



Antenna Model: **TFU-24JTH/VP-R 4C170 (SP)**

Proposal Number: **C-70634**  
Date: **11-Apr-17**  
Customer: **Tegna Media**  
Location: **Charlotte, NC**

### Electrical Specifications

Polarization: **Elliptical**  
Azimuth Pattern: **Directional**  
Antenna Input: **4-1/16"** **50 Ohm** **EIA/DCA**  
VSWR: **Channel** **1.08 : 1**  
Bandwidth: **6 MHz**  
Rated Input Power: **33 kW** **(15.19 dBk)** **Maximum Average Power**

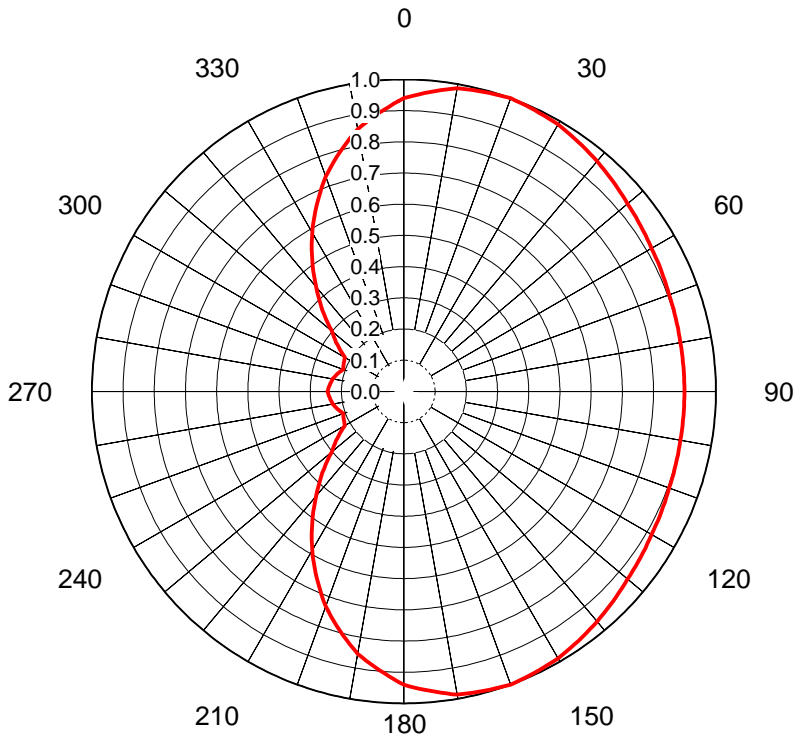
### Mechanical Specifications

Mounting: **Top Mounted**  
Environmental Protection: **Full Radome**  
Height: **48.5 ft (14.8m)** less Lightning Protector **52.5 ft (16m)** with Lightning Protector  
Weight: **7000 lb (3.2t)**  
Effective Projected Area: **50.3 ft² (4.7m²)** **TIA-222-G** Basic Wind Speed: **90 m/h (144.8 km/h)**

### Channel Specifications

Call	CH	Freq	Hpol ERP	Vpol ERP	TPO	Peak Main Lobe Hpol Gain	Peak Main Lobe Vpol Gain	Peak at Horizontal Hpol Gain	Peak at Horizontal Vpol Gain
WCNC	24	533 MHz	828 kW (29.18 dBk)	414 kW (26.17 dBk)	41.4 kW (16.17 dBk)	31.77 (15.02dB)	15.89 (12.01dB)	17.73 (12.49dB)	8.86 (9.48dB)

