



Order Number	42446
Date	12/10/2015
Call Letters	WWRA
Location	Clinton, LA
Customer	TSG Inc.
Antenna Type	DCRH5ED
Frequency	91.9
Drawing #	P40

## **PATTERN CERTIFICATION**

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## PATTERN CERTIFICATION

### Method of Measurement

The azimuth pattern for WWRA, Dielectric Document Sketch #P40, was measured in the following manner.

A single 4.4 to 1 scale model "DCRH5ED" 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 #P40. 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 8753ET 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.

Derek Small is a Sr. RF Engineer here at Dielectric. Derek received a BS in Electrical Engineering from the University of Maine in 1986. He has 29 years experience in RF engineering and has been employed by Dielectric since 2015.

Signed by:           Derek J Small



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### FM AZIMUTH PATTERN APPROVAL

The azimuth pattern of the horizontal polarization and vertical polarization as supplied by Dielectric in the document labeled "Pattern P40", is acknowledged as acceptable. We understand that Dielectric does not guarantee or predict signal strength in any particular location.

Technical Services Group, Inc.  
(Customer's name)

By: Arthur M. Hoover III  
(Name typed or printed)

Title: President

[Signature]  
(Signature)



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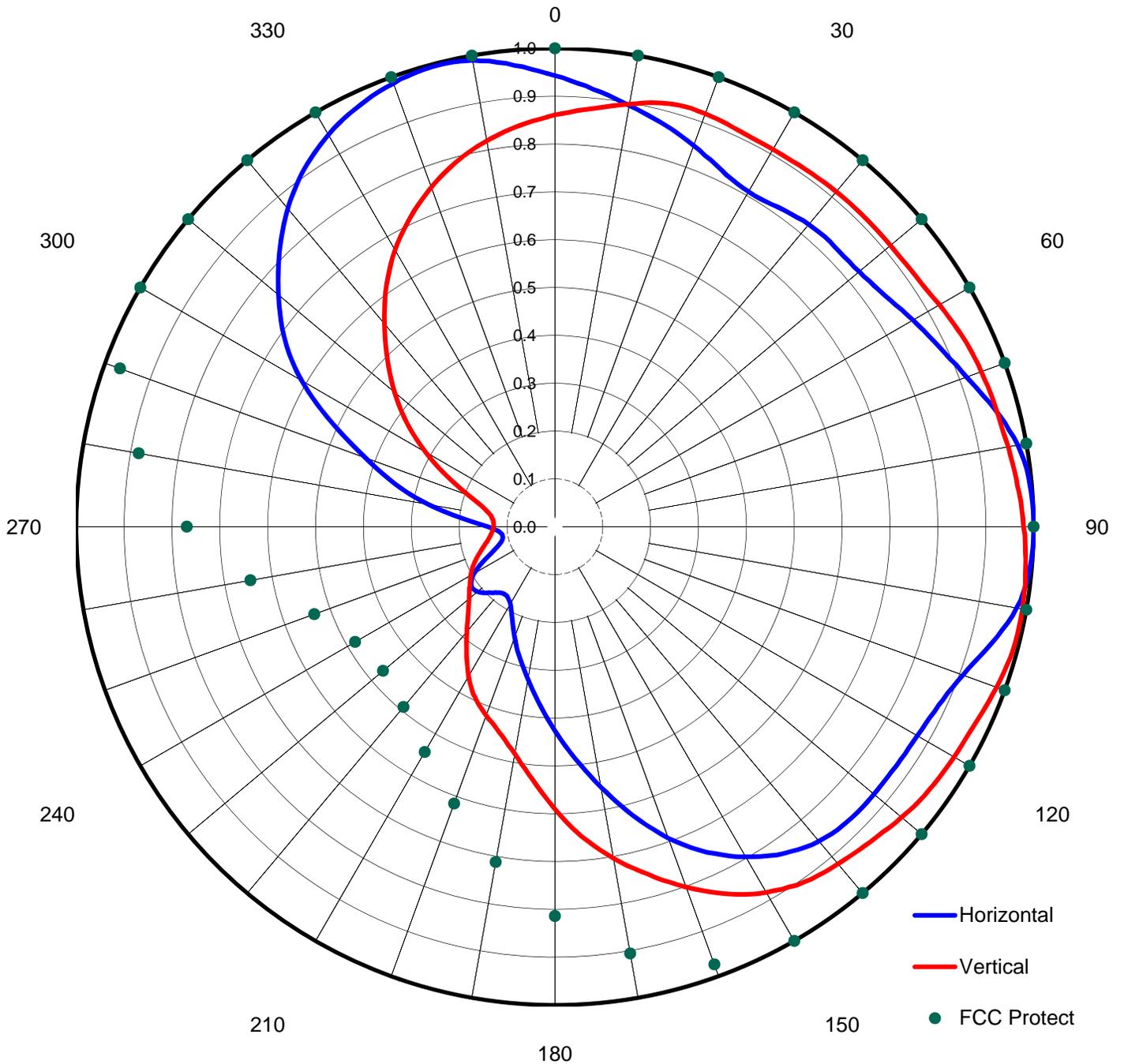
### AZIMUTH PATTERN

85.7% Ccov 50.2% Hrms - 49.8% Vrms

Gain 1.92 (2.83 dB) HPOL  
1.91 (2.81 dB) VPOL

Calculated / Measured

Measured





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**TABULATION OF HORIZONTAL AZIMUTH PATTERN**

Angle	Field	dBk	ERP kW
	0.943	13.470	22.231
10	0.894	13.006	19.981
20	0.848	12.547	17.978
30	0.809	12.138	16.362
40	0.825	12.308	17.016
50	0.830	12.361	17.223
60	0.864	12.710	18.662
70	0.915	13.208	20.931
80	0.982	13.822	24.108
90	1.000	13.979	25.000
100	0.979	13.795	23.961
110	0.907	13.132	20.566
120	0.874	12.810	19.097
130	0.870	12.770	18.923
140	0.858	12.649	18.404
150	0.797	12.009	15.880
160	0.693	10.794	12.006
170	0.553	8.834	7.645
180	0.427	6.588	4.558
190	0.324	4.190	2.624
200	0.246	1.798	1.513
210	0.186	-0.630	0.865
220	0.180	-0.915	0.810
230	0.211	0.465	1.113
240	0.195	-0.220	0.951
250	0.130	-3.742	0.423
260	0.111	-5.114	0.308
270	0.140	-3.098	0.490
280	0.269	2.574	1.809
290	0.422	6.486	4.452
300	0.611	9.700	9.333
310	0.754	11.527	14.213
320	0.868	12.750	18.836
330	0.946	13.497	22.373
340	0.986	13.857	24.305
350	0.990	13.892	24.503



