
FM DIRECTIONAL BROADCAST ANTENNA

PROOF-OF-PERFORMANCE

MODEL JMPC-1R (DA), 88.1MHZ

SERIAL NUMBER 20309-A

WCRX-FM

COLUMBIA COLLEGE CHICAGO, IL





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DATE: May 10, 2023

FM ANTENNA FOR: STATION: WCRX, 88.1 MHz

LOCATION: COLUMBIA COLLEGE CHICAGO

ANTENNA GAIN	H-pol	V-pol
Relative	1.286	0.890
(dBd)	(1.092)	(-0.506)

MODEL NUMBER: JMPC-1R DA

FREQUENCY & ERP: 88.1 MHz, 0.1 kW

ANTENNA INPUT POWER: 0.0778 kW

ANTENNA BORESIGHT BOOM HEADING: 100° True North

RMS OF THE NORMALIZED	Composite	H-pol	V-pol
AZIMUTH PATTERNS:	0.6740	0.6002	0.7727

Ratio of RMS of Composite pattern over RMS Limits 0.856 (85.6%)

CERTIFICATION

This certification, along with the accompanying antenna specification sheet, antenna mounting sketches, and azimuth and elevation patterns, certifies the construction, measurement and calculations of the *JAMPRO* FM CP antenna to the station's requirements, as designed, calculated, analyzed and measured at the *JAMPRO* Antenna, Inc. factory site in Sacramento, California. The following is an outline of construction methods, patterns design and calculations, tuning as measured, installation requirements, recommended maintenance and equipment used.

CONSTRUCTION

A standard CP FM antenna model was used and parasitic reflectors were added to create the required directional patterns. These additional reflectors elements are steel, hot dipped galvanized and either bolted or welded in place. Measurements to establish their exact location are shown on the antenna mounting sketches.

ANTENNA PATTERNS CALCULATIONS AND ANALYSIS

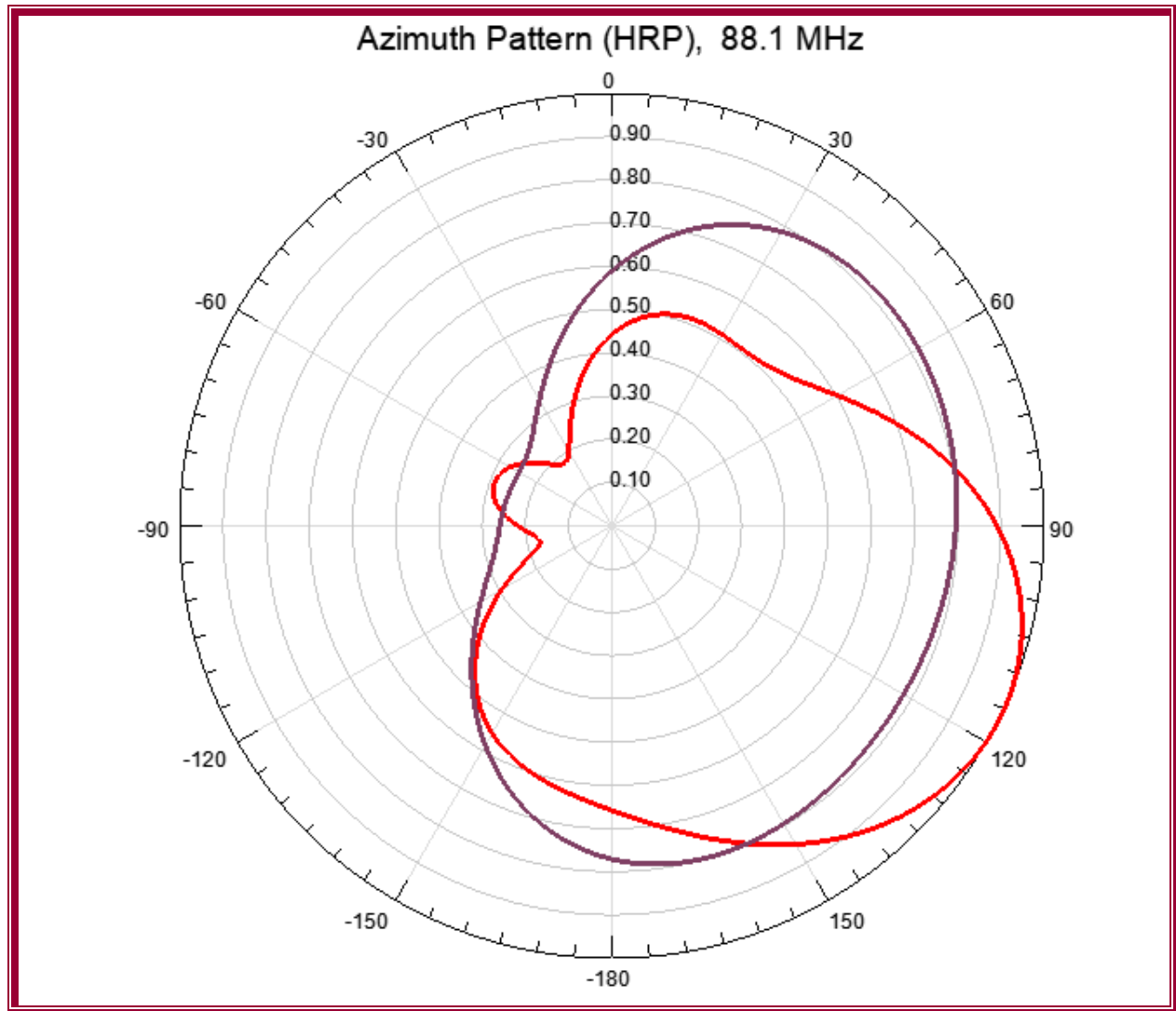
The full scale antenna was numerically modelled using commercial High Frequency Simulation Solver software ANSYS®Electromagnetics Suite 18.1.0. The model includes complete antenna with reflectors on a duplicate of its mechanical support. Resulting Azimuth HRP patterns, RMS values, Elevation patterns and gain figures each in both polarizations Horizontal and Vertical, as well their Composite pattern and other details, are to be found on the accompanying pages.