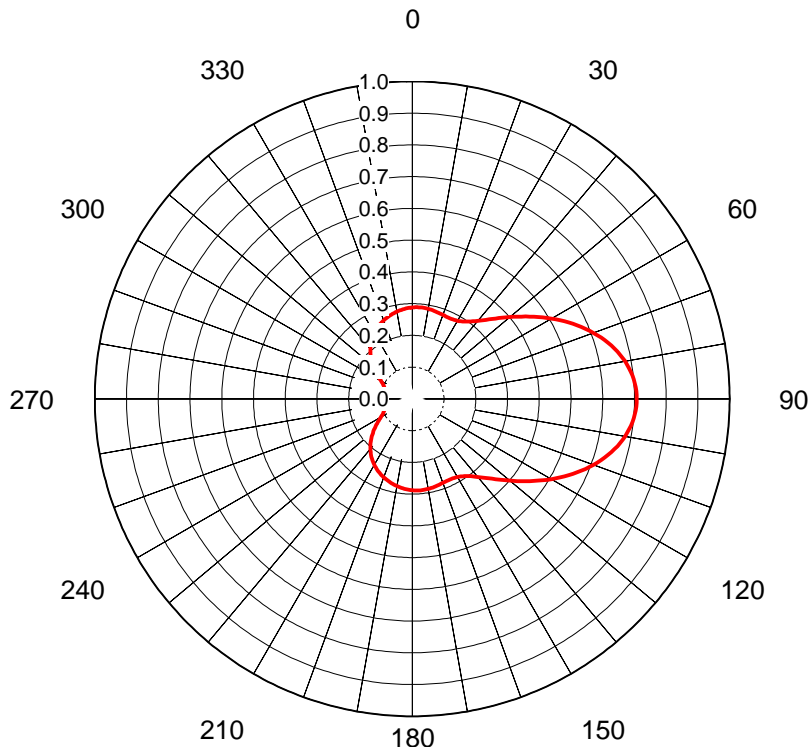
## AZIMUTH PATTERN Horizontal Polarization



Proposal No. **C-70634**  
 Date **11-Apr-17**  
 Call Letters **WCNC**  
 Channel **24**  
 Frequency **533 MHz**  
 Antenna Type **TFU-24JTH/VP-R 4C170 (SF**  
 Gain **1.7 (2.31dB)**  
 Calculated

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.940	36	0.973	72	0.904	108	0.904	144	0.973	180	0.940	216	0.497	252	0.212	288	0.212
1	0.945	37	0.970	73	0.904	109	0.905	145	0.975	181	0.931	217	0.482	253	0.214	289	0.209
2	0.949	38	0.968	74	0.903	110	0.905	146	0.978	182	0.923	218	0.467	254	0.217	290	0.207
3	0.954	39	0.965	75	0.902	111	0.906	147	0.980	183	0.914	219	0.452	255	0.220	291	0.208
4	0.959	40	0.963	76	0.902	112	0.907	148	0.983	184	0.906	220	0.437	256	0.222	292	0.209
5	0.964	41	0.960	77	0.901	113	0.909	149	0.985	185	0.897	221	0.424	257	0.225	293	0.210
6	0.968	42	0.958	78	0.901	114	0.910	150	0.988	186	0.888	222	0.410	258	0.227	294	0.211
7	0.973	43	0.955	79	0.900	115	0.911	151	0.989	187	0.880	223	0.396	259	0.229	295	0.213
8	0.978	44	0.952	80	0.900	116	0.912	152	0.990	188	0.871	224	0.383	260	0.232	296	0.214
9	0.982	45	0.950	81	0.900	117	0.913	153	0.992	189	0.863	225	0.370	261	0.233	297	0.215
10	0.987	46	0.947	82	0.900	118	0.915	154	0.993	190	0.854	226	0.356	262	0.235	298	0.216
11	0.988	47	0.944	83	0.900	119	0.916	155	0.994	191	0.842	227	0.343	263	0.236	299	0.217
12	0.990	48	0.941	84	0.900	120	0.917	156	0.995	192	0.830	228	0.329	264	0.237	300	0.218
13	0.991	49	0.939	85	0.900	121	0.919	157	0.996	193	0.818	229	0.315	265	0.238	301	0.226
14	0.992	50	0.936	86	0.899	122	0.921	158	0.998	194	0.806	230	0.302	266	0.240	302	0.235
15	0.993	51	0.934	87	0.899	123	0.923	159	0.999	195	0.794	231	0.294	267	0.241	303	0.243