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**TABULATION OF VERTICAL AZIMUTH PATTERN**

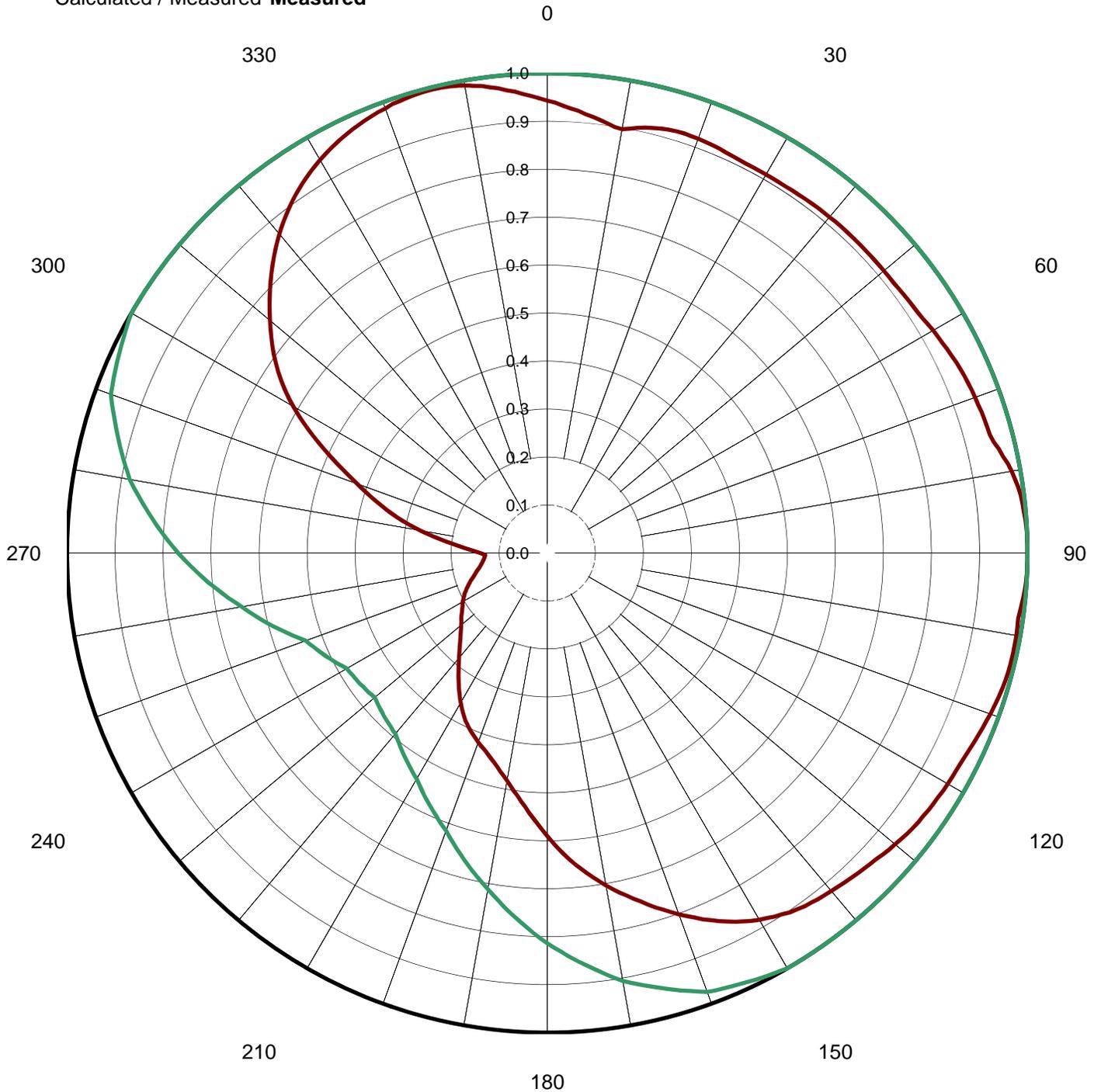
Angle	Field	dBk	ERP kW
	0.861	12.679	18.533
10	0.897	13.035	20.115
20	0.919	13.246	21.114
30	0.911	13.170	20.748
40	0.914	13.198	20.885
50	0.915	13.208	20.931
60	0.928	13.330	21.530
70	0.948	13.516	22.468
80	0.962	13.643	23.136
90	0.979	13.795	23.961
100	0.992	13.910	24.602
110	0.982	13.822	24.108
120	0.963	13.652	23.184
130	0.945	13.488	22.326
140	0.920	13.255	21.160
150	0.883	12.899	19.492
160	0.802	12.063	16.080
170	0.704	10.931	12.390
180	0.590	9.396	8.703
190	0.482	7.640	5.808
200	0.420	6.444	4.410
210	0.361	5.130	3.258
220	0.286	3.107	2.045
230	0.234	1.364	1.369
240	0.203	0.129	1.030
250	0.170	-1.412	0.723
260	0.140	-3.098	0.490
270	0.128	-3.876	0.410
280	0.136	-3.350	0.462
290	0.192	-0.355	0.922
300	0.312	3.862	2.434
310	0.437	6.789	4.774
320	0.554	8.850	7.673
330	0.668	10.475	11.156
340	0.755	11.538	14.251
350	0.819	12.245	16.769



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### COMPOSITE AZIMUTH PATTERN

Calculated / Measured **Measured**





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**TABULATION OF COMPOSITE AZIMUTH PATTERN**