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ANTENNA AZIMUTH PATTERN PLOT AT 88.1 MHZ



---- Horizontal Polarization

---- Vertical Polarization



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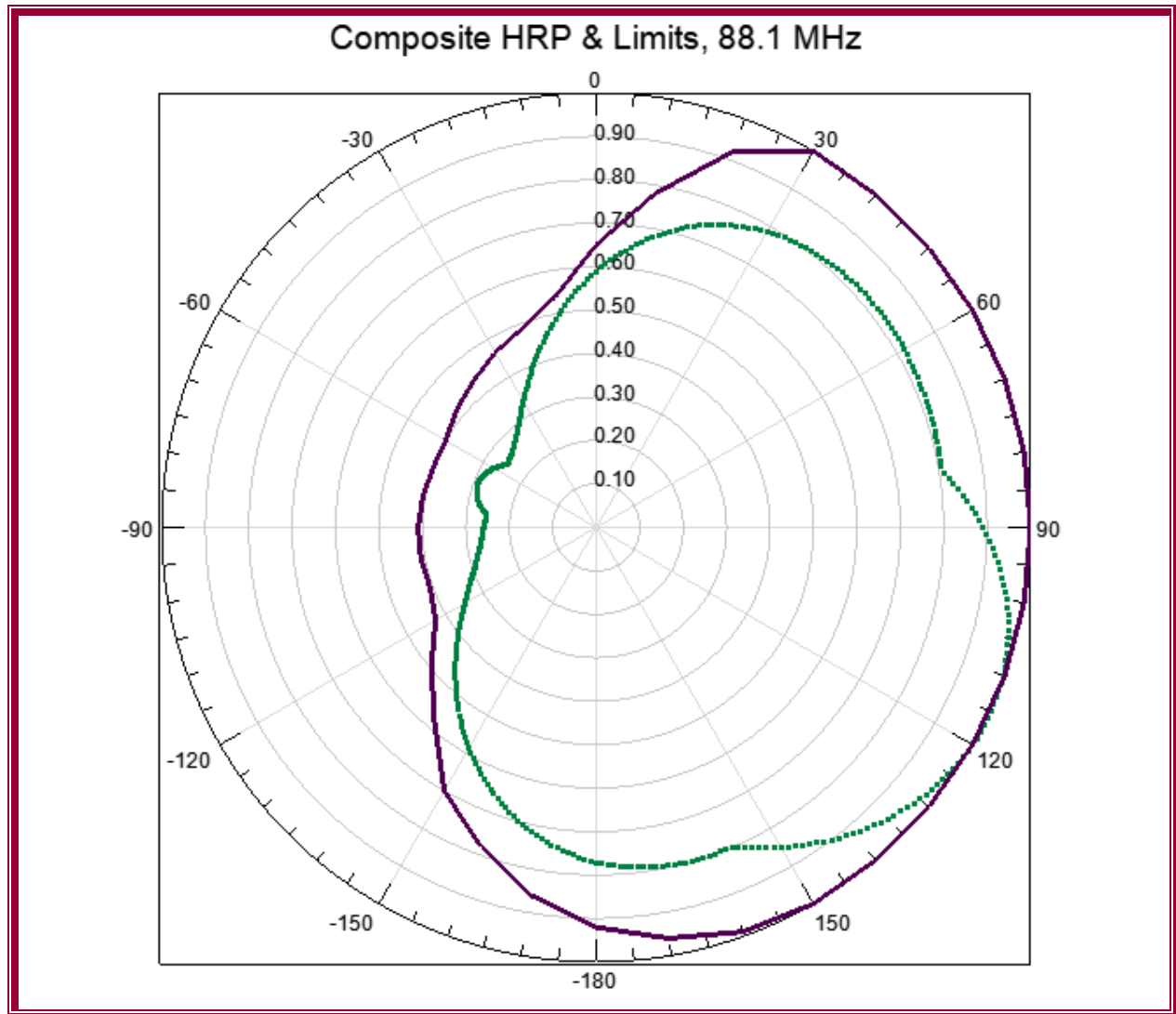
Station: WCRX Model JMPC-1R DA, 88.1 MHz				ERP=0.1 kW			
		Tabulation Of Radiating Fields					
	Horizontal Polarization				Vertical Polarization		
Bearing	Field	ERP	dBk		Field	ERP	dBk
degrees		kW				kW	
0	0.443	0.020	-17.08		0.589	0.035	-14.59
10	0.493	0.024	-16.14		0.673	0.045	-13.44
20	0.513	0.026	-15.80		0.740	0.055	-12.61
30	0.511	0.026	-15.84		0.786	0.062	-12.10
40	0.510	0.026	-15.86		0.810	0.066	-11.83
50	0.537	0.029	-15.41		0.819	0.067	-11.73
60	0.603	0.036	-14.40		0.819	0.067	-11.74
70	0.697	0.049	-13.14		0.813	0.066	-11.80
80	0.799	0.064	-11.95		0.805	0.065	-11.88
90	0.891	0.079	-11.00		0.796	0.063	-11.98
100	0.959	0.092	-10.36		0.788	0.062	-12.07
110	0.996	0.099	-10.03		0.782	0.061	-12.14
120	1.000	0.100	-10.00		0.780	0.061	-12.16
130	0.972	0.095	-10.24		0.782	0.061	-12.14
140	0.920	0.085	-10.73		0.788	0.062	-12.07
150	0.850	0.072	-11.41		0.795	0.063	-11.99
160	0.776	0.060	-12.20		0.799	0.064	-11.95
170	0.709	0.050	-12.99		0.793	0.063	-12.01
180	0.658	0.043	-13.63		0.771	0.059	-12.26
190	0.624	0.039	-14.10		0.728	0.053	-12.76
200	0.595	0.035	-14.52		0.664	0.044	-13.55
210	0.554	0.031	-15.13		0.586	0.034	-14.64
220	0.490	0.024	-16.20		0.501	0.025	-16.00
230	0.400	0.016	-17.96		0.419	0.018	-17.55
240	0.294	0.009	-20.64		0.351	0.012	-19.11
250	0.200	0.004	-23.98		0.301	0.009	-20.42
260	0.173	0.003	-25.26		0.273	0.007	-21.29
270	0.218	0.005	-23.23		0.259	0.007	-21.74
280	0.269	0.007	-21.41		0.253	0.006	-21.94
290	0.289	0.008	-20.77		0.249	0.006	-22.07
300	0.272	0.007	-21.31		0.248	0.006	-22.12
310	0.227	0.005	-22.90		0.256	0.007	-21.83
320	0.185	0.003	-24.66		0.284	0.008	-20.95
330	0.199	0.004	-24.02		0.335	0.011	-19.49
340	0.273	0.008	-21.26		0.409	0.017	-17.76
350	0.364	0.013	-18.77		0.497	0.025	-16.07
Bearing	Horizontal	ERP	dBk		Vertical	ERP	dBk
degrees	Polarization	kW			Polarization	kW	
	Field				Field		
	rms=0.6002				rms=0.7727		



