



TFU-23ETT/VP-R 4C130

Proposal Number: C-70383
Date: 25-Feb-17
Customer: Graham Media
Location: Detroit, MI

Electrical Specifications

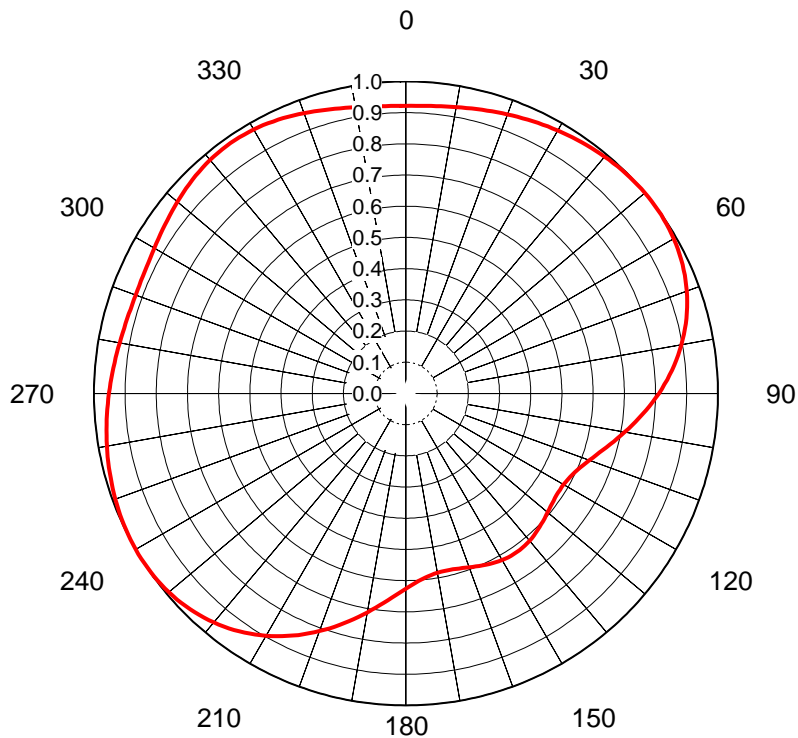
Polarization	Elliptical				
Azimuth Pattern	Directional				
Antenna Input	6-1/8"	75 Ohm	EIA/DCA		
VSWR	Channel	1.08 : 1		Band	1.08 : 1
Bandwidth	6 MHz				
Rated Input Power	40 kW	(16.02 dBk)	Maximum Average Power		

Mechanical Specifications

Mounting	Top Mounted				
Environmental Protection					
Height	52.5 ft (16m)	less Lightning Protector	56.5 ft (17.2m)	with Lightning Protector	
Weight	10000 lb (4.5t)				
Effective Projected Area	79.1 ft² (7.3m²)	TIA-222-G	Basic Wind Speed	89 m/h (143.2 km/h)	

Channel Specifications

Call	CH	Freq	Hpol ERP	Vpol ERP	TPO	Peak Main Lob Hpol Gain	Peak Main Lobe Vpol Gain	Peak at Horizontal Hpol Gain	Peak at Horizontal Vpol Gain
WDIV	32	581 MHz	678.0 kW (28.31 dBk)	203.0 kW (23.07 dBk)	40.3 kW (16.06 dBk)	21.76 (13.38dB)	6.51 (8.14dB)	16.43 (12.16dB)	4.92 (6.92dB)



AZIMUTH PATTERN Horizontal Polarization

Proposal No. **C-70383**
 Date **25-Feb-17**
 Call Letters **WDIV 32**
 Frequency **581 MHz**
 Antenna Type **TFU-23ETT/VP-R 4C130 (SF)**