16	0.995	52	0.932	88	0.899	124	0.925	160	1.000	196	0.781	232	0.285	268	0.242	304	0.252
17	0.996	53	0.930	89	0.899	125	0.927	161	0.999	197	0.769	233	0.277	269	0.244	305	0.260
18	0.997	54	0.928	90	0.899	126	0.928	162	0.997	198	0.757	234	0.268	270	0.245	306	0.268
19	0.999	55	0.927	91	0.899	127	0.930	163	0.996	199	0.745	235	0.260	271	0.244	307	0.277
20	1.000	56	0.925	92	0.899	128	0.932	164	0.995	200	0.733	236	0.252	272	0.242	308	0.285
21	0.999	57	0.923	93	0.899	129	0.934	165	0.993	201	0.719	237	0.243	273	0.241	309	0.294
22	0.998	58	0.921	94	0.899	130	0.936	166	0.992	202	0.704	238	0.235	274	0.240	310	0.302
23	0.996	59	0.919	95	0.900	131	0.939	167	0.991	203	0.689	239	0.226	275	0.238	311	0.315
24	0.995	60	0.917	96	0.900	132	0.941	168	0.990	204	0.675	240	0.218	276	0.237	312	0.329
25	0.994	61	0.916	97	0.900	133	0.944	169	0.988	205	0.660	241	0.217	277	0.236	313	0.343
26	0.993	62	0.915	98	0.900	134	0.947	170	0.987	206	0.646	242	0.216	278	0.235	314	0.356
27	0.992	63	0.913	99	0.900	135	0.950	171	0.982	207	0.632	243	0.215	279	0.233	315	0.370
28	0.990	64	0.912	100	0.900	136	0.952	172	0.978	208	0.617	244	0.214	280	0.232	316	0.383
29	0.989	65	0.911	101	0.900	137	0.955	173	0.973	209	0.603	245	0.213	281	0.229	317	0.396
30	0.988	66	0.910	102	0.901	138	0.958	174	0.968	210	0.588	246	0.211	282	0.227	318	0.410
31	0.985	67	0.909	103	0.901	139	0.960	175	0.964	211	0.573	247	0.210	283	0.225	319	0.424
32	0.983	68	0.907	104	0.902	140	0.963	176	0.959	212	0.558	248	0.209	284	0.222	320	0.437
33	0.980	69	0.906	105	0.902	141	0.965	177	0.954	213	0.543	249	0.208	285	0.220	321	0.452
34	0.978	70	0.905	106	0.903	142	0.968	178	0.949	214	0.528	250	0.207	286	0.217	322	0.467
35	0.975	71	0.905	107	0.904	143	0.970	179	0.945	215	0.512	251	0.209	287	0.214	323	0.482