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COMPOSITE AZIMUTH PATTERN & LIMITS PLOT, AT 88.1 MHZ



---- Composite Horizontal & Vertical Polarization (rms=0.6740)

---- Limits (rms=0.7876)



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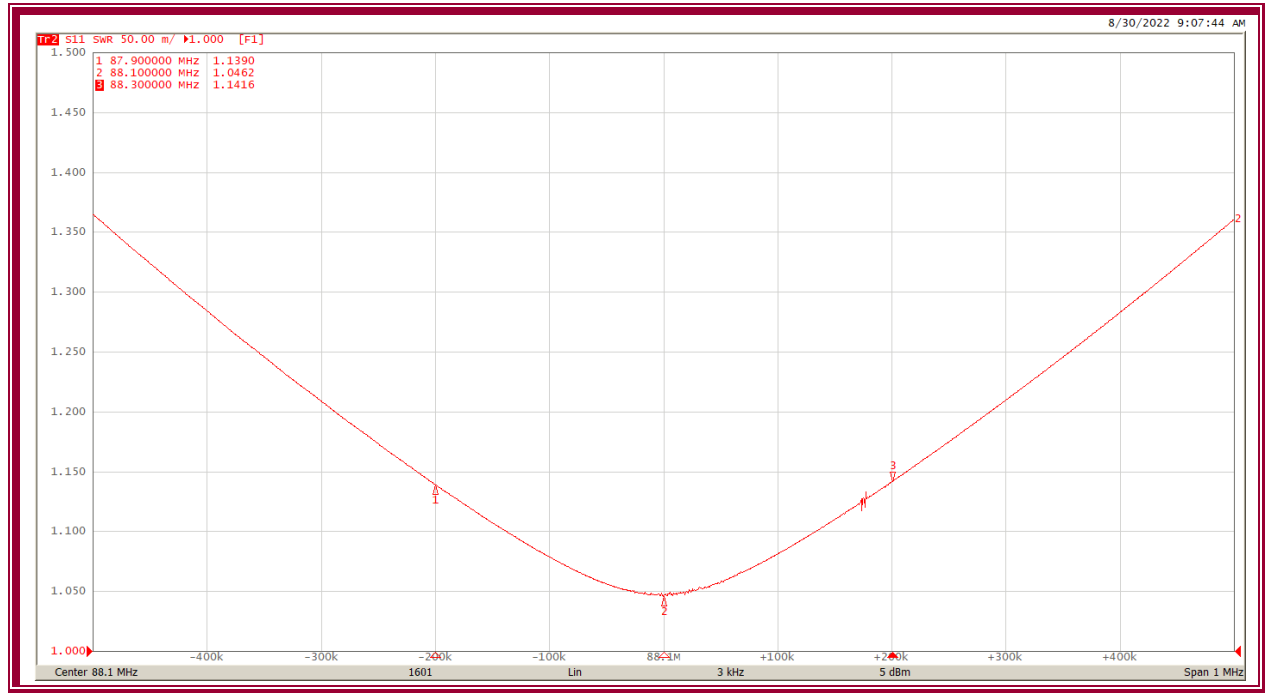
Station: WCRX Model JMPC-1R DA, 88.1 MHz			
ERP=0.1 kW			
Tabulation Of Radiating Fields			
Composite H & V Pattern			
Bearing degrees	Field	ERP kW	dBk
0	0.589	0.035	-14.59
10	0.673	0.045	-13.44
20	0.740	0.055	-12.61
30	0.786	0.062	-12.10
40	0.810	0.066	-11.83
50	0.819	0.067	-11.73
60	0.819	0.067	-11.74
70	0.813	0.066	-11.80
80	0.805	0.065	-11.88
90	0.891	0.079	-11.00
100	0.959	0.092	-10.36
110	0.996	0.099	-10.03
120	1.000	0.100	-10.00
130	0.972	0.095	-10.24
140	0.920	0.085	-10.73
150	0.850	0.072	-11.41
160	0.799	0.064	-11.95
170	0.793	0.063	-12.01
180	0.771	0.059	-12.26
190	0.728	0.053	-12.76
200	0.664	0.044	-13.55
210	0.586	0.034	-14.64
220	0.501	0.025	-16.00
230	0.419	0.018	-17.55
240	0.351	0.012	-19.11
250	0.301	0.009	-20.42
260	0.273	0.007	-21.29
270	0.259	0.007	-21.74
280	0.269	0.007	-21.41
290	0.289	0.008	-20.77
300	0.272	0.007	-21.31
310	0.256	0.007	-21.83
320	0.284	0.008	-20.95
330	0.335	0.011	-19.49
340	0.409	0.017	-17.76
350	0.497	0.025	-16.07
Bearing degrees	Composite H & V Field	ERP kW	dBk
	rms=0.674		