 Gain **1.32 (1.21dB)**
Calculated

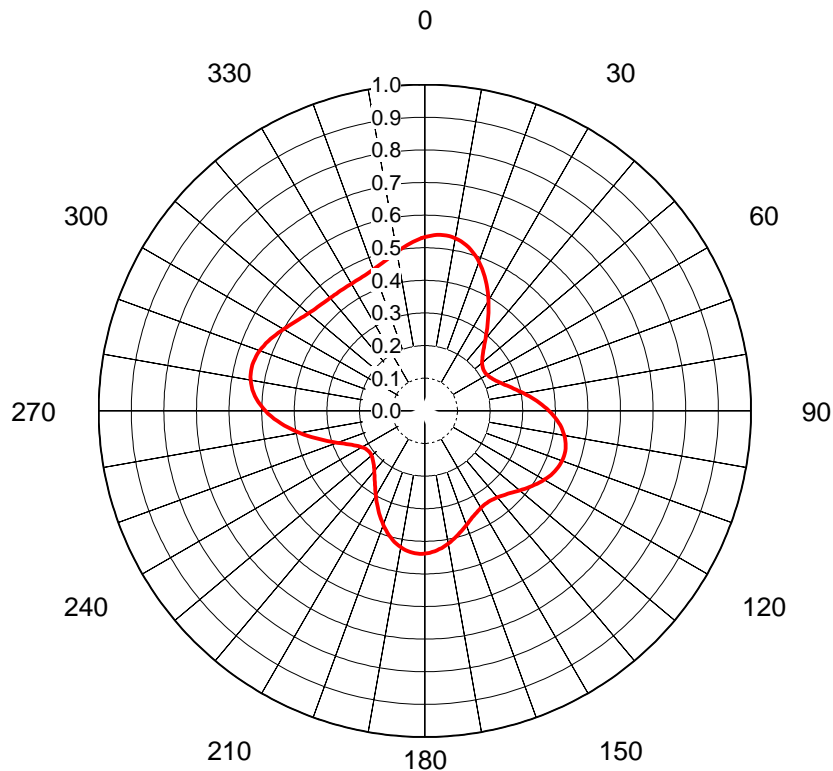
 Directional
 Drawing # **TFU-4C130-HP**