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## AZIMUTH PATTERN Vertical Polarization

Proposal No. **C-70634**  
 Date **11-Apr-17**  
 Call Letters **WCNC**  
 Channel **24**  
 Frequency **533 MHz**  
 Antenna Type **TFU-24JTH/VP-R 4C170 (SF**  
 Gain **4.02 (6.04dB)**  
 Calculated

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.288	36	0.301	72	0.625	108	0.625	144	0.301	180	0.288	216	0.220	252	0.096	288	0.096
1	0.288	37	0.305	73	0.634	109	0.617	145	0.297	181	0.288	217	0.217	253	0.097	289	0.095
2	0.289	38	0.310	74	0.642	110	0.608	146	0.294	182	0.287	218	0.213	254	0.098	290	0.095
3	0.289	39	0.315	75	0.649	111	0.598	147	0.291	183	0.286	219	0.209	255	0.099	291	0.095
4	0.289	40	0.321	76	0.656	112	0.589	148	0.288	184	0.285	220	0.205	256	0.101	292	0.095
5	0.289	41	0.327	77	0.663	113	0.579	149	0.286	185	0.285	221	0.201	257	0.102	293	0.096
6	0.289	42	0.334	78	0.669	114	0.569	150	0.284	186	0.284	222	0.197	258	0.104	294	0.097
7	0.289	43	0.341	79	0.675	115	0.559	151	0.283	187	0.283	223	0.192	259	0.106	295	0.099
8	0.289	44	0.348	80	0.681	116	0.548	152	0.282	188	0.281	224	0.188	260	0.107	296	0.101
9	0.288	45	0.356	81	0.686	117	0.538	153	0.281	189	0.280	225	0.183	261	0.109	297	0.104
10	0.288	46	0.364	82	0.690	118	0.527	154	0.281	190	0.279	226	0.179	262	0.111	298	0.107
11	0.288	47	0.373	83	0.694	119	0.517	155	0.280	191	0.278	227	0.174	263	0.112	299	0.110
12	0.287	48	0.382	84	0.697	120	0.506	156	0.280	192	0.276	228	0.169	264	0.113	300	0.114
13	0.286	49	0.391	85	0.700	121	0.495	157	0.280	193	0.275	229	0.164	265	0.114	301	0.118
14	0.286	50	0.401	86	0.703	122	0.484	158	0.281	194	0.273	230	0.160	266	0.115	302	0.122
15	0.285	51	0.411	87	0.705	123	0.473	159	0.281	195	0.272	231	0.155	267	0.116	303	0.126
16	0.284	52	0.421	88	0.706	124	0.463	160	0.282	196	0.270	232	0.150	268	0.117	304	0.131
17	0.284	53	0.431	89	0.707	125	0.452	161	0.282	197	0.268	233	0.145	269	0.117	305	0.135
18	0.283	54	0.441	90	0.707	126	0.441	162	0.283	198	0.267	234	0.140	270	0.117	306	0.140
19	0.282	55	0.452	91	0.707	127	0.431	163	0.284	199	0.265	235	0.135	271	0.117	307	0.145
20	0.282	56	0.463	92	0.706	128	0.421	164	0.284	200	0.263	236	0.131	272	0.117	308	0.150
21	0.281	57	0.473	93	0.705	129	0.411	165	0.285	201	0.261	237	0.126	273	0.116	309	0.155
22	0.281	58	0.484	94	0.703	130	0.401	166	0.286	202	0.259	238	0.122	274	0.115	310	0.160
23	0.280	59	0.495	95	0.700	131	0.391	167	0.286	203	0.257	239	0.118	275	0.114	311	0.164
24	0.280	60	0.506	96	0.697	132	0.382	168	0.287	204	0.255	240	0.114	276	0.113	312	0.169
25	0.280	61	0.517	97	0.694	133	0.373	169	0.288	205	0.252	241	0.110	277	0.112	313	0.174
26	0.281	62	0.527	98	0.690	134	0.364	170	0.288	206	0.250	242	0.107	278	0.111	314	0.179
27	0.281	63	0.538	99	0.686	135	0.356	171	0.288	207	0.247	243	0.104	279	0.109	315	0.183
28	0.282	64	0.548	100	0.681	136	0.348	172	0.289	208	0.245	244	0.101	280	0.107	316	0.188
29	0.283	65	0.559	101	0.675	137	0.341	173	0.289	209	0.242	245	0.099	281	0.106	317	0.192
30	0.284	66	0.569	102	0.669	138	0.334	174	0.289	210	0.239	246	0.097	282	0.104	318	0.197
31	0.286	67	0.579	103	0.663	139	0.327	175	0.289	211	0.237	247	0.096	283	0.102	319	0.201
32	0.288	68	0.589	104	0.656	140	0.321	176	0.289	212	0.234	248	0.095	284	0.101	320	0.205
33	0.291	69	0.598	105	0.649	141	0.315	177	0.289	213	0.230	249	0.095	285	0.099	321	0.209
34	0.294	70	0.608	106	0.642	142	0.310	178	0.289	214	0.227	250	0.095	286	0.098	322	0.213
35	0.297	71	0.617	107	0.634	143	0.305	179	0.288	215	0.224	251	0.095	287	0.097	323	0.217

