Call Letters	**WVGR**
Location	**Grand Rapids, M**
Customer	**University of Michigan**
Antenna Type	**DCRC6EHD**
Frequency	**104.10 MHz**
Drawing #:	**10**

TABULATION OF VERTICAL AZIMUTH PATTERN

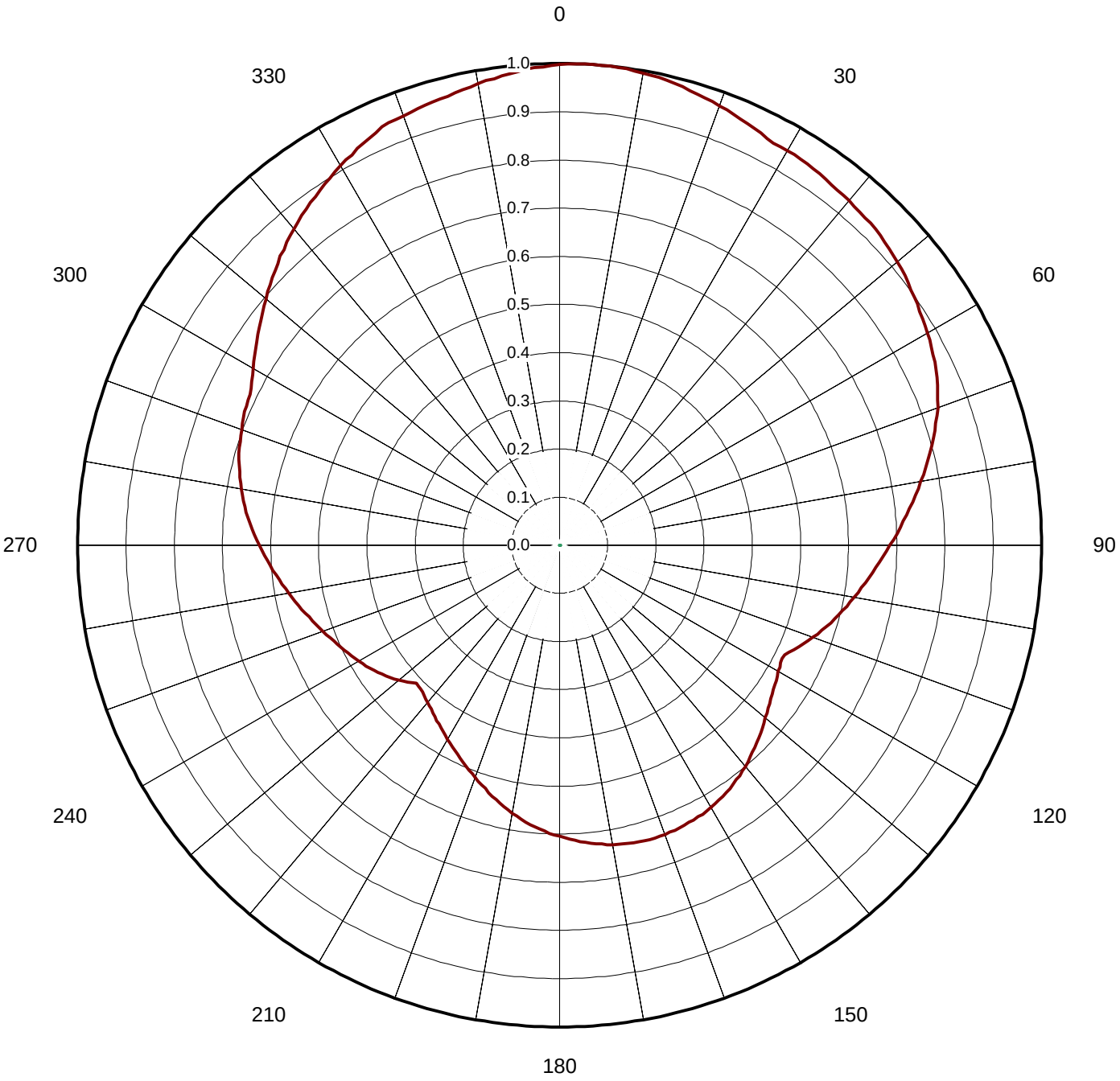
Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.882	45	0.927	90	0.685	135	0.433	180	0.330	225	0.405	270	0.623	315	0.748
1	0.885	46	0.925	91	0.678	136	0.430	181	0.327	226	0.412	271	0.628	316	0.752
2	0.888	47	0.922	92	0.671	137	0.428	182	0.325	227	0.418	272	0.634	317	0.754
3	0.891	48	0.920	93	0.664	138	0.425	183	0.324	228	0.424	273	0.639	318	0.758
4	0.894	49	0.917	94	0.658	139	0.423	184	0.322	229	0.430	274	0.643	319	0.760
5	0.896	50	0.915	95	0.652	140	0.420	185	0.321	230	0.435	275	0.649	320	0.764
6	0.899	51	0.912	96	0.645	141	0.418	186	0.319	231	0.441	276	0.654	321	0.766
7	0.903	52	0.909	97	0.639	142	0.416	187	0.319	232	0.446	277	0.658	322	0.770
8	0.905	53	0.906	98	0.632	143	0.413	188	0.318	233	0.451	278	0.662	323	0.773
9	0.908	54	0.901	99	0.627	144	0.412	189	0.318	234	0.455	279	0.667	324	0.776
10	0.910	55	0.898	100	0.621	145	0.409	190	0.318	235	0.460	280	0.671	325	0.780
11	0.912	56	0.895	101	0.614	146	0.407	191	0.318	236	0.464	281	0.674	326	0.783
12	0.914	57	0.891	102	0.609	147	0.405	192	0.319	237	0.469	282	0.678	327	0.786
13	0.916	58	0.888	103	0.602	148	0.404	193	0.319	238	0.473	283	0.681	328	0.790
14	0.919	59	0.885	104	0.597	149	0.402	194	0.320	239	0.477	284	0.685	329	0.792
15	0.921	60	0.881	105	0.591	150	0.400	195	0.321	240	0.481	285	0.689	330	0.796
16	0.924	61	0.878	106	0.585	151	0.398	196	0.322	241	0.485	286	0.692	331	0.799
17	0.926	62	0.874	107	0.579	152	0.396	197	0.322	242	0.489	287	0.694	332	0.803
18	0.929	63	0.870	108	0.572	153	0.394	198	0.323	243	0.493	288	0.697	333	0.805
19	0.931	64	0.866	109	0.566	154	0.393	199	0.324	244	0.497	289	0.700	334	0.808
20	0.933	65	0.862	110	0.559	155	0.391	200	0.325	245	0.501	290	0.702	335	0.812
21	0.936	66	0.857	111	0.552	156	0.389	201	0.325	246	0.505	291	0.705	336	0.815
22	0.939	67	0.852	112	0.546	157	0.387	202	0.326	247	0.509	292	0.707	337	0.818
23	0.941	68	0.846	113	0.539	158	0.385	203	0.327	248	0.513	293	0.710	338	0.820
24	0.942	69	0.840	114	0.532	159	0.383	204	0.327	249	0.518	294	0.711	339	0.823
25	0.944	70	0.835	115	0.525	160	0.381	205	0.328	250	0.522	295	0.713	340	0.826
26	0.945	71	0.828	116	0.519	161	0.379	206	0.330	251	0.527	296	0.715	341	0.829
27	0.946	72	0.821	117	0.513	162	0.377	207	0.331	252	0.531	297	0.717	342	0.831
28	0.946	73	0.814	118	0.507	163	0.375	208	0.332	253	0.536	298	0.718	343	0.834
29	0.946	74	0.807	119	0.501	164	0.372	209	0.334	254	0.541	299	0.719	344	0.836
30	0.946	75	0.800	120	0.495	165	0.370	210	0.336	255	0.546	300	0.721	345	0.839
31	0.945	76	0.792	121	0.490	166	0.367	211	0.338	256	0.551	301	0.722	346	0.842
32	0.944	77	0.784	122	0.484	167	0.365	212	0.340	257	0.556	302	0.724	347	0.844
33	0.943	78	0.777	123	0.479	168	0.362	213	0.343	258	0.561	303	0.724	348	0.847
34	0.942	79	0.769	124	0.474	169	0.359	214	0.346	259	0.566	304	0.726	349	0.850
35	0.941	80	0.761	125	0.469	170	0.356	215	0.350	260	0.571	305	0.728	350	0.853
36	0.939	81	0.754	126	0.465	171	0.354	216	0.354	261	0.576	306	0.729	351	0.856
37	0.937	82	0.746	127	0.460	172	0.351	217	0.358	262	0.581	307	0.730	352	0.858
38	0.936	83	0.738	128	0.457	173	0.348	218	0.363	263	0.586	308	0.732	353	0.861
39	0.935	84	0.730	129	0.452	174	0.345	219	0.368	264	0.591	309	0.734	354	0.864
40	0.934	85	0.723	130	0.449	175	0.342	220	0.374	265	0.597	310	0.736	355	0.867
41	0.932	86	0.715	131	0.446	176	0.340	221	0.380	266	0.602	311	0.739	356	0.870
42	0.931	87	0.708	132	0.442	177	0.337	222	0.386	267	0.607	312	0.740	357	0.873
43	0.930	88	0.701	133	0.439	178	0.334	223	0.393	268	0.612	313	0.743	358	0.876
44	0.929	89	0.693	134	0.436	179	0.332	224	0.399	269	0.618	314	0.746	359	0.879