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.922	36	0.984	72	0.948	108	0.641	144	0.621	180	0.626	216	0.937	252	0.988	288	0.922	324	0.980
1	0.922	37	0.986	73	0.942	109	0.633	145	0.621	181	0.633	217	0.943	253	0.986	289	0.922	325	0.980
2	0.923	38	0.988	74	0.937	110	0.626	146	0.621	182	0.641	218	0.948	254	0.984	290	0.922	326	0.980
3	0.923	39	0.989	75	0.931	111	0.619	147	0.620	183	0.649	219	0.953	255	0.983	291	0.922	327	0.979
4	0.924	40	0.991	76	0.924	112	0.613	148	0.619	184	0.657	220	0.958	256	0.981	292	0.922	328	0.979
5	0.925	41	0.992	77	0.918	113	0.607	149	0.618	185	0.665	221	0.963	257	0.979	293	0.922	329	0.978
6	0.926	42	0.994	78	0.911	114	0.602	150	0.617	186	0.674	222	0.967	258	0.977	294	0.923	330	0.977
7	0.927	43	0.995	79	0.904	115	0.598	151	0.615	187	0.684	223	0.971	259	0.975	295	0.924	331	0.975
8	0.929	44	0.996	80	0.897	116	0.594	152	0.613	188	0.693	224	0.975	260	0.973	296	0.925	332	0.974
9	0.930	45	0.997	81	0.889	117	0.591	153	0.611	189	0.703	225	0.978	261	0.971	297	0.926	333	0.972
10	0.932	46	0.998	82	0.881	118	0.588	154	0.609	190	0.712	226	0.981	262	0.969	298	0.928	334	0.970
11	0.933	47	0.999	83	0.873	119	0.586	155	0.606	191	0.722	227	0.984	263	0.967	299	0.929	335	0.968
12	0.935	48	0.999	84	0.865	120	0.584	156	0.603	192	0.732	228	0.987	264	0.965	300	0.931	336	0.966
13	0.937	49	1.000	85	0.856	121	0.583	157	0.601	193	0.742	229	0.989	265	0.963	301	0.933	337	0.963
14	0.939	50	1.000	86	0.848	122	0.582	158	0.598	194	0.752	230	0.992	266	0.960	302	0.935	338	0.961
15	0.941	51	1.000	87	0.839	123	0.582	159	0.596	195	0.762	231	0.993	267	0.958	303	0.938	339	0.958
16	0.943	52	1.000	88	0.830	124	0.583	160	0.593	196	0.772	232	0.995	268	0.956	304	0.940	340	0.956
17	0.945	53	1.000	89	0.820	125	0.584	161	0.591	197	0.782	233	0.996	269	0.954	305	0.943	341	0.953
18	0.947	54	0.999	90	0.811	126	0.585	162	0.589	198	0.792	234	0.998	270	0.952	306	0.945	342	0.951
19	0.950	55	0.998	91	0.801	127	0.587	163	0.587	199	0.801	235	0.998	271	0.949	307	0.948	343	0.948
20	0.952	56	0.998	92	0.792	128	0.589	164	0.585	200	0.811	236	0.999	272	0.947	308	0.950	344	0.945
21	0.954	57	0.996	93	0.782	129	0.591	165	0.584	201	0.820	237	1.000	273	0.945	309	0.953	345	0.943
22	0.956	58	0.995	94	0.772	130	0.593	166	0.583	202	0.830	238	1.000	274	0.943	310	0.956	346	0.940
23	0.958	59	0.993	95	0.762	131	0.596	167	0.582	203	0.839	239	1.000	275	0.941	311	0.958	347	0.938
24	0.961	60	0.992	96	0.752	132	0.598	168	0.582	204	0.848	240	1.000	276	0.939	312	0.961	348	0.936
25	0.963	61	0.989	97	0.742	133	0.601	169	0.583	205	0.856	241	1.000	277	0.937	313	0.963	349	0.933
26	0.965	62	0.987	98	0.732	134	0.604	170	0.584	206	0.865	242	0.999	278	0.935	314	0.966	350	0.931
27	0.967	63	0.984	99	0.722	135	0.606	171	0.585	207	0.873	243	0.999	279	0.933	315	0.968	351	0.930
28	0.969	64	0.981	100	0.712	136	0.609	172	0.588	208	0.881	244	0.998	280	0.932	316	0.970	352	0.928
29	0.971	65	0.978	101	0.703	137	0.611	173	0.590	209	0.889	245	0.997	281	0.930	317	0.972	353	0.926
30	0.973	66	0.975	102	0.693	138	0.613	174	0.594	210	0.897	246	0.996	282	0.928	318	0.974	354	0.925
31	0.975	67	0.971	103	0.684	139	0.615	175	0.598	211	0.904	247	0.995	283	0.927	319	0.975	355	0.924
32	0.977	68	0.967	104	0.674	140	0.617	176	0.602	212	0.911	248	0.994	284	0.926	320	0.977	356	0.923
33	0.979	69	0.963	105	0.666	141	0.618	177	0.607	213	0.918	249	0.992	285	0.925	321	0.978	357	0.923
34	0.981	70	0.958	106	0.657	142	0.619	178	0.613	214	0.924	250	0.991	286	0.924	322	0.979	358	0.922
35	0.983	71	0.953	107	0.649	143	0.620	179	0.619	215	0.931	251	0.989	287	0.923	323	0.979	359	0.922

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AZIMUTH PATTERN Vertical Polarization

Proposal No. **C-70383**
 Date **25-Feb-17**
 Call Letters **WDIV 32**
 Frequency **581 MHz**
 Antenna Type **TFU-23ETT/VP-R 4C130 (SF)**
 Gain **1.84 (2.66dB)**
 Directional
 Drawing # **TFU-4C130V D32**



Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.533	36	0.327	72	0.258	108	0.449	144	0.341	180	0.438	216	0.261	252	0.304	288	0.543	324	0.450
1	0.535	37	0.317	73	0.264	109	0.449	145	0.341	181	0.438	217	0.256	253	0.314	289	0.541	325	0.450
2	0.537	38	0.308	74	0.269	110	0.448	146	0.341	182	0.439	218	0.251	254	0.325	290	0.539	326	0.450
3	0.539	39	0.298	75	0.275	111	0.447	147	0.341	183	0.438	219	0.246	255	0.335	291	0.536	327	0.450
4	0.540	40	0.290	76	0.281	112	0.446	148	0.342	184	0.438	220	0.241	256	0.346	292	0.533	328	0.450
5	0.541	41	0.281	77	0.288	113	0.444	149	0.342	185	0.437	221	0.237	257	0.357	293	0.529	329	0.450
6	0.542	42	0.273	78	0.294	114	0.442	150	0.344	186	0.435	222	0.233	258	0.368	294	0.525	330	0.450
7	0.541	43	0.266	79	0.301	115	0.439	151	0.345	187	0.433	223	0.229	259	0.379	295	0.521	331	0.450
8	0.541	44	0.259	80	0.308	116	0.437	152	0.347	188	0.431	224	0.226	260	0.390	296	0.517	332	0.451
9	0.539	45	0.253	81	0.315	117	0.434	153	0.350	189	0.428	225	0.223	261	0.401	297	0.513	333	0.451
10	0.537	46	0.247	82	0.323	118	0.430	154	0.352	190	0.425	226	0.220	262	0.411	298	0.509	334	0.452
11	0.535	47	0.242	83	0.330	119	0.427	155	0.355	191	0.421	227	0.218	263	0.422	299	0.505	335	0.453
12	0.532	48	0.237	84	0.337	120	0.423	156	0.358	192	0.417	228	0.216	264	0.433	300	0.500	336	0.454
13	0.528	49	0.233	85	0.345	121	0.419	157	0.361	193	0.412	229	0.215	265	0.443	301	0.496	337	0.456
14	0.524	50	0.230	86	0.352	122	0.415	158	0.365	194	0.408	230	0.213	266	0.453	302	0.492	338	0.457
15	0.519	51	0.227	87	0.360	123	0.411	159	0.369	195	0.402	231	0.212	267	0.462	303	0.488	339	0.459
16	0.513	52	0.224	88	0.367	124	0.406	160	0.373	196	0.397	232	0.212	268	0.472	304	0.484	340	0.461
17	0.507	53	0.222	89	0.374	125	0.402	161	0.377	197	0.391	233	0.212	269	0.480	305	0.480	341	0.463
18	0.501	54	0.221	90	0.381	126	0.397	162	0.381	198	0.385	234	0.212	270	0.489	306	0.477	342	0.466
19	0.494	55	0.220	91	0.387	127	0.393	163	0.385	199	0.379	235	0.213	271	0.497	307	0.474	343	0.469
20	0.486	56	0.219	92	0.394	128	0.388	164	0.389	200	0.372	236	0.214	272	0.504	308	0.471	344	0.472
21	0.478	57	0.219	93	0.400	129	0.384	165	0.393	201	0.365	237	0.215	273	0.511	309	0.468	345	0.475
22	0.469	58	0.219	94	0.406	130	0.380	166	0.397	202	0.358	238	0.217	274	0.517	310	0.465	346	0.479
23	0.460	59	0.220	95	0.412	131	0.375	167	0.401	203	0.351	239	0.220	275	0.523	311	0.463	347	0.482
24	0.451	60	0.221	96	0.417	132	0.371	168	0.406	204	0.344	240	0.223	276	0.528	312	0.461	348	0.486
25	0.442	61	0.222	97	0.422	133	0.367	169	0.410	205	0.336	241	0.227	277	0.532	313	0.459	349	0.490
26	0.432	62	0.224	98	0.426	134	0.364	170	0.413	206	0.329	242	0.231	278	0.536	314	0.457	350	0.494
27	0.422	63	0.226	99	0.431	135	0.360	171	0.417	207	0.322	243	0.236	279	0.540	315	0.456	351	0.499
28	0.411	64	0.228	100	0.434	136	0.357	172	0.420	208	0.314	244	0.241	280	0.542	316	0.455	352	0.503
29	0.401	65	0.231	101	0.438	137	0.354	173	0.424	209	0.307	245	0.247	281	0.544	317	0.454	353	0.507
30	0.390	66	0.234	102	0.441	138	0.351	174	0.427	210	0.300	246	0.254	282	0.546	318	0.453	354	0.511
31	0.379	67	0.237	103	0.443	139	0.349	175	0.429	211	0.293	247	0.261	283	0.547	319	0.452	355	0.515
32	0.369	68	0.241	104	0.445	140	0.346	176	0.432	212	0.286	248	0.268	284	0.547	320	0.451	356	0.519
33	0.358	69	0.245	105	0.447	141	0.345	177	0.434	213	0.280	249	0.277	285	0.547	321	0.451	357	0.523
34	0.348	70	0.249	106	0.448	142	0.343	178	0.435	214	0.273	250	0.286	286	0.546	322	0.451	358	0.526
35	0.337	71	0.253	107	0.449	143	0.342	179	0.437	215	0.267	251	0.295	287	0.545	323	0.450	359	0.530