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ANTENNA VSWR PLOT

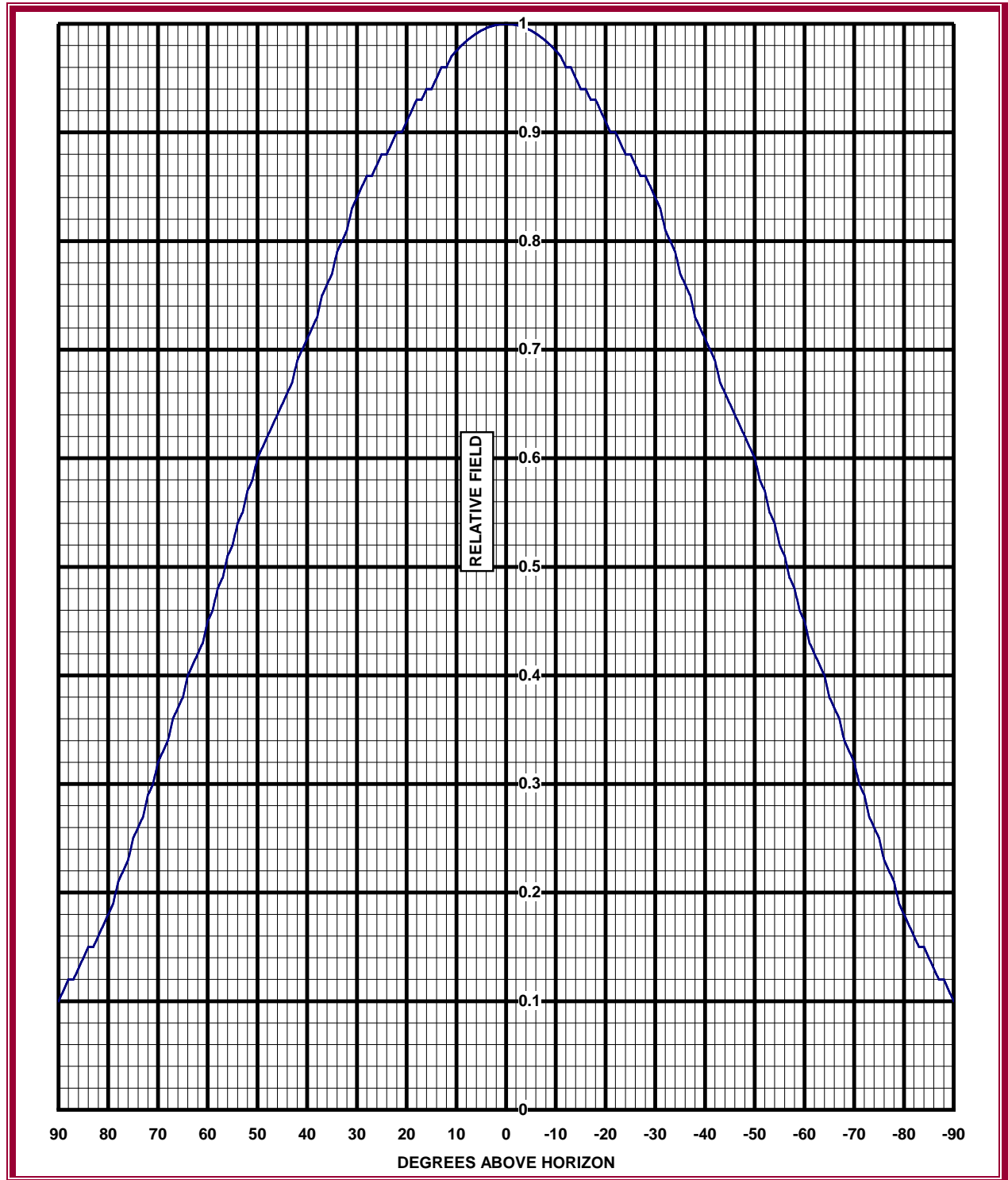




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ELEVATION PATTERN NORMALIZED





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ELEVATION PATTERN TABULATION