Dielectric

Proposal Number	**82382**	Revision:	**4**
Date	**Sep 22, 2006**		
Call Letters	**WVGR**		
Location	**Grand Rapids, MI**		
Customer	**University of Michigan**		
Antenna Type	**DCRC6EHD**		

COMPOSITE AZIMUTH PATTERN

Calculated / Measured	**Measured**	Frequency	**104.10 MHz**
		Drawing #	**10**



Dielectric

Proposal Number	**82382**
Date	**22-Sep-06**
Call Letters	**WVGR**
Location	**Grand Rapids, MI**
Customer	**University of Michigan**
Antenna Type	**DCRC6EHD**
Frequency	**104.10 MHz**
Drawing #:	**10**

TABULATION OF COMPOSITE AZIMUTH PATTERN

Angle	Field
0	0.998
10	0.995
20	0.970
30	0.946
40	0.934
50	0.915
60	0.881
70	0.835
80	0.761
90	0.685
100	0.621
110	0.559
120	0.524
130	0.557
140	0.599
150	0.628
160	0.639
170	0.631
180	0.604
190	0.565
200	0.513
210	0.465
220	0.426
230	0.435
240	0.481
250	0.522
260	0.571
270	0.623
280	0.671
290	0.702
300	0.734
310	0.795
320	0.857
330	0.909
340	0.948
350	0.973

Proposal Number	**82382**
Date	**Sep 22, 2006**
Call Letters	**WVGR**
Location	**Grand Rapids, MI**
Customer	**University of Michigan**
Antenna Type	**DCRC6EHD**
Frequency	**104.10 MHz**
Drawing #	**10**

CUSTOMER GAIN SUMMARY

Azimuth Pattern Gain of Horizontal Polarization	**2.01**	**(3.03 dB)**
Elevation Pattern Gain Per Polarization	**3.20**	**(5.05 dB)**
Peak Gain at Horizontal Polarization	**6.43**	**(8.08 dB)**

Proposal Number	**82382**
Date	**22-Sep-06**
Call Letters	**WVGR**
Location	**Grand Rapids, MI**
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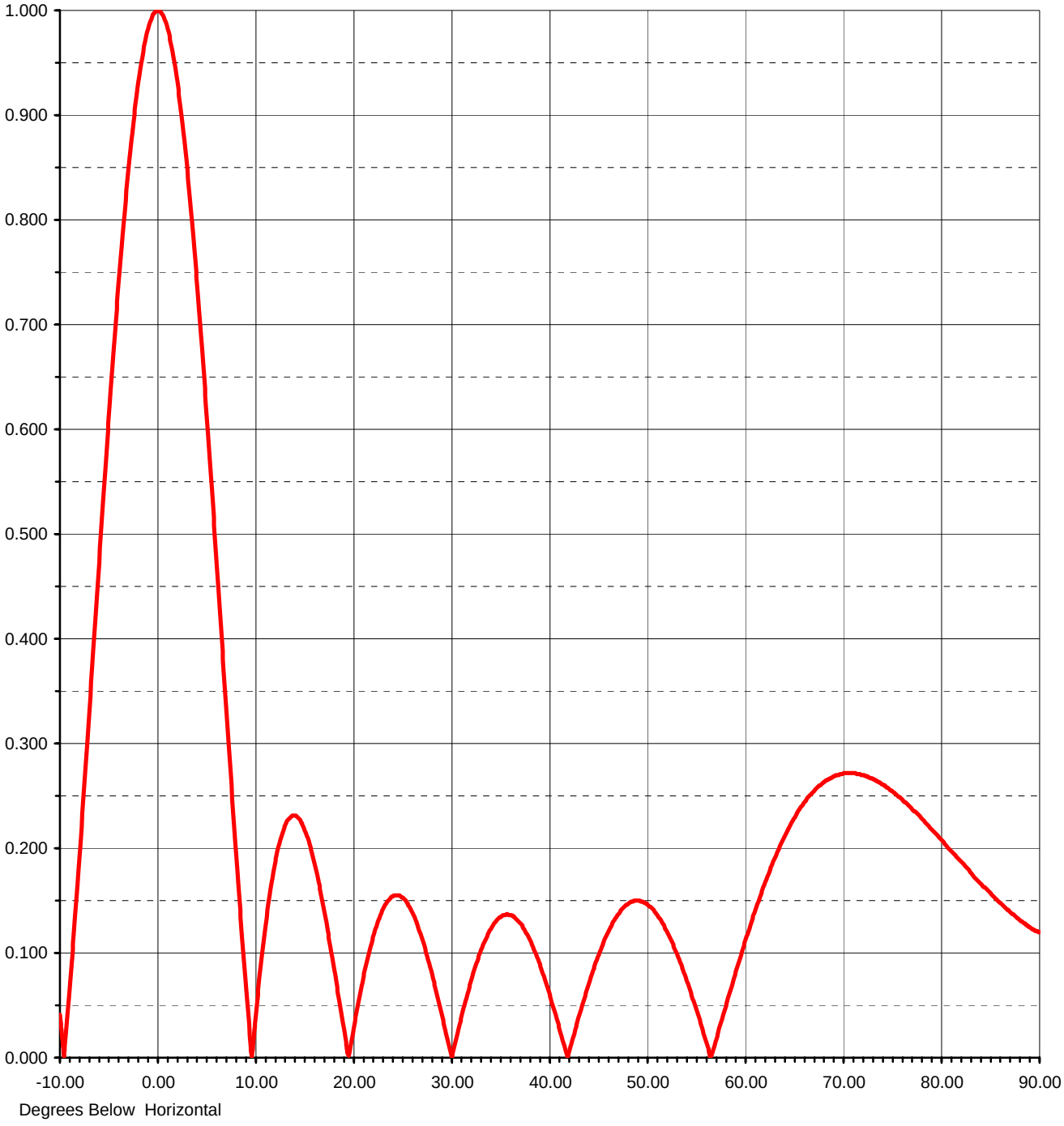
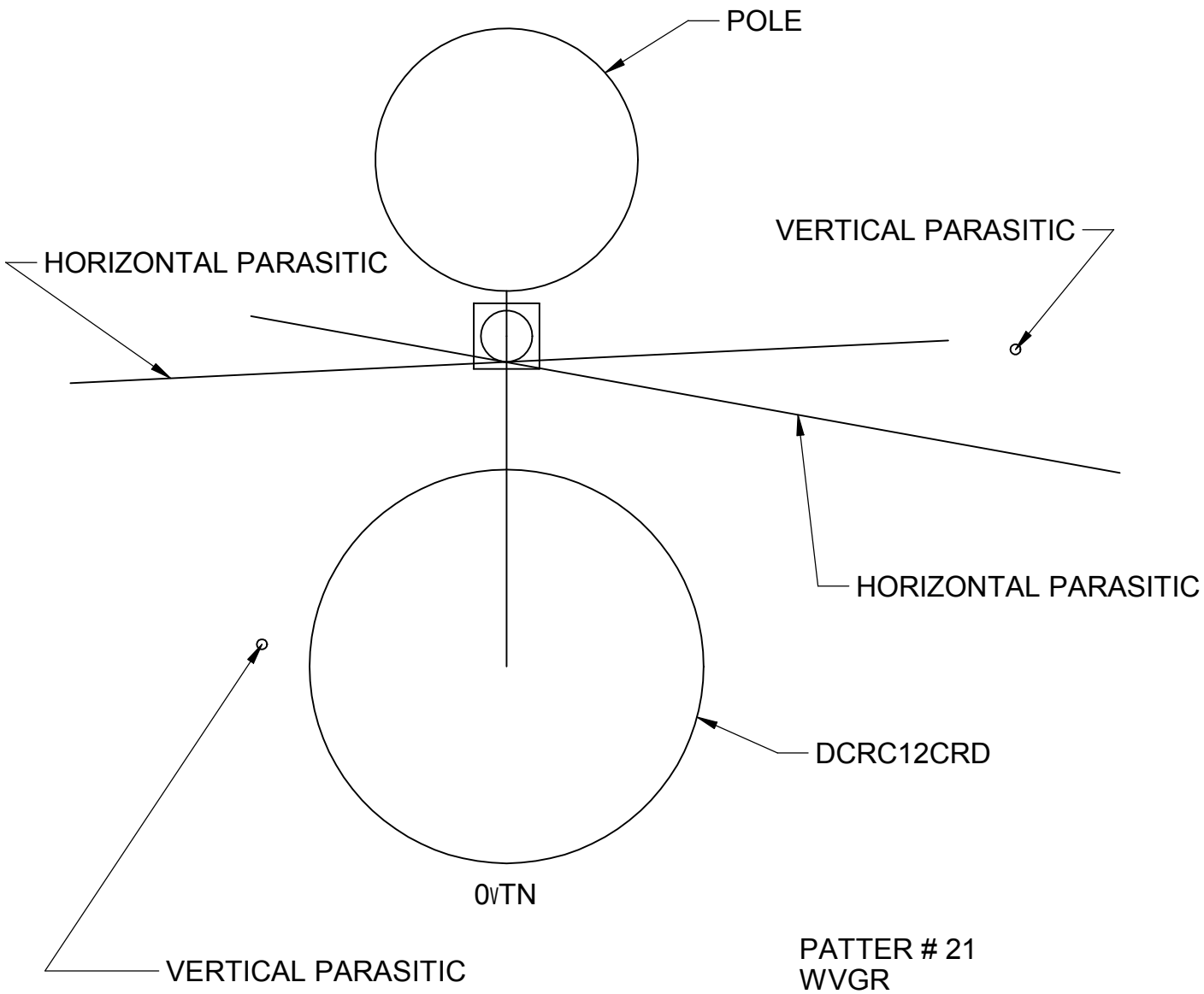
Antenna Type	**DCRC6EHD**
Drawing #	