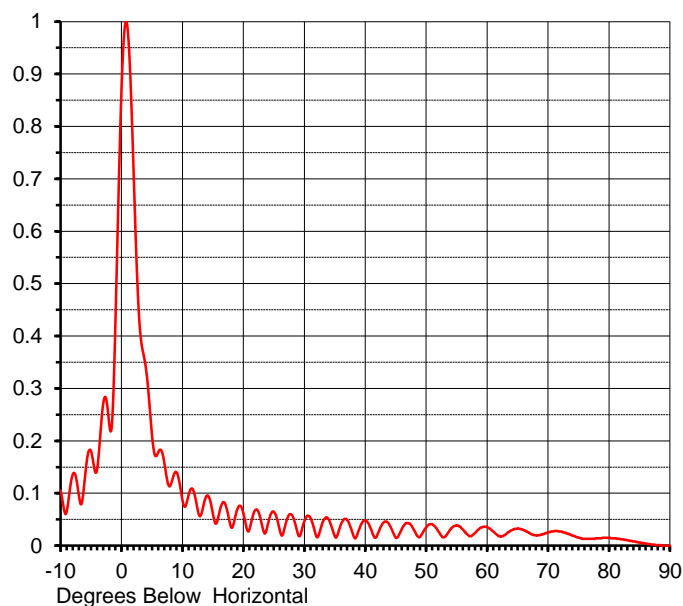
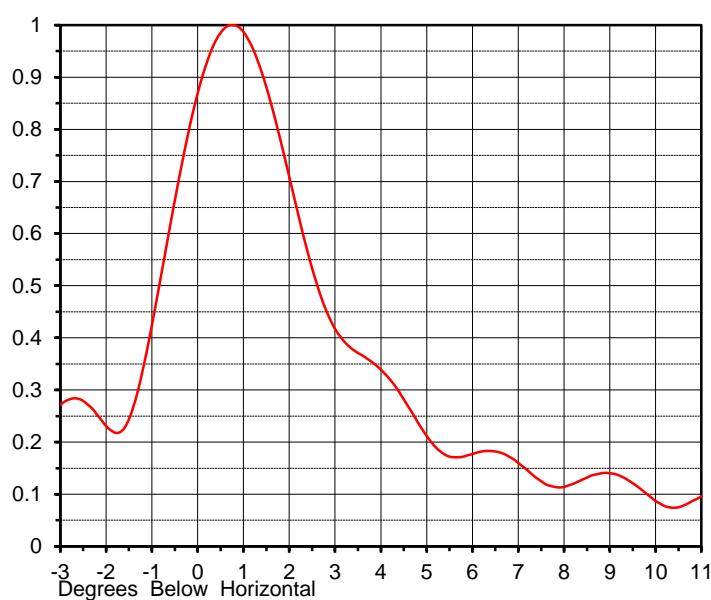
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ELEVATION PATTERN

Proposal No. **C-70383**
 Date **25-Feb-17**
 Call Letters **WDIV 32**
 Frequency **581 MHz**
 Antenna Type **TFU-23ETT/VP-R 4C130 (**

RMS Directivity at Main Lobe **20.00 (13.01 dB)**
 RMS Directivity at Horizontal **15.10 (11.79 dB)**
Calculated