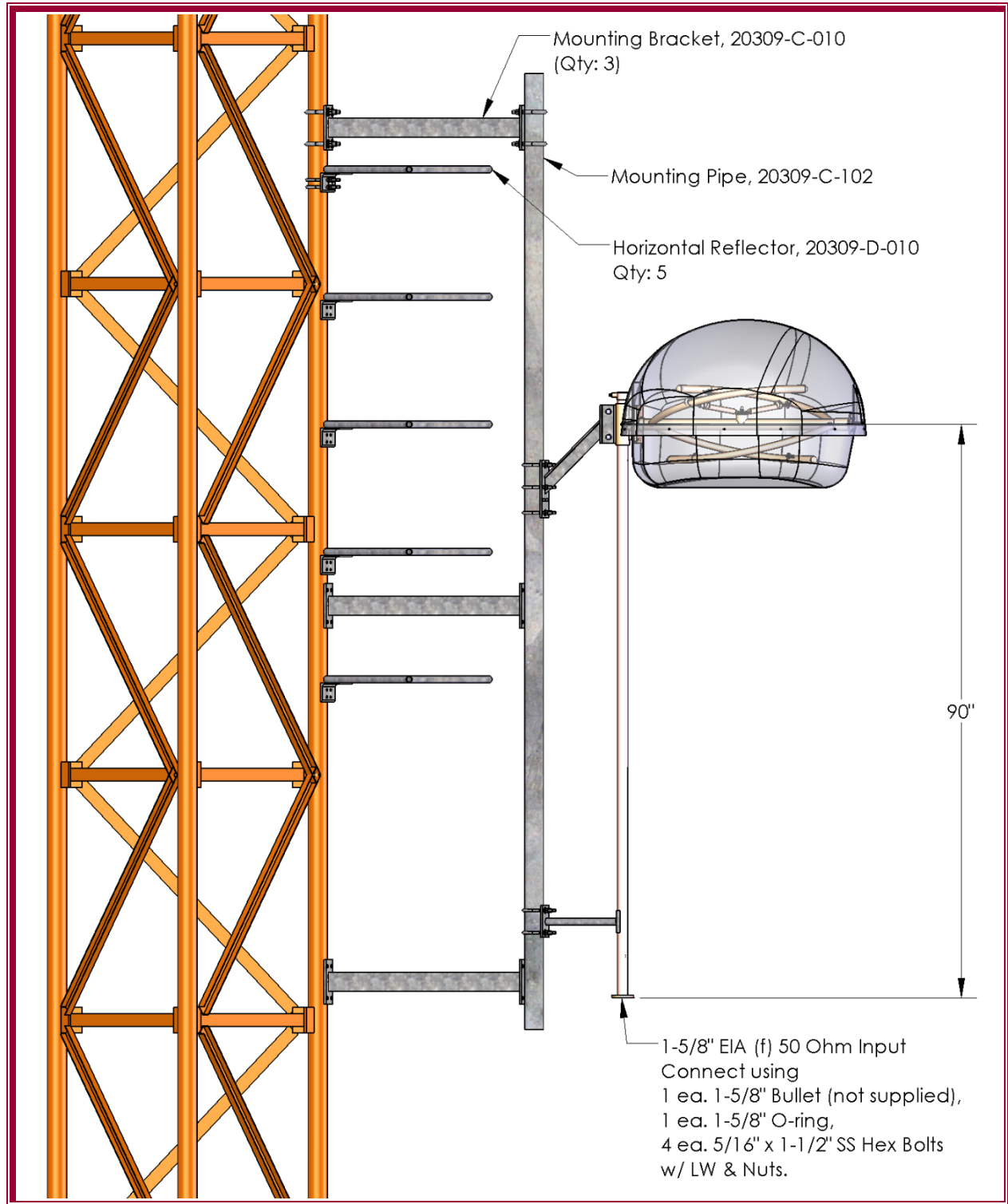
<u>ELEVATION</u>	<u>RELATIVE</u>	<u>ELEVATION</u>	<u>RELATIVE</u>	<u>ELEVATION</u>	<u>RELATIVE</u>
<u>ANGLE</u>	<u>FIELD</u>	<u>ANGLE</u>	<u>FIELD</u>	<u>ANGLE</u>	<u>FIELD</u>
10	0.975	-26	0.870	-61	0.430
9	0.980	-27	0.860	-62	0.420
8	0.984	-28	0.860	-63	0.410
7	0.988	-29	0.850	-64	0.400
6	0.991	-30	0.840	-65	0.380
5	0.994	-31	0.830	-66	0.370
4	0.996	-32	0.810	-67	0.360
3	0.998	-33	0.800	-68	0.340
2	0.999	-34	0.790	-69	0.330
1	1.000	-35	0.770	-70	0.320
0	1.000	-36	0.760	-71	0.300
-1	1.000	-37	0.750	-72	0.290
-2	0.999	-38	0.730	-73	0.270
-3	0.998	-39	0.720	-74	0.260
-4	0.996	-40	0.710	-75	0.250
-5	0.994	-41	0.700	-76	0.230
-6	0.991	-42	0.690	-77	0.220
-7	0.988	-43	0.670	-78	0.210
-8	0.984	-44	0.660	-79	0.190
-9	0.980	-45	0.650	-80	0.180
-10	0.975	-46	0.640	-81	0.170
-11	0.970	-47	0.630	-82	0.160
-12	0.960	-48	0.620	-83	0.150
-13	0.960	-49	0.610	-84	0.150
-14	0.950	-50	0.600	-85	0.140
-15	0.940	-51	0.580	-86	0.130
-16	0.940	-52	0.570	-87	0.120
-17	0.930	-53	0.550	-88	0.120
-18	0.930	-54	0.540	-89	0.110
-19	0.920	-55	0.520	-90	0.100
-20	0.910	-56	0.510		
-21	0.900	-57	0.490		
-22	0.900	-58	0.480		
-23	0.890	-59	0.460		
-24	0.880	-60	0.450		
-25	0.880				



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MECHANICAL DRAWINGS - ELEVATION VIEW