ELEVATION PATTERN

RMS Gain at Main Lobe	**3.20 (5.05 dB)**	Beam Tilt	**0.00 deg**
Per Polarization		Frequency	**104.10 MHz**
Calculated / Measured	**Calculated**		



REV:	REVISION NOTE CAD MAINTAINED. CHANGES SHALL BE INCORPORATED BY THE DESIGN ACTIVITY.
A	SEE SHEET #1



PATTER # 21
WVGR
104.1 FM
MSO 82382
K. MCLANE
POLE #16

A Unit of SPX Corporation — Raymond, ME

	GAGE CODE	DRAWING NO:
A	08441	

SHEET: 1 OF 1

System Field Report
Transmission Line and Antenna

WVGR - FM
Wayland, MI

104.1 MHz

Antenna Type:
DCRC6EHD P/N101990

Line Type: 4-1/8” 50 Ohm Flexline

Prepared for:
Dielectric Communications

Date of Service: September 13th , 2006

By:
Daniel Barton
Alive Telecommunications

Antenna System Report

The following engineering statement and attached exhibits has been prepared for Dielectric Communications and contains data and information regarding the transmission line, 4" 50 ohm and antenna of the WVGR-FM, 104.1MHz in Wayland, MI.

All data contained in this report was acquired through the use of a Hewlett-Packard 8753E Network Analyzer. This analyzer was calibrated on site using 1601 points according to the manufacturer's instructions for use at the frequency range of interest. In order to minimize the effects of the short test cable that was used, the calibration procedure was performed at the far end of this cable.
Measurements of the system were made using the Dielectric 3" 50 ohm test adapter attached at the coax switch in side the transmitter building.

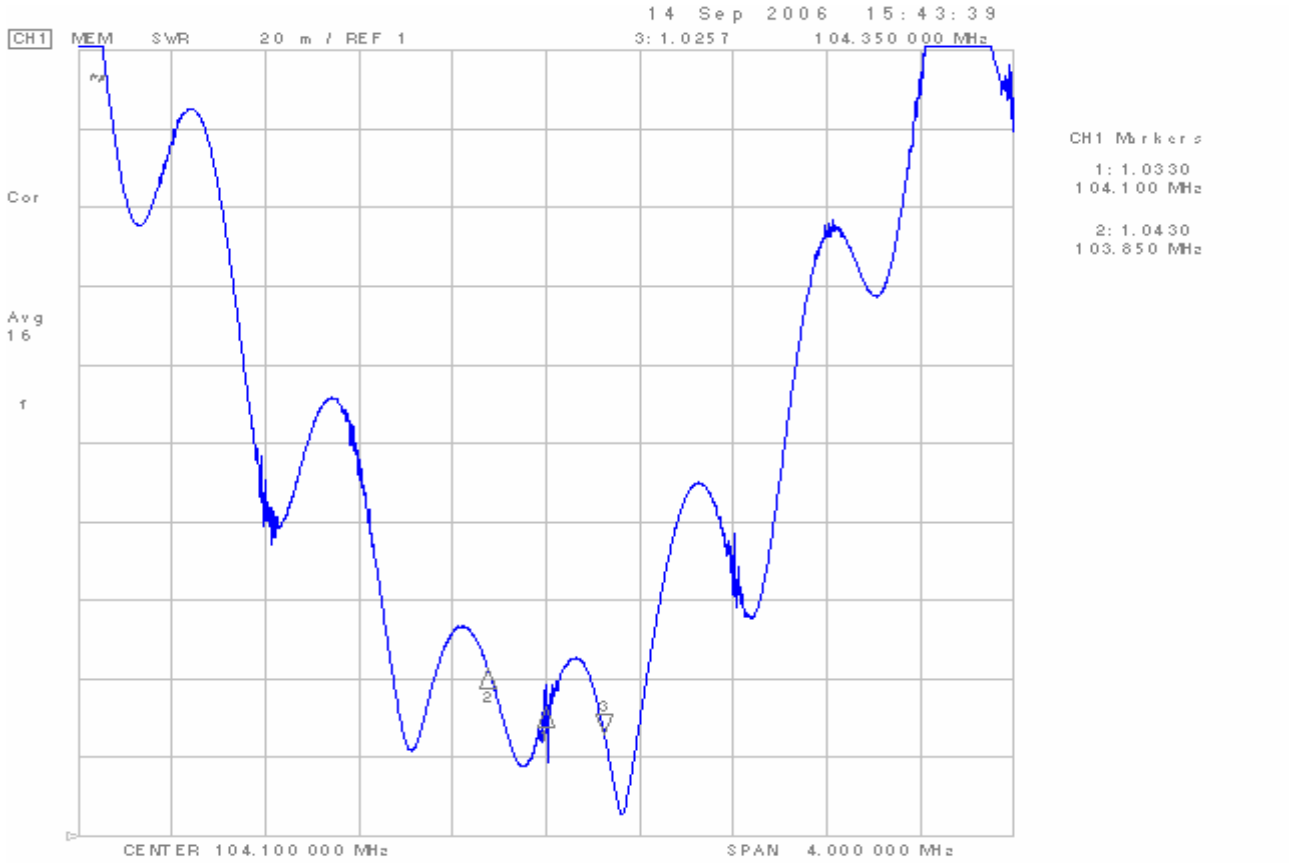
Observations and Conclusions

Arrived on site just as the crew was pressurizing the system.