Beam Tilt **0.75 deg**
 Drawing Number **23E200075**



Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.105	10.0	0.087	30.0	0.046	50.0	0.035	70.0	0.025
-9.0	0.065	11.0	0.096	31.0	0.053	51.0	0.041	71.0	0.028
-8.0	0.136	12.0	0.097	32.0	0.017	52.0	0.027	72.0	0.027
-7.0	0.096	13.0	0.058	33.0	0.044	53.0	0.016	73.0	0.024
-6.0	0.130	14.0	0.095	34.0	0.050	54.0	0.031	74.0	0.019
-5.0	0.180	15.0	0.061	35.0	0.018	55.0	0.039	75.0	0.015
-4.0	0.146	16.0	0.060	36.0	0.040	56.0	0.031	76.0	0.013
-3.0	0.271	17.0	0.080	37.0	0.049	57.0	0.019	77.0	0.013
-2.0	0.231	18.0	0.035	38.0	0.021	58.0	0.024	78.0	0.014
-1.0	0.424	19.0	0.069	39.0	0.031	59.0	0.034	79.0	0.015
0.0	0.869	20.0	0.062	40.0	0.048	60.0	0.035	80.0	0.015
1.0	0.987	21.0	0.031	41.0	0.030	61.0	0.027	81.0	0.014
2.0	0.709	22.0	0.068	42.0	0.021	62.0	0.018	82.0	0.012
3.0	0.417	23.0	0.042	43.0	0.044	63.0	0.021	83.0	0.010
4.0	0.339	24.0	0.040	44.0	0.039	64.0	0.029	84.0	0.008
5.0	0.212	25.0	0.065	45.0	0.015	65.0	0.033	85.0	0.006
6.0	0.177	26.0	0.028	46.0	0.032	66.0	0.030	86.0	0.004
7.0	0.160	27.0	0.044	47.0	0.043	67.0	0.024	87.0	0.002
8.0	0.114	28.0	0.058	48.0	0.030	68.0	0.020	88.0	0.001
9.0	0.140	29.0	0.021	49.0	0.017	69.0	0.021	89.0	0.000
								90.0	0.000

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MECHANICALS

Proposal No. **C-70383**
 Date **25-Feb-17**
 Call Letters **WDIV** **32**
 Frequency **581 MHz**
 Antenna Type **TFU-23ETT/VP-R 4C130 (SI**

Preliminary Specifications

Top Mounted

Mechanical Specification without ice TIA-222-G

Height AGL(z) 980 ft (298.7 m)
 Basic Wind Speed 89 m/h (143.2 km/h)

Structure Class II
 Exposure Category B
 Topography Category 1

Mechanical Specifications with ice TIA-222-G

Design Ice 1 in $t_{iz} = 2.80$ in
 Wind Speed w/Ice 40 m/h (64.4 km/h)

Mechanical Specifications

		without ice	with ice	
Height with Lightning Protector	H4	56.5 ft (17.2m)		
Height less Lightning Protector	H2	52.5 ft (16m)		
Height of Center of Radiation	H3	33.75 ft (10.3m)		
Effective Projected Area	(EPA) _S	79.1 ft ² (7.3m ²)	187.6 ft ² (17.4m ²)	
Moment Arm	D1	20 ft (6.1m)	26.6 ft (8.1m)	
Effective Projected Area	(EPA) _S	31.8 ft ² (3m ²)	50.2 ft ² (4.7m ²)	below tower top
Moment Arm	D3	8.1 ft (2.5m)	8.1 ft (2.5m)	below tower top
Pole Bury Length	D2	16.4 ft (5m)		below tower top
Weight	W	10000 lb (4.5t)	16800 lb (7.6t)	

Antenna designed in accordance with AISC specifications for design of structural steel as prescribed by TIA-222-G

Prepared by: KLP

Date: 25-Feb-17

ME:



EE:

Date: 25-Feb-17

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Summary

Proposal No.	C-70383	
Date	25-Feb-17	
Call Letters	WDIV	32 DTV
Frequency	581 MHz	
Antenna Type	TFU-23ETT/VP-R 4C130 (S	

Antenna

	Hpol	Vpol
ERP:	678.0 kW (28.31 dBk)	203.0 kW (23.07 dBk)
Peak Gain*	21.76 (13.38 dB)	6.51 (8.14 dB)

Antenna Input Power	31.2 kW (14.94 dBk)
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Transmission Line

Type	Rigid	Attenuation	(1.12 dB)
Size	Size 8-3/16"	Efficiency	77.3%
Impedance	75 Ohm		
Length	1280 ft	390.1 m	

Transmitter Output

40.3 kW (16.06 dBk)

Transmitter filter losses not included

* Directivity and Gain are with respect to half wave dipole.

**Antenna Gain includes feed system losses

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