Angle	Field	dBk	Power kW	Input Power
	0.943	13.470	22.231	25.000
10	0.897	13.035	20.115	25.000
20	0.919	13.246	21.114	25.000
30	0.911	13.170	20.748	25.000
40	0.914	13.198	20.885	25.000
50	0.915	13.208	20.931	25.000
60	0.928	13.330	21.530	25.000
70	0.948	13.516	22.468	25.000
80	0.982	13.822	24.108	25.000
90	1.000	13.979	25.000	25.000
100	0.992	13.910	24.602	25.000
110	0.982	13.822	24.108	25.000
120	0.963	13.652	23.184	25.000
130	0.945	13.488	22.326	25.000
140	0.920	13.255	21.160	25.000
150	0.883	12.899	19.492	25.000
160	0.802	12.063	16.080	25.000
170	0.704	10.931	12.390	25.000
180	0.590	9.396	8.703	25.000
190	0.482	7.640	5.808	25.000
200	0.420	6.444	4.410	25.000
210	0.361	5.130	3.258	25.000
220	0.286	3.107	2.045	25.000
230	0.234	1.364	1.369	25.000
240	0.203	0.129	1.030	25.000
250	0.170	-1.412	0.723	25.000
260	0.140	-3.098	0.490	25.000
270	0.140	-3.098	0.490	25.000
280	0.269	2.574	1.809	25.000
290	0.422	6.486	4.452	25.000
300	0.611	9.700	9.333	25.000
310	0.754	11.527	14.213	25.000
320	0.868	12.750	18.836	25.000
330	0.946	13.497	22.373	25.000
340	0.986	13.857	24.305	25.000
350	0.990	13.892	24.503	25.000



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## CUSTOMER GAIN SUMMARY

Azimuth Pattern Gain of Horizontal Polarization	1.92 (2.83 dB)
Elevation Pattern Gain Per Polarization	2.70 (4.31 dB)
Peak Gain of Horizontal Polarization	5.18 (7.14 dB)

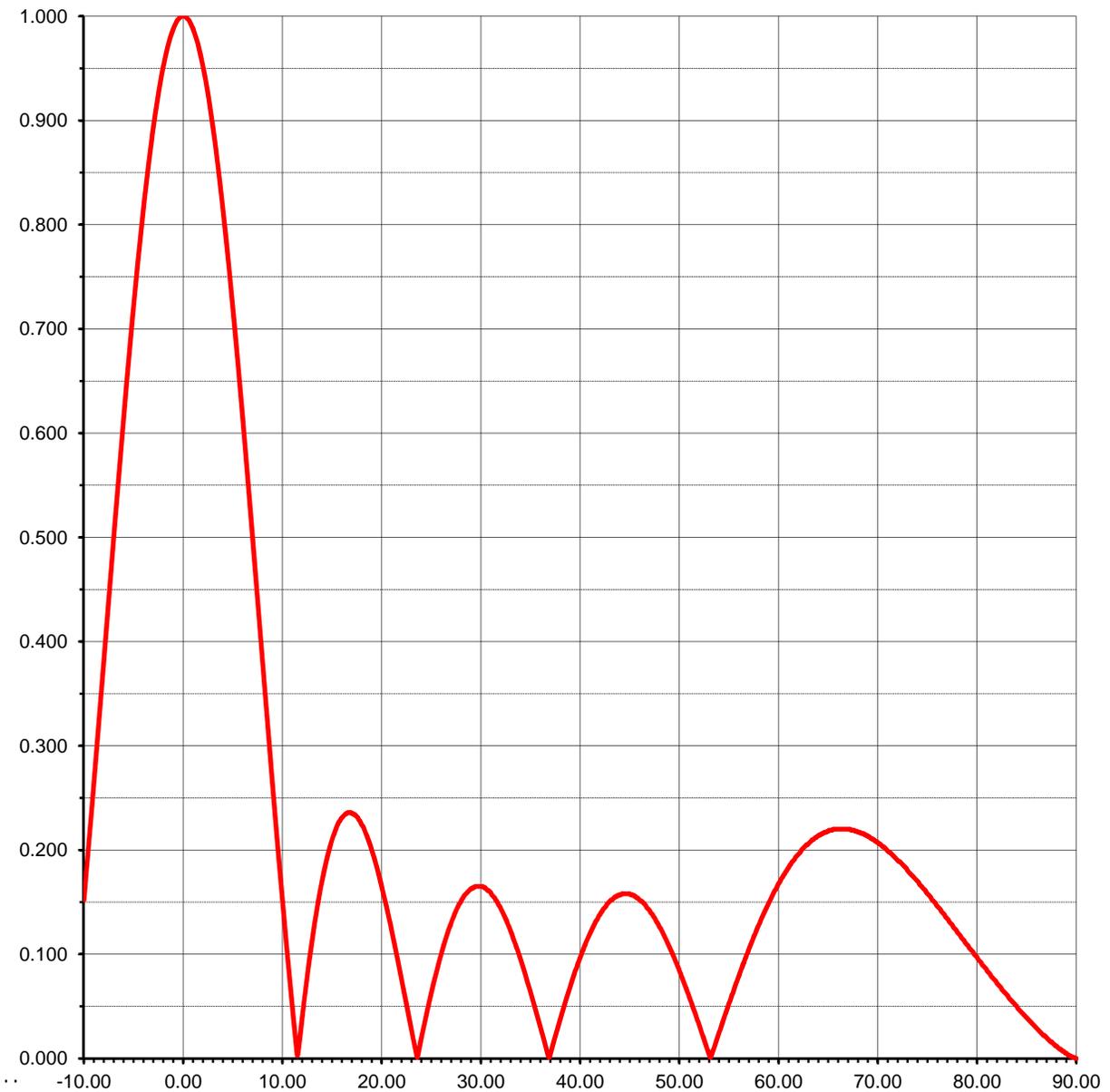


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### ELEVATION PATTERN

RMS Gain at Main Lobe 2.70 ( 4.31 dB )  
Per Polarization  
Calculated / Measured Calculated

Beam Tilt  
Frequency 91.9 MHz





\*Input power used will be either Hpol or Vpol depending on composite pattern

	Input Power	
Horizontal	Vertical H or V max	
0.943	0.861	25.000
0.894	0.897	25.000
0.848	0.919	25.000
0.809	0.911	25.000
0.825	0.914	25.000
0.830	0.915	25.000
0.864	0.928	25.000
0.915	0.948	25.000
0.982	0.962	25.000
1.000	0.979	25.000
0.979	0.992	25.000
0.907	0.982	25.000
0.874	0.963	25.000
0.870	0.945	25.000
0.858	0.920	25.000
0.797	0.883	25.000
0.693	0.802	25.000
0.553	0.704	25.000
0.427	0.590	25.000
0.324	0.482	25.000
0.246	0.420	25.000
0.186	0.361	25.000
0.180	0.286	25.000
0.211	0.234	25.000
0.195	0.203	25.000
0.130	0.170	25.000
0.111	0.140	25.000
0.140	0.128	25.000
0.269	0.136	25.000
0.422	0.192	25.000
0.611	0.312	25.000
0.754	0.437	25.000
0.868	0.554	25.000
0.946	0.668	25.000
0.986	0.755	25.000
0.990	0.819	25.000