The removal of the 30" transmission line piece greatly effected the tuning as expected.
The system was retuned and the values nearly replicated the original data.
One exception concerned the test location; the station preferred I tested from the switch rather then take the transmission line apart.
The switch added another element to the system resulting in a ripple across the frequency response.

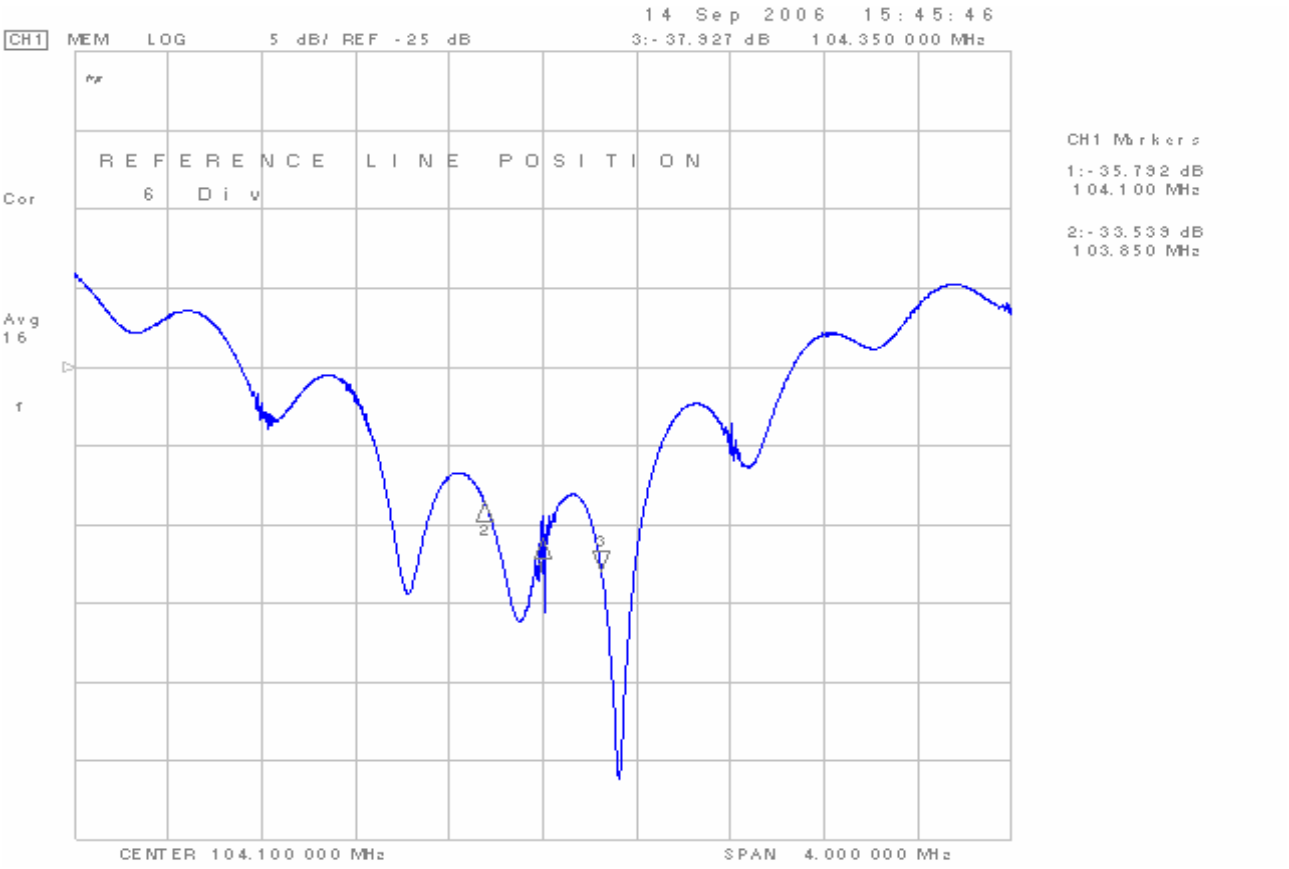
The transmitter was turned on and the response, replicated the previous state.

All data measured and interpretations thereof presented herein by Dan Barton, of Alive Telecommunications. All information present in this report is done so using the best of my abilities and utilization of equipment at the time it was taken. Alive Telecommunications takes on no responsibilities or liabilities in any form due to damage or injury resulting from a lack of knowledge and/or experience, or failure to observe safety guidelines on the part of the customer or any person acting on their behalf when carrying out specified suggestions presented herein.