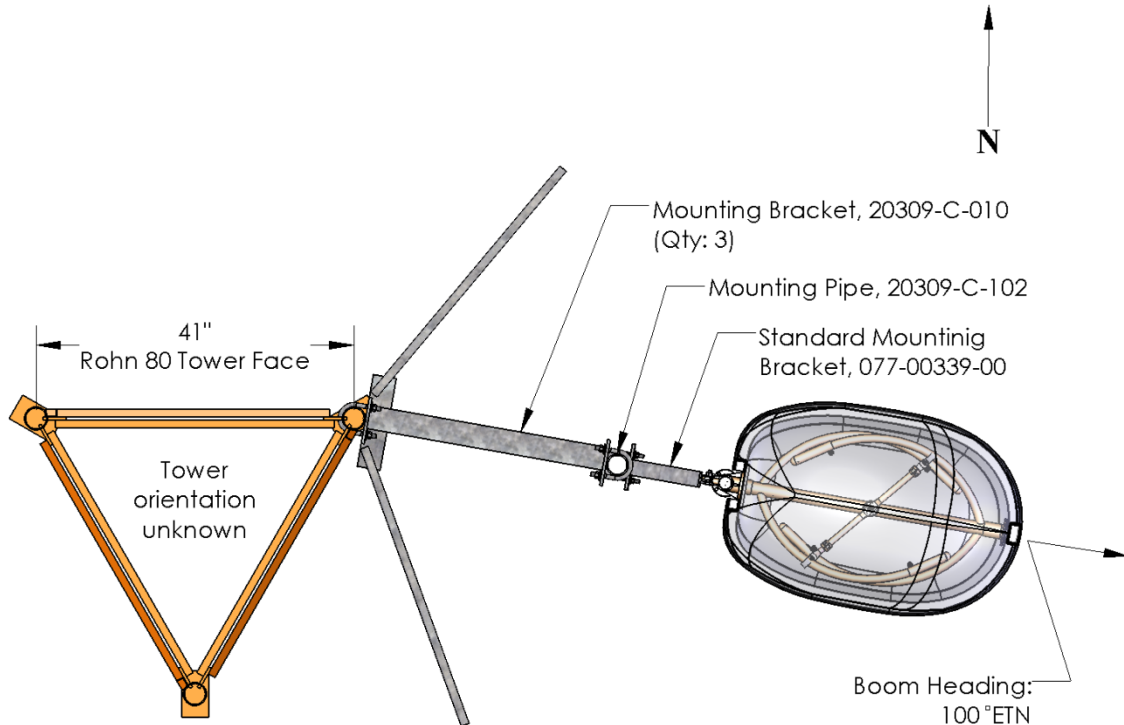




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MECHANICAL DRAWINGS - TOP VIEW



NOTES:

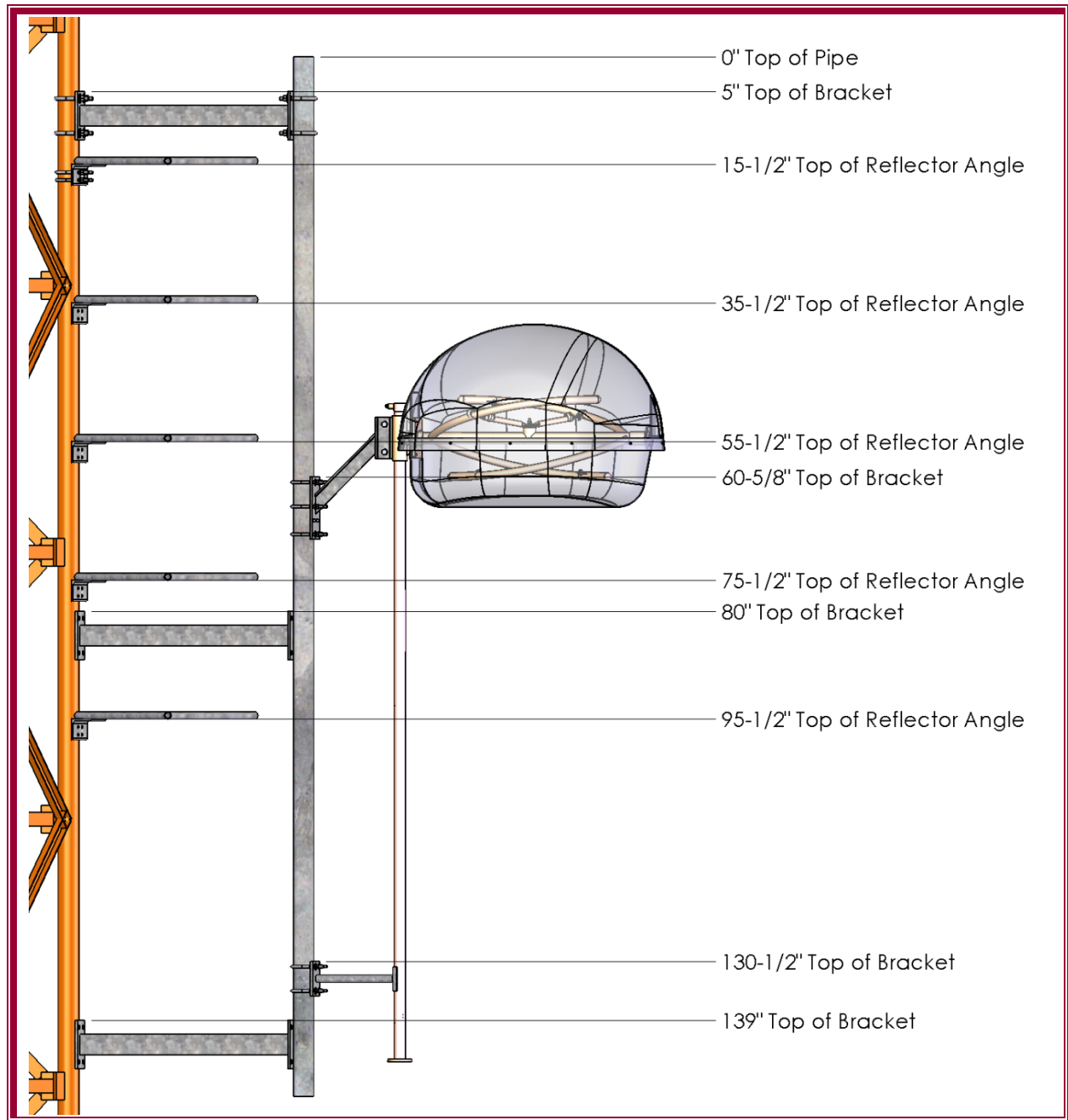
1. The leg size and/or face width are based on information provided by the customer or an authorized representative.
2. The tower orientation was unknown at the time of this publication.
3. Install the antenna as shown and position the antenna based on the dimension(s) indicated on the 'Element Position' Sheet.
4. Installing the antenna other than illustrated may affect performance.
5. If guy wires are present, use of glass rods or break-up insulators in guy wires is optional.
6. Purge moisture from antenna system and coaxial cable before applying any RF power.
7. All metal parts are at D.C. ground through element grounding.
8. Remove paint at tower leg connections to ensure proper grounding.
9. The Station Engineer is to determine onto which leg the antenna will be installed for optimal coverage.