WWRA 91.9 MHz

DCRHS ED

D. SCHUELER 12/4/2015

P40

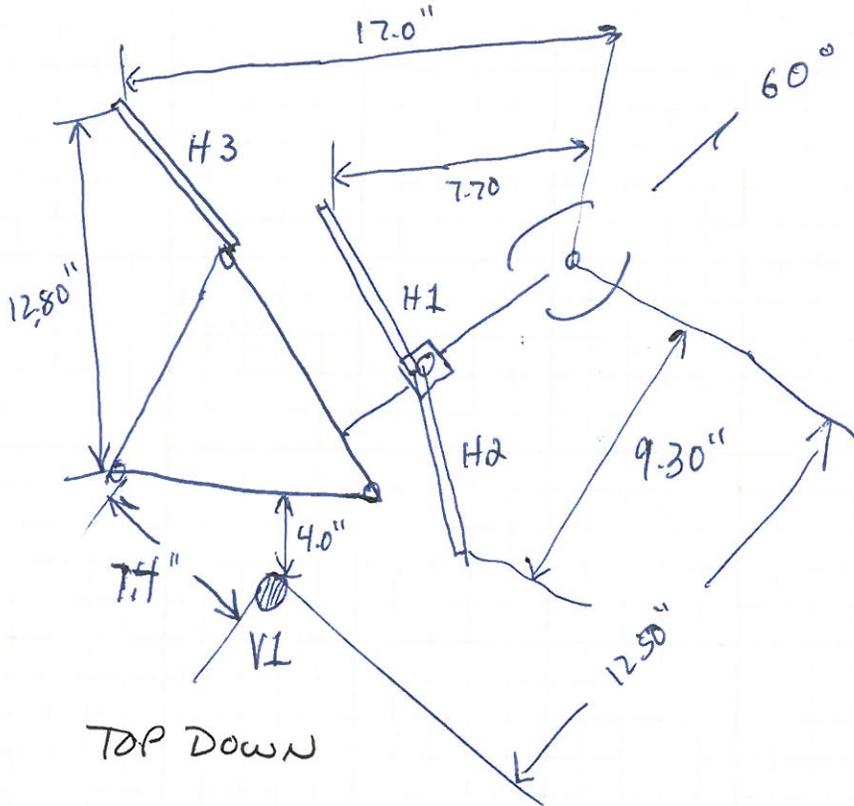
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H1 6.45" L

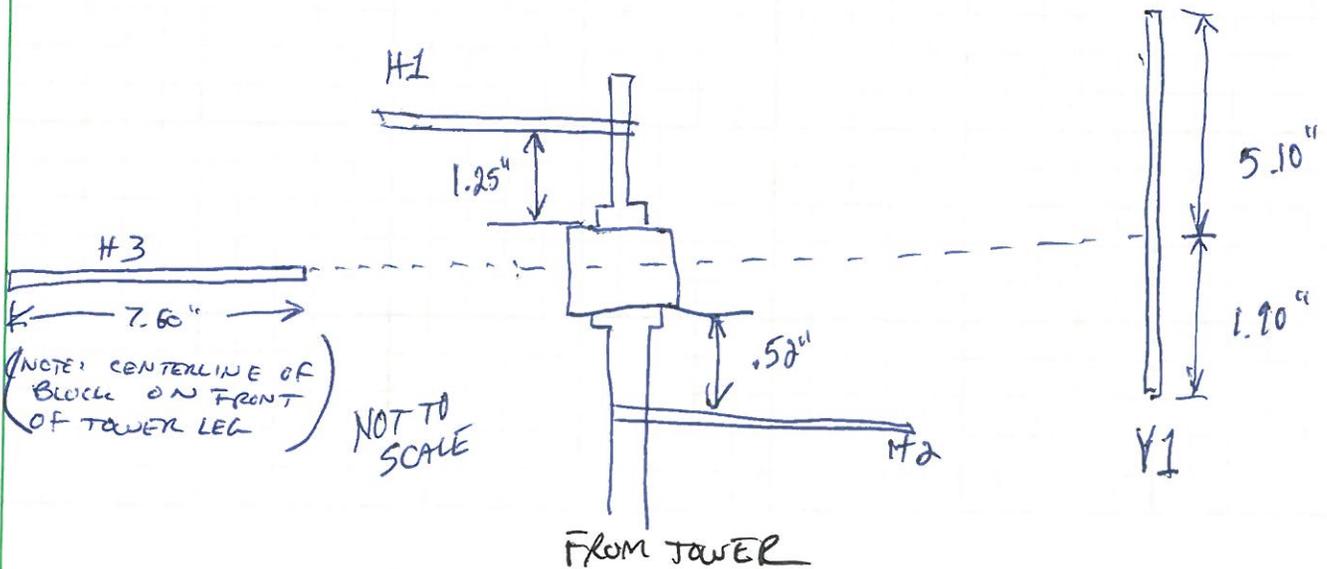
H2 7.42" L

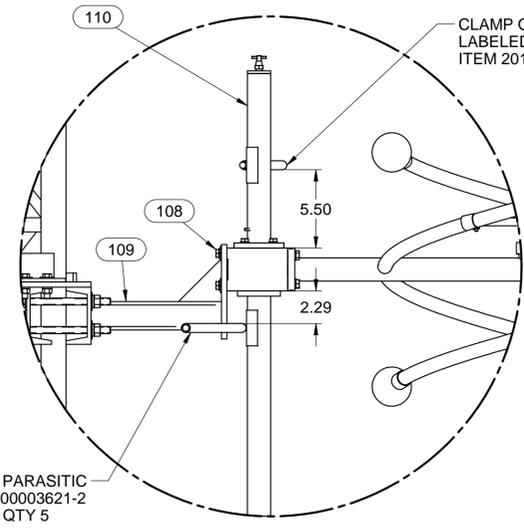
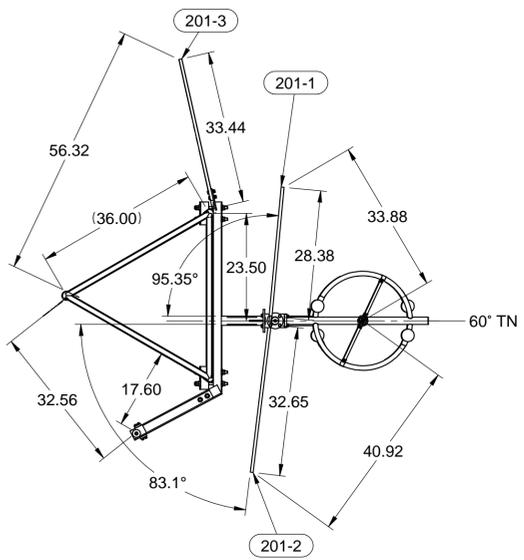
V1 7.00" L