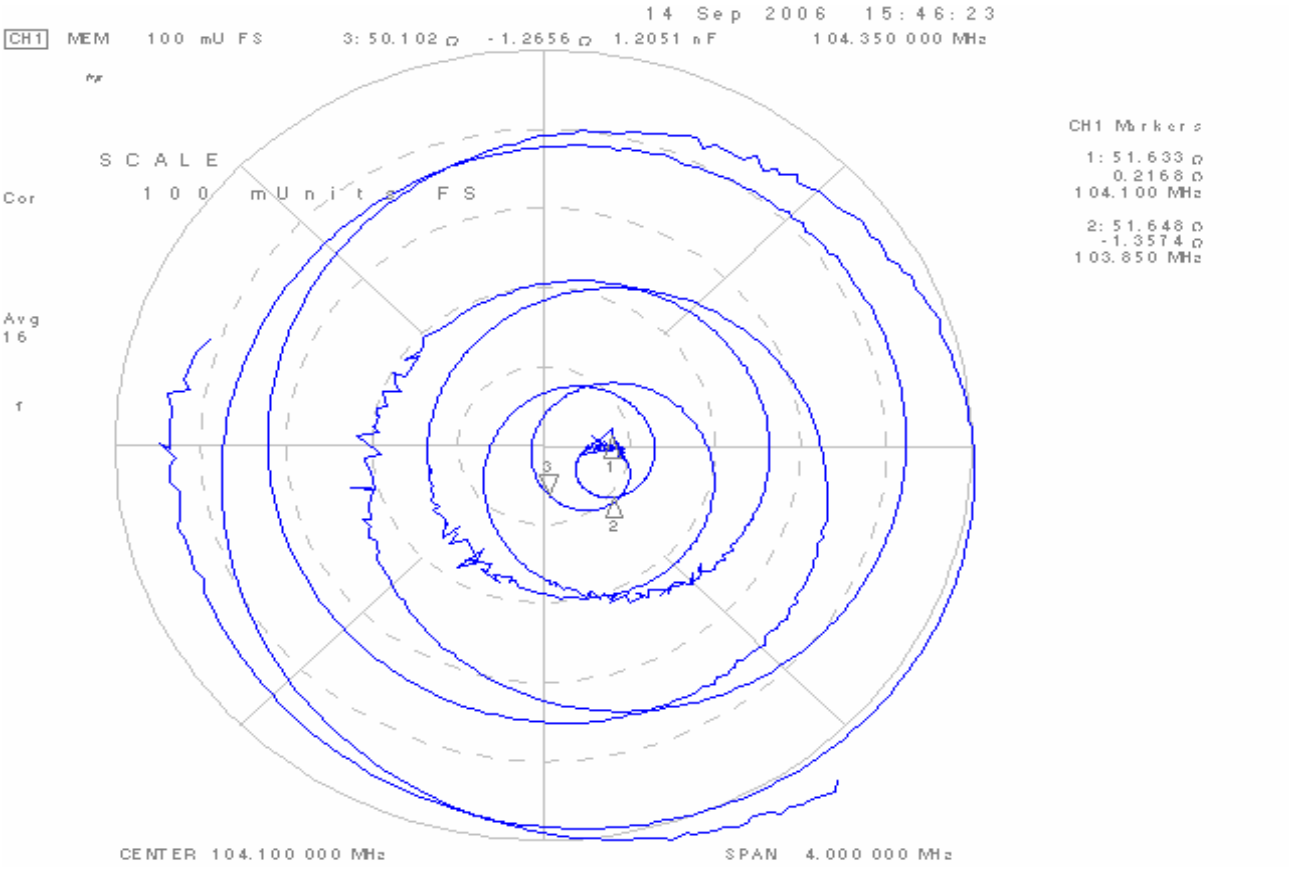
5 MHz Span VSWR

Marker 1 = 104.1 MHz
Marker 2 = 103.85 MHz
Marker 3 = 104.35 MHz



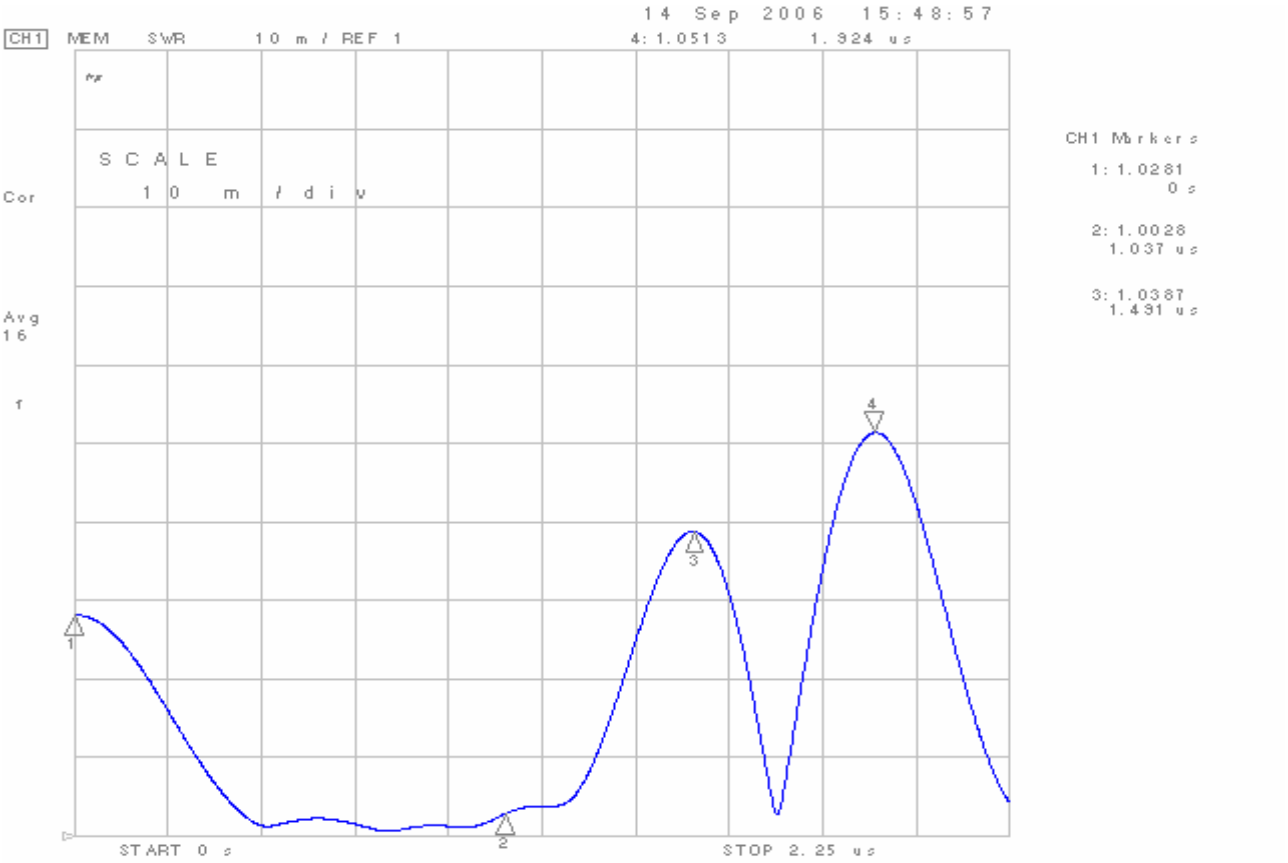
5 MHz Span Return Loss

Marker 1 = 104.1 MHz
Marker 2 = 103.85 MHz
Marker 3 = 104.35 MHz