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MOUNT AND REFLECTOR POSITION VIEW



Horizontal Reflector, 20309-D-010
Qty: 5

41" Rohn 80 Tower Face

38-3/8" or symmetrical

62" to C of Tower Leg

32-5/8" to C of Rigid Line

Boom Heading: 100° ETN

Tower orientation unknown
(See 'NOTES')

Tower Leg Ø 3"

North arrow pointing up and slightly left.

NOTES:
1. The tower is currently positioned with one face oriented in a northerly direction which may or may not be the final orientation after construction.

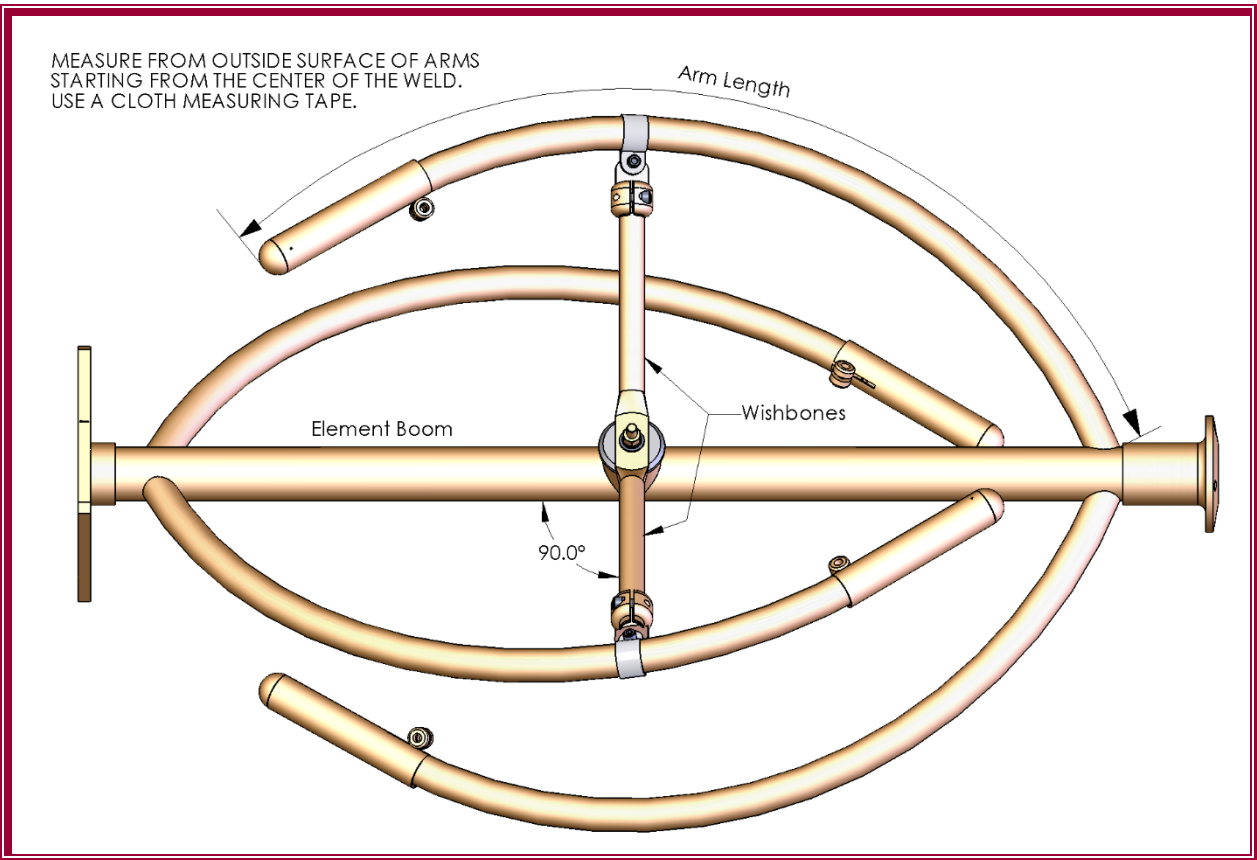
1. The tower is currently positioned with one face oriented in a northerly direction which may or may not be the final orientation after construction.
2. If the tower is oriented other than indicated, please contact the structural design engineer to obtain updated dimensions.



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MECHANICAL DRAWINGS – RADIATING DIPOLES ARMS LENGTH & FEED WISHBONE SETTINGS



Arms Length and Feed Wishbone (WB) settings for serial#20309-A are :
Arms Length=30-1/2", WBs are Orthogonal to boom across from feed pin



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REFLECTORS DRAWING