H3 7.60" L

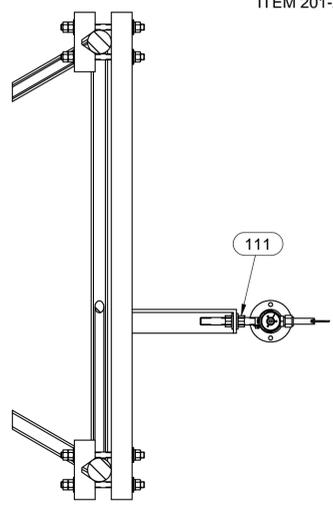


TOP DOWN





DETAIL A  
TYP ALL BAYS



SECTION F-F

DCRH3ERP ANTENNA BOM P/N 300003619				
ITEM NO	MATERIAL	MATERIAL DESCRIPTION	REQ'D QTY	UNIT
101	R66905	DCRH PLAIN BAY	5	EA
102	RTL2FMSQFLG	T/L KIT 1-50 SQ FLANGE FM USE 125.43 CUT LENGTH"	4	EA
103	R68429	JCT BLK END ASSY DCRH	1	EA
104	R68428	BLOCK JCT CTR DCRH/SKM ANT	4	EA
105	R80174	F/L INPUT SECT 1-50 x 70"	1	EA
106	R75886	AFM 1-50 FM SHORT-STUB 53" LONG	1	EA
107	R0046348501	ICE SHIELD KIT T/L 1-50 FM ANT	1	EA
108	11000005999	HARDWARE BLOCK MOUNTING KIT	5	EA
109-1	300003734	FACE MOUNT ANTENNA DCRH5RF 91.9 FM 36.00 CTC KIT BAYS 3-5	1	EA
109-2	300003734	FACE MOUNT ANTENNA DCRH5RF 91.9 FM 36.00 CTC KIT BAY 1-2	1	EA
110	R103326	EXTENSION TOP BLOCK 1-50 T/L	1	EA
111	R103295	SADDLE KIT, 1 5/8 T/L 5/8 X 7 LG	1	EA

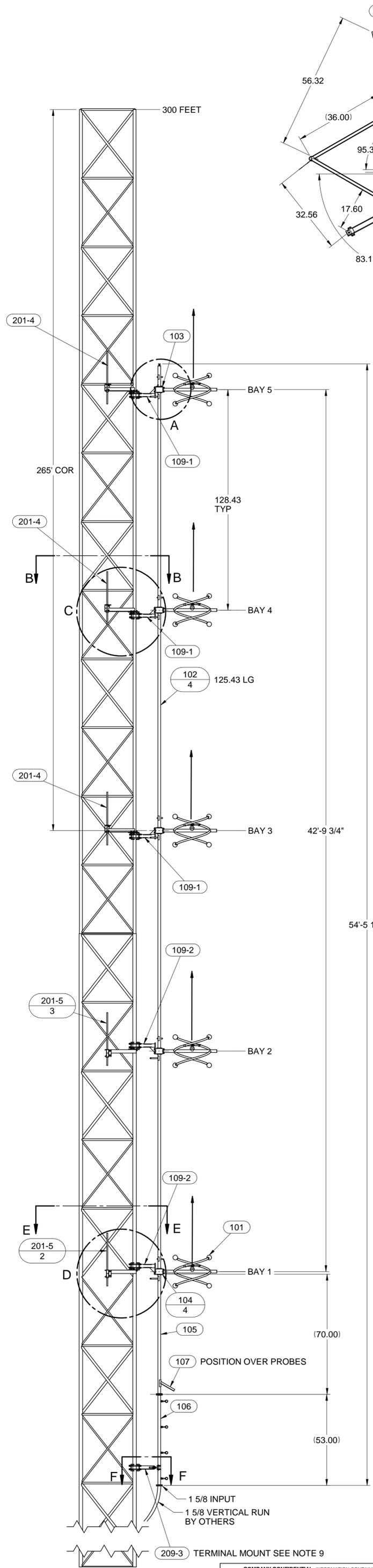
ITEM NO	MATERIAL	PARASITIC MATERIAL DESCRIPTION	REQ'D QTY	UNIT
201	300003621	HORIZONTAL AND VERTICAL PARASITIC KIT	1	EA
201-1	300003621-1	CLAMP ON PARASITIC LABELED 300003621-1	5	EA
201-2	300003621-2	CLAMP ON PARASITIC LABELED 300003621-2	5	EA
201-3	300003621-3	BOLT ON PARASITIC LABELED 300003621-3	5	EA
201-4	300003621-4	VERTICAL PARASITIC LABELED 300003621-4	5	EA
201-5	300003621-5	VERTICAL PARASITIC LABELED 300003621-5	5	EA
204	300003621	VERTICAL MOUNT ANGLE 19.50 LONG	5	EA
205	300003621	VERTICAL MOUNT ANGLE 3.00 LONG	5	EA
206	300003621	MOUNTING PLATE 4.00 X 1.50 X .38	5	EA
207	R0002187008	HOSE CLAMP 1.19-2.25 DIA	20	EA
208	R0013816150	SHCS SS 3/8-16X1.50	20	EA
209	R0163800000	LOCK WASHER SPLIT 3/8 SS	20	EA
210	R0143816000	NUT HEX 3/8-16 MOLLY LUBED	20	EA
211	R0022520100	HHCS SS 1/4-20X1.00	20	EA

INSTALLATION NOTES:

- ANTENNA SHALL BE INSTALLED PER THIS INSTALLATION DRAWING. ANY DEVIATIONS WILL VOID WARRANTY UNLESS APPROVED BY DIELECTRIC.
- TO ACHIEVE ANY GIVEN PATTERN STUDY PERFORMED BY DIELECTRIC, THE PROVIDED ANTENNA MUST BE INSTALLED AND ORIENTED AS DEPICTED IN THIS DRAWING. IF ANY SUCH PATTERN WAS NOT PROVIDED, THE ANTENNA ORIENTATION AND POSITION IS AT THE DISCRETION OF THE BUYER TO WHICH THE ANTENNA WAS SOLD. SHOULD ANY QUESTIONS ARISE DURING THE INSTALLATION PROCESS, CONTACT DIELECTRIC AT, 1-800-341-9678, TO ASSIST IN THIS PROCESS; BE PREPARED TO PROVIDE THE PART NUMBER OR DRAWING NUMBER SHOWN BELOW.
- COMPONENTS ARE MATCH MARKED FOR EASE IN ASSEMBLY.
- ITEM NUMBERS DEPICTED ON THIS DRAWING CORRESPOND TO ITEM NUMBERS LISTED ON ENCLOSED BILL OF MATERIAL.
- APPLY THIN LAYER OF DC4 DOW CORNING COMPOUND TO ALL "O"-RING SEALS PRIOR TO ASSEMBLY.
- UNLESS OTHERWISE SPECIFIED, THE TOP BAY MUST NOT BE LOCATED ANY CLOSER THAN 5 ft. BELOW THE TOWER TOP.
- BAY TAP POINT DIRECTION INDICATED BY ARROWS LOCATED IN THE BAY IN ELEVATION VIEW.
- THE VARIABLE TRANSFORMER IS SHIPPED WITH ALL PROBES FULLY INSERTED. AT INSTALLATION, BE CERTAIN TO LOOSEN LOCKNUTS AND PULL ALL PROBES TO FULL OUTWARD POSITION. ALL PROBES MUST BE IN FULL OUTWARD POSITION BEFORE POWERING UP ANTENNA. REFER TO INSTRUCTION MANUAL FOR TUNING INSTRUCTIONS.
- SUGGESTED LOCATION FOR TERMINATION MOUNT. LOCATION MAY VARY PER TOWER DESIGN.
- FOR HEATED ANTENNAS ONLY: HEATER HARNESS TO BE DRESSED AND SECURED TO TOWER PER INSTALLERS DISCRETION. LOOSE OR DANGLING WIRE IN RF FIELD WILL SHORT AND RESULT IN ANTENNA FAILURE.
- REFER TO DRAWING A88212 FOR ALL HARDWARE TORQUE SPECIFICATIONS.  
\* FOR FIBERGLASS APPLICATIONS, TORQUE MOUNTING HARDWARE TO 180 in-lbs (15 ft-lbs)
- IT IS IMPORTANT TO MAINTAIN DOCUMENT FOR HISTORICAL PURPOSES. THE MOST CRITICAL PORTION OF INFORMATION TO BE MAINTAINED IS THE PART NUMBER AS SPECIFIED.
- AFTER ANTENNA HAS BEEN INSTALLED AND TUNED ON THE TOWER, IT IS REQUESTED THAT A COPY OF THE TEST DATA BE FORWARDED TO:

DIELECTRIC  
C/O FM ENGINEERING MANAGER  
22 TOWER RD. RAYMOND, ME. 04071  
PHONE 1 - 800 - 341 - 9678

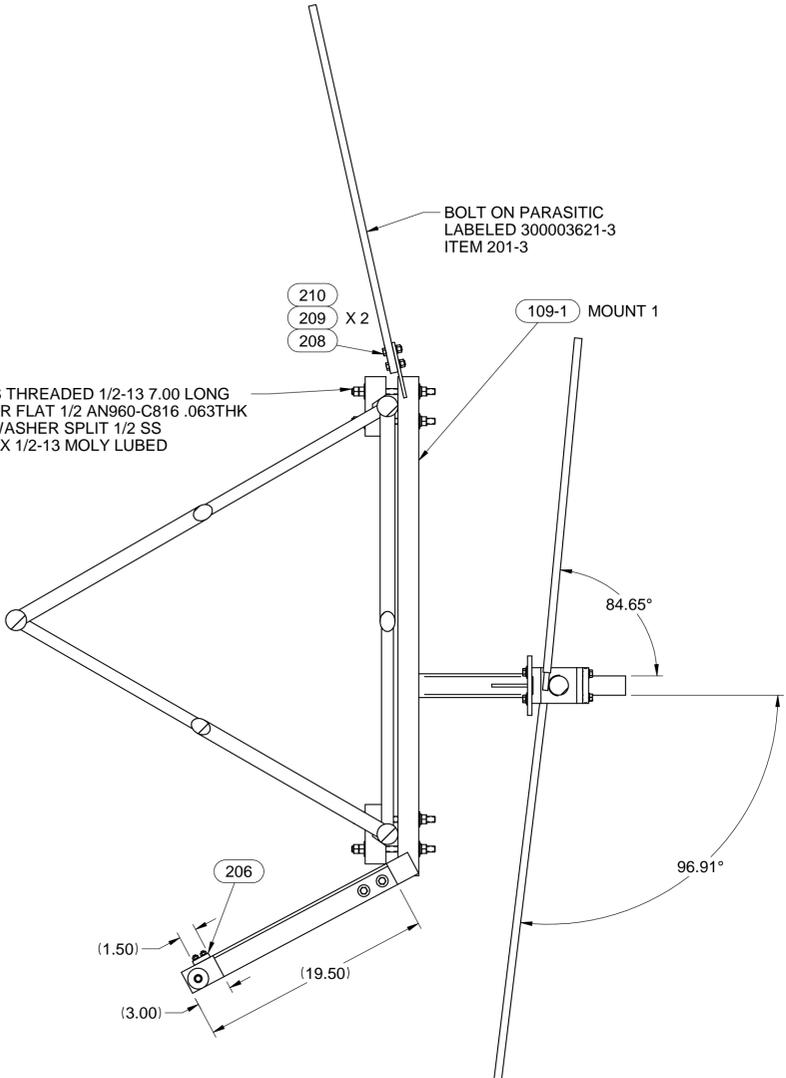
SEE SHEET 2 FOR SECTION VIEWS OF B-B AND E-E AND FOR DETAILS VIEWS OF C AND D



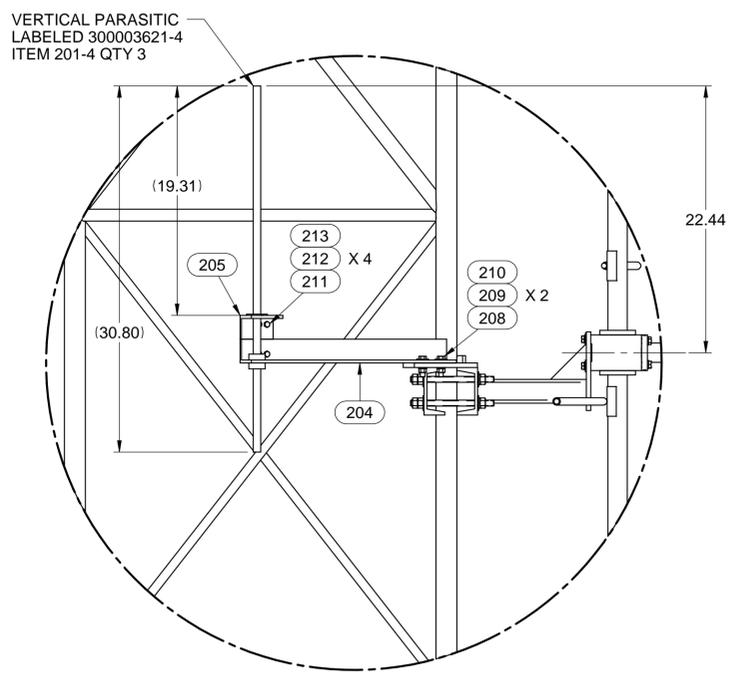
COMPANY CONFIDENTIAL. INFORMATION CONTAINED HEREIN IS CONFIDENTIAL. IT IS THE PROPERTY OF DIELECTRIC. IT IS TO BE USED SOLELY FOR THE PURPOSE PROVIDED, AND IT IS NOT TO BE DISCLOSED TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF DIELECTRIC.  
UNLESS OTHERWISE SPECIFIED  
MANUFACTURING TOLERANCE AND PROCEDURES MUST BE IN ACCORDANCE WITH D78691. ALL ALUMINUM, COPPER, AND BRASS WELDING MUST COMPLY WITH A-62700, SECT. XIV "PRODUCTION WELDING PROCEDURES". STRUCTURAL STEEL WELDING MUST COMPLY WITH "AWS 1.1 CURRENT REVISION".

STATUS: <b>RELEASED</b>	DIMENSIONAL TOLERANCES (UNLESS OTHERWISE NOTED) DECIMAL DIMENSIONS 3 PLACE DIMENSIONS ±.005 2 PLACE DIMENSIONS ±.02 FRACTIONAL DIMENSIONS 0" - 1/16" 1/8" - 1/4" 1/2" - 1/8" 3/4" - 1/4" 1" - 1/8" 1 1/2" - 1/4" 2" - 1/4" 3" - 1/4" 4" - 1/4" 5" - 1/4" 6" - 1/4" 7" - 1/4" 8" - 1/4" 9" - 1/4" 10" - 1/4" 11" - 1/4" 12" - 1/4" 13" - 1/4" 14" - 1/4" 15" - 1/4" 16" - 1/4" 17" - 1/4" 18" - 1/4" 19" - 1/4" 20" - 1/4" 21" - 1/4" 22" - 1/4" 23" - 1/4" 24" - 1/4" 25" - 1/4" 26" - 1/4" 27" - 1/4" 28" - 1/4" 29" - 1/4" 30" - 1/4" 31" - 1/4" 32" - 1/4" 33" - 1/4" 34" - 1/4" 35" - 1/4" 36" - 1/4" 37" - 1/4" 38" - 1/4" 39" - 1/4" 40" - 1/4" 41" - 1/4" 42" - 1/4" 43" - 1/4" 44" - 1/4" 45" - 1/4" 46" - 1/4" 47" - 1/4" 48" - 1/4" 49" - 1/4" 50" - 1/4" 51" - 1/4" 52" - 1/4" 53" - 1/4" 54" - 1/4" 55" - 1/4" 56" - 1/4" 57" - 1/4" 58" - 1/4" 59" - 1/4" 60" - 1/4" 61" - 1/4" 62" - 1/4" 63" - 1/4" 64" - 1/4" 65" - 1/4" 66" - 1/4" 67" - 1/4" 68" - 1/4" 69" - 1/4" 70" - 1/4" 71" - 1/4" 72" - 1/4" 73" - 1/4" 74" - 1/4" 75" - 1/4" 76" - 1/4" 77" - 1/4" 78" - 1/4" 79" - 1/4" 80" - 1/4" 81" - 1/4" 82" - 1/4" 83" - 1/4" 84" - 1/4" 85" - 1/4" 86" - 1/4" 87" - 1/4" 88" - 1/4" 89" - 1/4" 90" - 1/4" 91" - 1/4" 92" - 1/4" 93" - 1/4" 94" - 1/4" 95" - 1/4" 96" - 1/4" 97" - 1/4" 98" - 1/4" 99" - 1/4" 100" - 1/4"	 Raymond, ME TITLE: <b>INSTALLATION</b> DCRH5ED WWRA 91.9 FM SO 42446 GAGE CODE: <b>D 08441</b> DRAWING NO.: <b>017A60900</b> 8:50:30 AM SHEET: 1 OF 2
PART NO.: MATERIAL NO: <b>300003619</b>	DESIGNED BY: jcmason 12/16/2015 DETAIL BY: jcmason 12/16/2015 CHKD BY: jmked 12/15/15 ENG. 1 APPR: jeds 12/15/15 ENG. 2 APPR: jeds 12/15/15 MANUFACT. jhnm 12/15/15	
SAP DOCUMENT NO:	REFER TO D8110 FOR PLATING REFER TO D17800 FOR PAINT	
MATERIAL:		
FINISH: N/A		