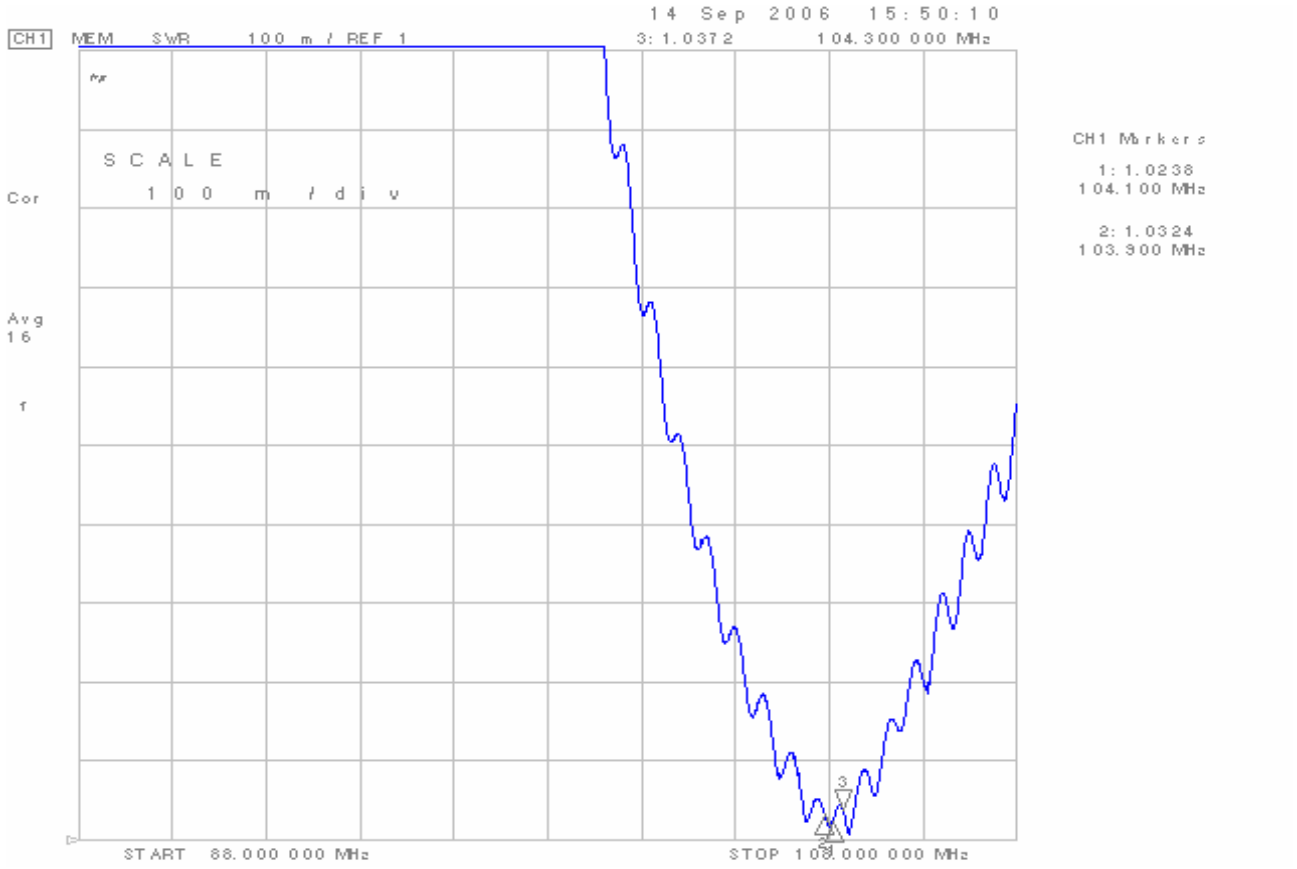
5 MHz Span Smith Chart

Marker 1 = 104.1 MHz
Marker 2 = 103.85 MHz
Marker 3 = 104.35 MHz



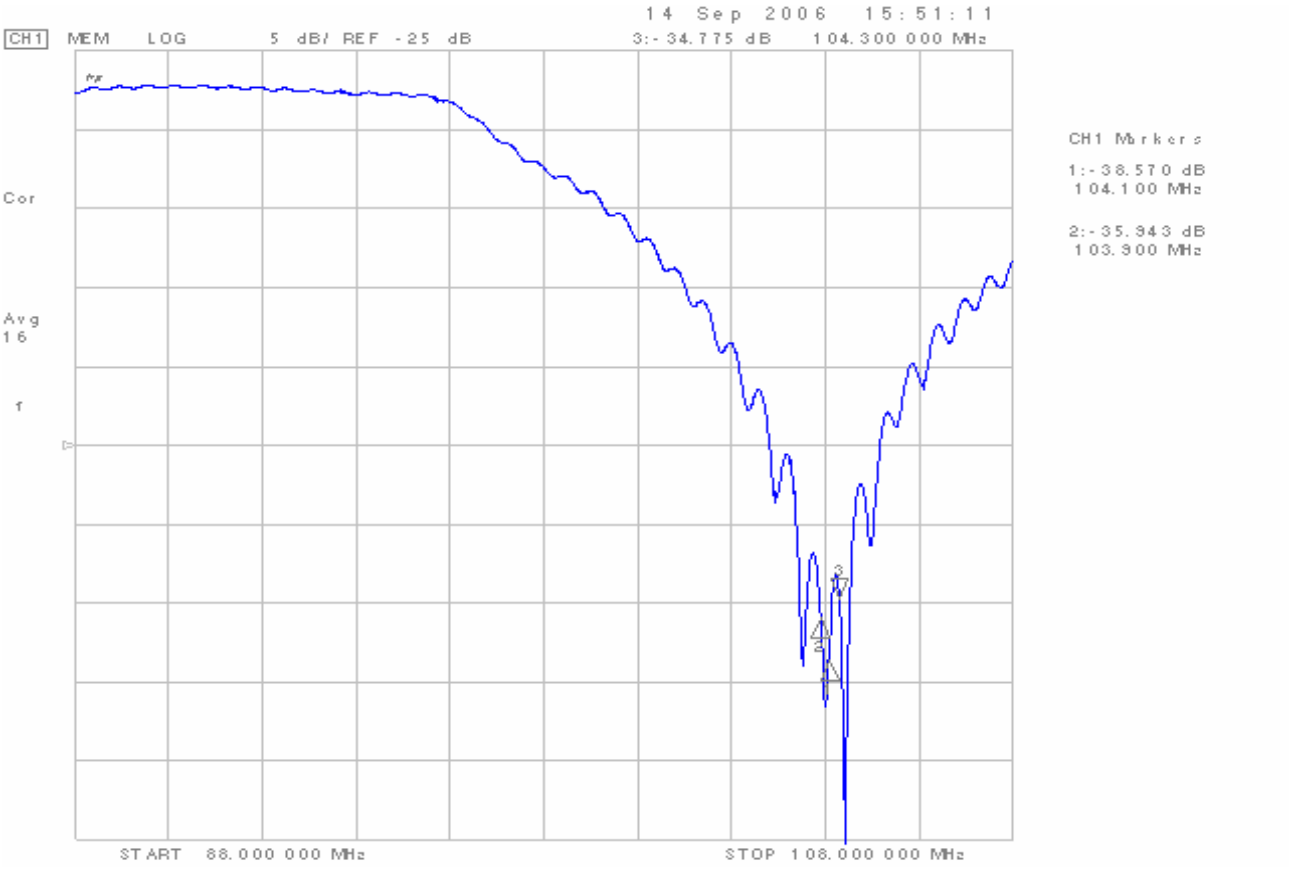
4 MHz TDR

Marker 1 = input/switch
Marker 2 = line sample
Marker 3 = Fine Matcher
Marker 4 = Antenna