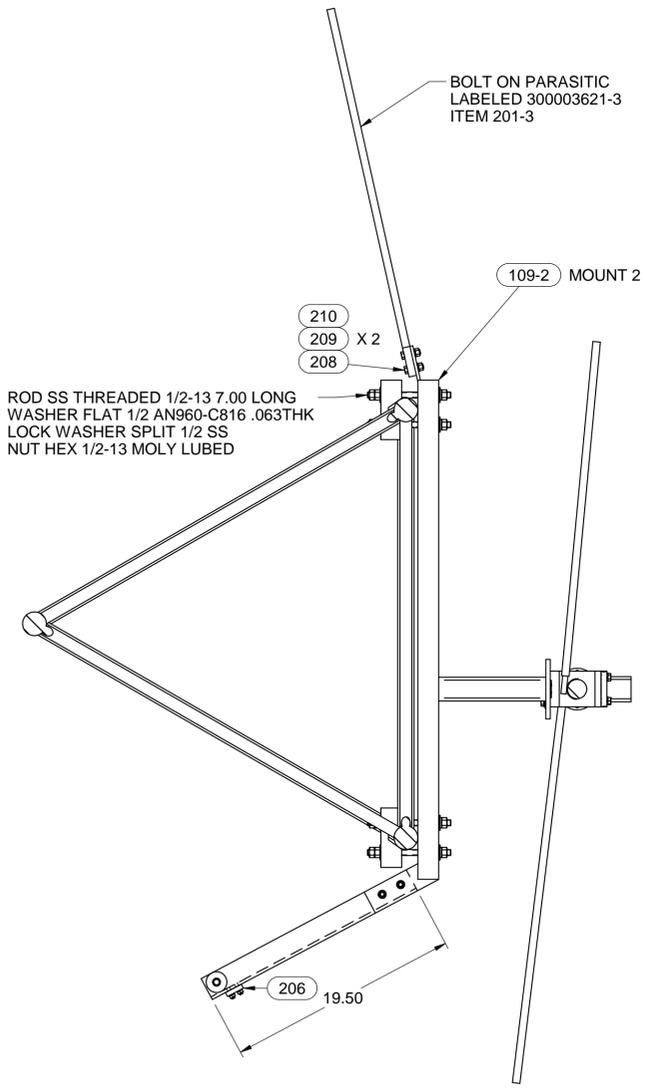
REV:	SHEET:	ZONE:	3	REVISION NOTE	ECO:	DATE APPR:
A				CAD MAINTAINED. CHANGES SHALL BE INCORPORATED BY THE DESIGN ACTIVITY. PRODUCTION RELEASE		



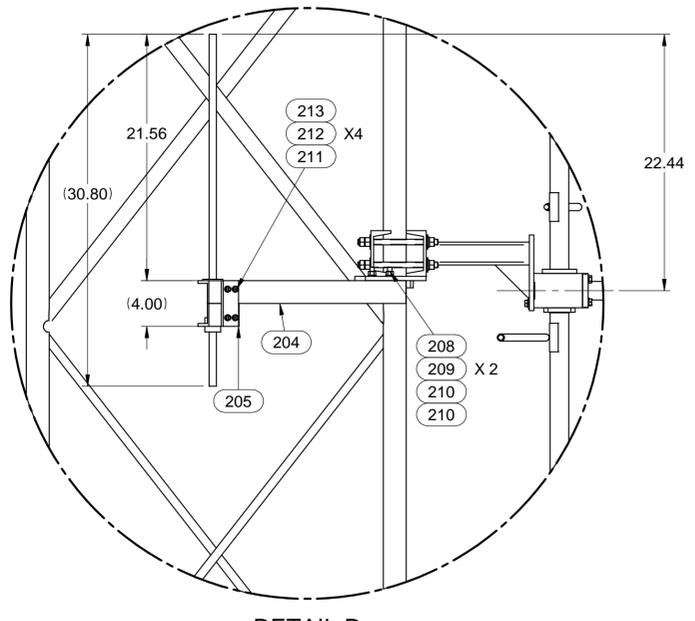
SECTION B-B  
BAYS 3-5



DETAIL C  
BAYS 3-5



SECTION E-E  
BAYS 1-2



DETAIL D  
BAYS 1-2

**COMPANY CONFIDENTIAL.** INFORMATION CONTAINED HEREIN IS CONFIDENTIAL. IT IS THE PROPERTY OF DIELECTRIC. IT IS TO BE USED SOLELY FOR THE PURPOSE PROVIDED, AND IT IS NOT TO BE DISCLOSED TO OTHERS WITHOUT THE PRIOR WRITTEN CONSENT OF DIELECTRIC.

**UNLESS OTHERWISE SPECIFIED**  
MANUFACTURING TOLERANCE AND PROCEDURES MUST BE IN ACCORDANCE WITH D78691. ALL ALUMINUM, COPPER, AND BRASS WELDING MUST COMPLY WITH A-62700, SECT. XIV "PRODUCTION WELDING PROCEDURES". STRUCTURAL STEEL WELDING MUST COMPLY WITH "AWS 1.1 CURRENT REVISION".

STATUS: <b>RELEASED</b>	<b>DIMENSIONAL TOLERANCES</b> (UNLESS OTHERWISE NOTED) DECIMAL DIMENSIONS 3 PLACE DIMENSIONS ±.005 2 PLACE DIMENSIONS ±.02 FRACTIONAL DIMENSIONS 0" - ±1/32" ABOVE 6" UP TO 12" ±1/16" ABOVE 12" UP TO 48" ±1/8" ABOVE 48" ±1/4" ANGULAR DIMENSIONS ±1/2" REFERENCE DIMENSIONS ARE NOT FOR MANUFACTURING OR INSPECTION	Raymond, ME <b>INSTALLATION</b> DCRH5ED WWRA 91.9 FM SO 42446																		
PARTY NO. / MATERIAL NO: <b>300003619</b>																				
SAP DOCUMENT NO:	<table border="1"> <tr><th>NAME</th><th>DATE</th></tr> <tr><td>DESIGNED BY jcmason</td><td>12/16/2015</td></tr> <tr><td>DETAIL BY jcmason</td><td>12/16/2015</td></tr> <tr><td>CHKD BY jmked</td><td>12/15/15</td></tr> <tr><td>ENG. 1 APPR. jcks</td><td>12/15/15</td></tr> <tr><td>ENG. 2 APPR. hericks</td><td>12/15/15</td></tr> <tr><td>MANUFACT. jghm</td><td>12/15/15</td></tr> </table>	NAME	DATE	DESIGNED BY jcmason	12/16/2015	DETAIL BY jcmason	12/16/2015	CHKD BY jmked	12/15/15	ENG. 1 APPR. jcks	12/15/15	ENG. 2 APPR. hericks	12/15/15	MANUFACT. jghm	12/15/15	<table border="1"> <tr><th>GAGE CODE</th><th>DRAWING NO.</th></tr> <tr><td><b>D 08441</b></td><td><b>017A60900</b></td></tr> </table>	GAGE CODE	DRAWING NO.	<b>D 08441</b>	<b>017A60900</b>
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