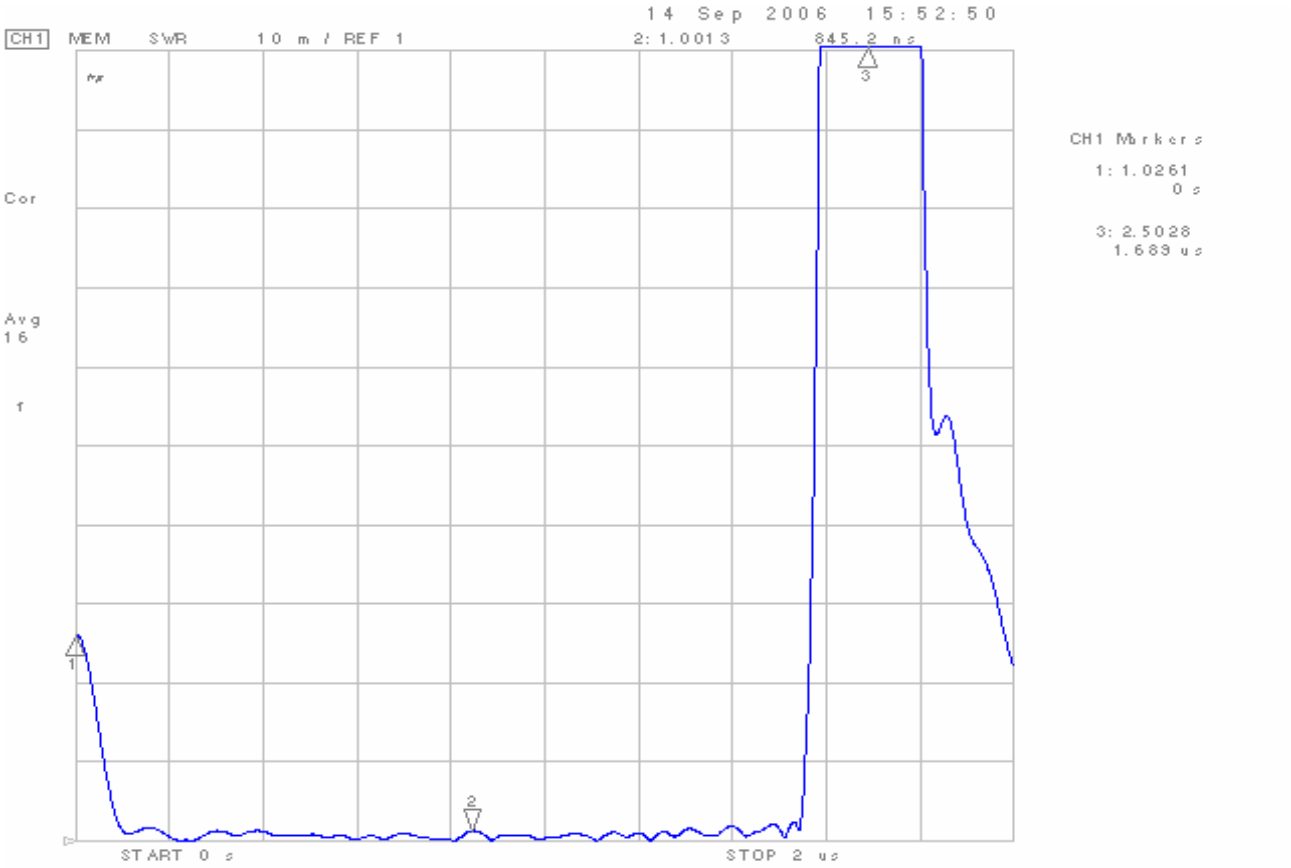
20 MHz Span VSWR

Marker 1 = 104.1 MHz
Marker 2 = 103.9 MHz
Marker 3 = 104.3 MHz



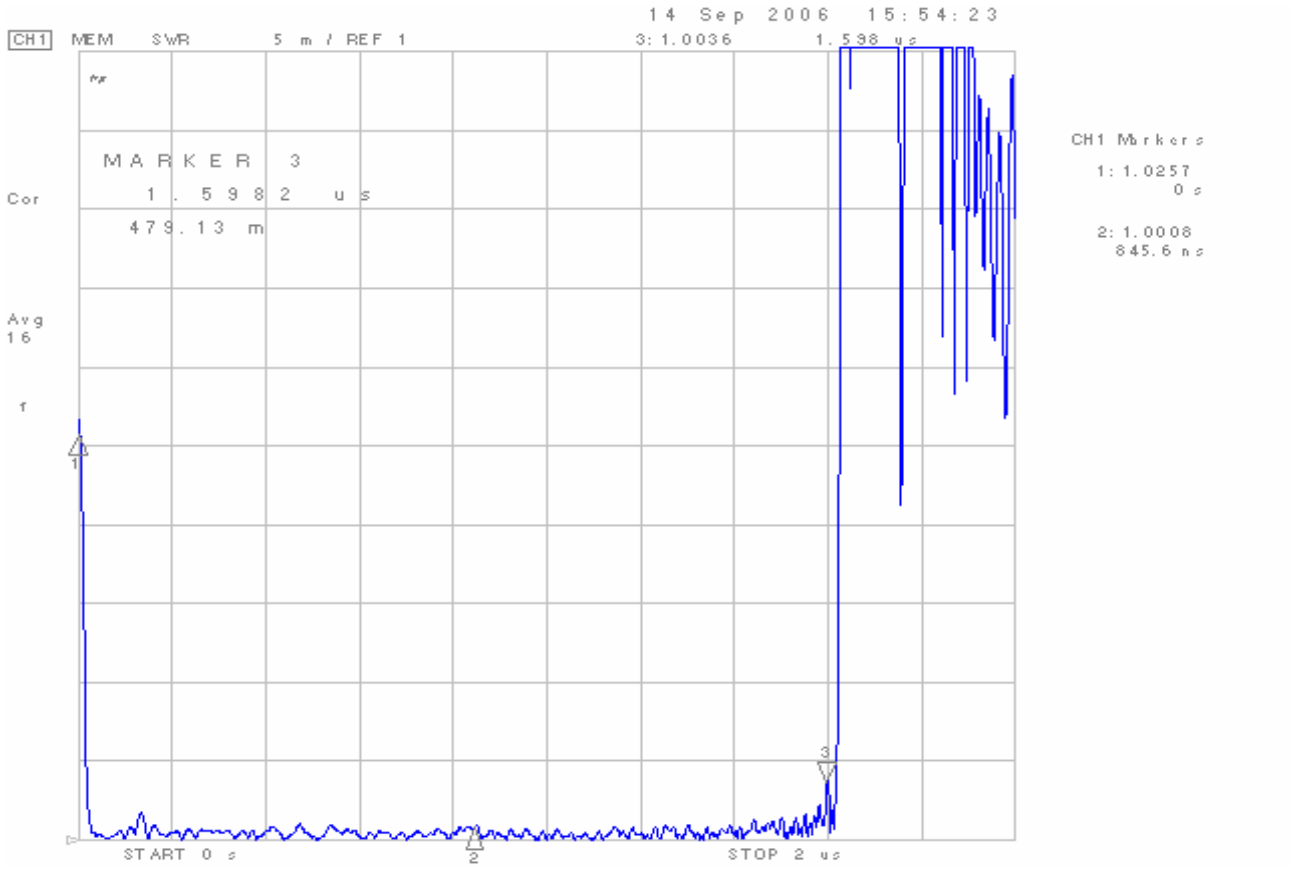
20 MHz Span Return Loss Plot

Marker 1 = 104.1 MHz
Marker 2 = 103.9 MHz
Marker 3 = 104.3 MHz



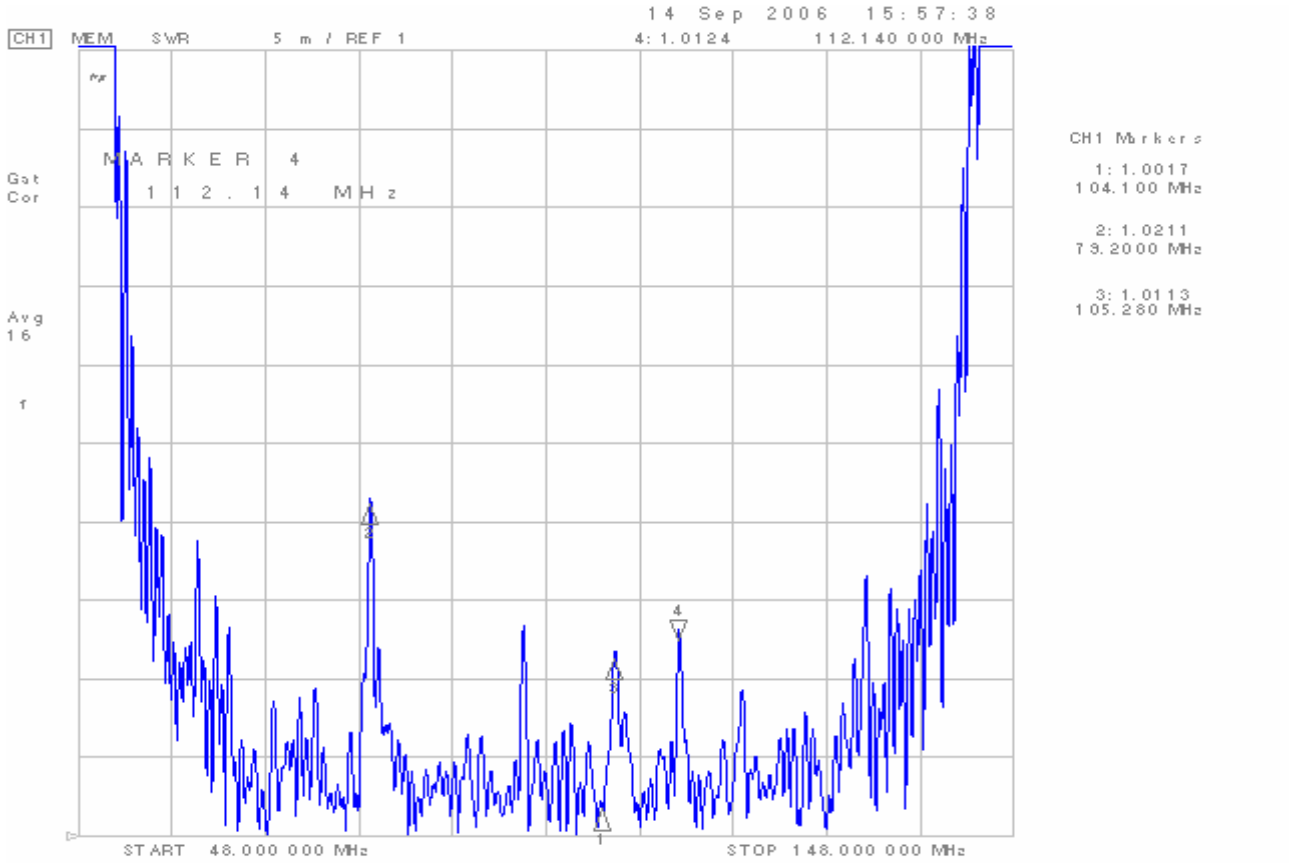
20 MHz Span TDR

Marker 1 = input
Marker 2 = line sample
Marker 3 = antenna



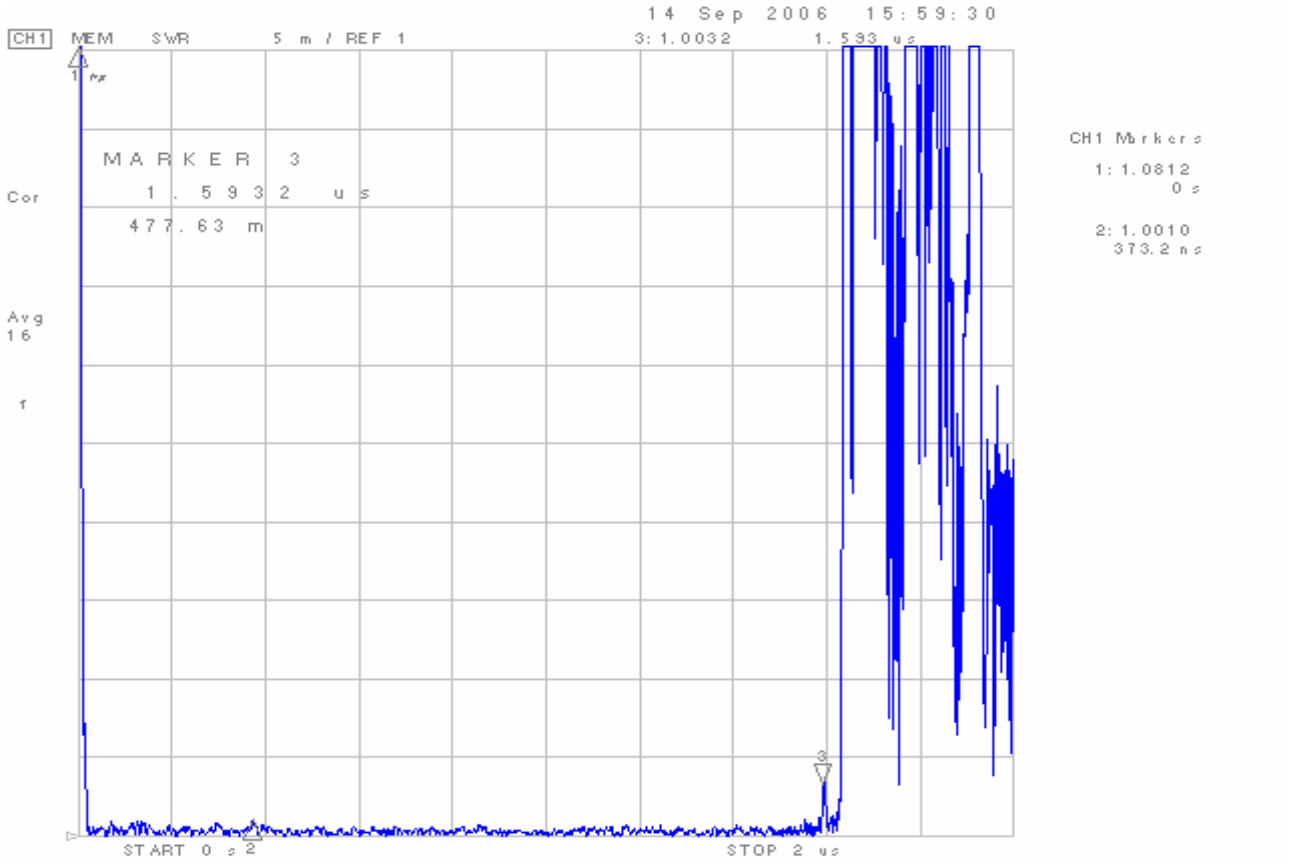
100 MHz Span TDR

Marker 1 = input
Marker 2 = line sample
Marker 3 = Connector



100 MHz Gated VSWR

Marker 1 = 104.1 MHz
Marker 2 = Flexline Peak
Marker 3 = Flexline Peak
Marker 4 = Flexline Peak



300 MHz Span TDR

Marker 1 = test transtition / switch
Marker 2 = line section
Marker 3 = connector

SURVEYOR'S AFFIDAVIT

STATE OF MICHIGAN)

) ss

COUNTY OF KENT)

Douglas J. Root, being duly sworn, deposes and says that he is a Professional Surveyor, certified to practice in the State of Michigan, Registration Number 41109.

Further, that on August 25, 2006, he performed as-built measurements to verify the direction of antenna mounted on the University of Michigan broadcast mast located in the SE 1/4, Section 7, T7N, R10W, Yankee Springs Township, Barry County, Michigan.

Further, that the as-built direction of the mounting rods for the antenna is N10°E, within the tolerances of the instrument used to perform the measurement, which are +/- 01°.

Douglas J. Root

Douglas J. Root, P.S. 41109

Subscribed and sworn to before me on this 25th day of August, 2006.

Mary Kattreh

Mary Kattreh
Notary Public Kent County, Michigan

My Commission expires May 27, 2012.
Acting in Kent County.

MARY KATTREH
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF KENT
My Commission Expires May 27, 2012
Acting in the County of Kent

Prepared by:
Douglas J. Root, P.S.
Exxel Engineering, Inc.
5252 Clyde Park Ave.
Grand Rapids, MI 49509

MICHIGAN RADIO

ANTENNA INSTALATION CERTIFICATION

Installation of Directional Antenna for WVGR:

On July 23, 2006 the directional antenna for WVGR was assembled, installed and aligned to the proper azimuth under my supervision, pursuant to the manufacturer's instructions. Before the installation, the manufacturer's drawings and information were reviewed with the tower crew leader. Each bay was assembled as far as possible on the ground and all bays were prepared before the first bay was carefully hoisted into position. The tower crew leader worked with the crew on the tower to oversee the installation as previously discussed. Radio contact with the ground was maintained so that questions were immediately answered. The surveyor had placed stakes in the ground along a radial indicating the correct azimuth. The bays were initially aligned visually with that radial. The final azimuth adjustment was done using a transit at the end of the radial farthest from the tower to check the proper position of each bay.

Statement of Qualifications

Donald J. Beans is a Media Engineer with the University of Michigan, Michigan Radio department. He received a BS in Electrical Engineering from the University of Michigan in 1964. He has over 40 years experience in the operation, maintenance and upgrading of radio transmitting facilities, including AM, FM and HF transmitters and antenna systems. He has been employed by Michigan Radio since 1987.

Signed by: Donald J Beans

Date: Aug 21, 2006

Michigan Radio – a service of Michigan Public Media

The University of Michigan

535 West William Street, Suite 110, Ann Arbor, MI 48103-4943 Telephone (734) 764-9210 Fax (734) 647-3488

91.7 FM Ann Arbor/Detroit • 104.1 FM Grand Rapids • 91.1 FM Flint

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DIRECTIONAL PATTERN DATA
WVGR-FM
TABLE #1

Actual Bearing	Pattern Azimuth	Auth. Relative Field	Auth. ERP (dBk)	Composite Relative Field	Composite ERP (dBk)
N000E	0.00	1.000	19.82	0.998	19.81
	10.00	0.997	19.80	0.995	19.78
	20.00	0.973	19.58	0.970	19.56
	30.00	0.950	19.38	0.946	19.34
	40.00	0.940	19.29	0.934	19.23
	50.00	0.920	19.10	0.915	19.05
	60.00	0.883	18.74	0.881	18.72
	70.00	0.838	18.29	0.835	18.26
	80.00	0.764	17.48	0.761	17.45
N090E	90.00	0.688	16.57	0.685	16.54
	100.00	0.623	15.71	0.621	15.68
	110.00	0.565	14.86	0.559	14.77
	120.00	0.526	14.24	0.524	14.21
	130.00	0.560	14.79	0.557	14.74
	140.00	0.610	15.53	0.599	15.37
	150.00	0.650	16.08	0.628	15.78
	160.00	0.660	16.21	0.639	15.93
	170.00	0.650	16.08	0.631	15.82
N180E	180.00	0.624	15.73	0.604	15.44
	190.00	0.585	15.17	0.565	14.86
	200.00	0.533	14.36	0.513	14.03
	210.00	0.485	13.54	0.465	13.17
	220.00	0.440	12.69	0.426	12.41
	230.00	0.455	12.98	0.435	12.59
	240.00	0.501	13.82	0.481	13.47
	250.00	0.542	14.50	0.522	14.18
	260.00	0.591	15.25	0.571	14.96
N270E	270.00	0.643	15.99	0.623	15.71
	280.00	0.691	16.61	0.671	16.36
	290.00	0.722	16.99	0.702	16.75
	300.00	0.754	17.37	0.734	17.14
	310.00	0.815	18.05	0.795	17.83
	320.00	0.877	18.68	0.857	18.48
	330.00	0.929	19.18	0.909	18.99
	340.00	0.968	19.54	0.948	19.36
	350.00	0.993	19.76	0.973	19.58