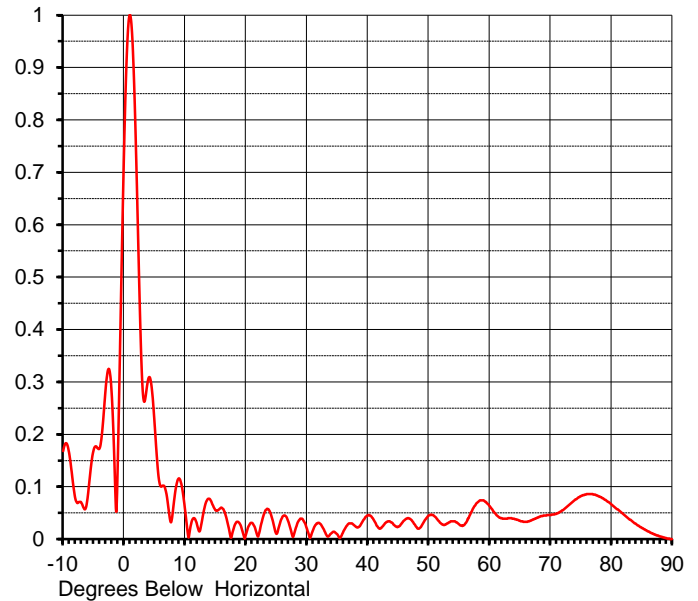
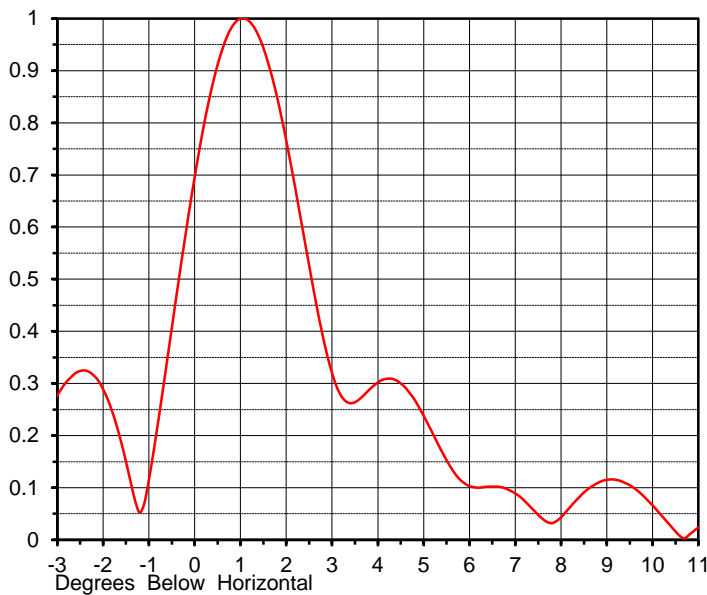
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## ELEVATION PATTERN

Proposal No. **C-70634**  
 Date **11-Apr-17**  
 Call Letters **WCNC**  
 Channel **24**  
 Frequency **533 MHz**  
 Antenna Type **TFU-24JTH/VP-R 4C170 (**

RMS Directivity at Main Lobe **22.7 ( 13.56 dB )**  
 RMS Directivity at Horizontal **12.7 ( 11.04 dB )**  
**Calculated**

Beam Tilt **1.00 deg**  
 Pattern Number **24J227100**



Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.168	10.0	0.056	30.0	0.020	50.0	0.045	70.0	0.046
-9.0	0.163	11.0	0.029	31.0	0.017	51.0	0.043	71.0	0.049
-8.0	0.077	12.0	0.026	32.0	0.031	52.0	0.030	72.0	0.055
-7.0	0.069	13.0	0.049	33.0	0.013	53.0	0.030	73.0	0.065
-6.0	0.078	14.0	0.077	34.0	0.011	54.0	0.034	74.0	0.075
-5.0	0.170	15.0	0.055	35.0	0.009	55.0	0.028	75.0	0.082
-4.0	0.174	16.0	0.060	36.0	0.015	56.0	0.030	76.0	0.086
-3.0	0.291	17.0	0.030	37.0	0.030	57.0	0.052	77.0	0.085
-2.0	0.270	18.0	0.021	38.0	0.024	58.0	0.070	78.0	0.081
-1.0	0.168	19.0	0.029	39.0	0.031	59.0	0.074	79.0	0.075
0.0	0.747	20.0	0.009	40.0	0.045	60.0	0.063	80.0	0.066
1.0	1.000	21.0	0.031	41.0	0.036	61.0	0.048	81.0	0.057
2.0	0.720	22.0	0.005	42.0	0.020	62.0	0.040	82.0	0.047
3.0	0.294	23.0	0.049	43.0	0.032	63.0	0.040	83.0	0.037
4.0	0.307	24.0	0.050	44.0	0.031	64.0	0.039	84.0	0.029
5.0	0.221	25.0	0.010	45.0	0.024	65.0	0.035	85.0	0.021
6.0	0.101	26.0	0.043	46.0	0.036	66.0	0.033	86.0	0.015
7.0	0.083	27.0	0.032	47.0	0.038	67.0	0.037	87.0	0.009
8.0	0.053	28.0	0.014	48.0	0.023	68.0	0.042	88.0	0.005
9.0	0.116	29.0	0.039	49.0	0.029	69.0	0.045	89.0	0.002
								90.0	0.000

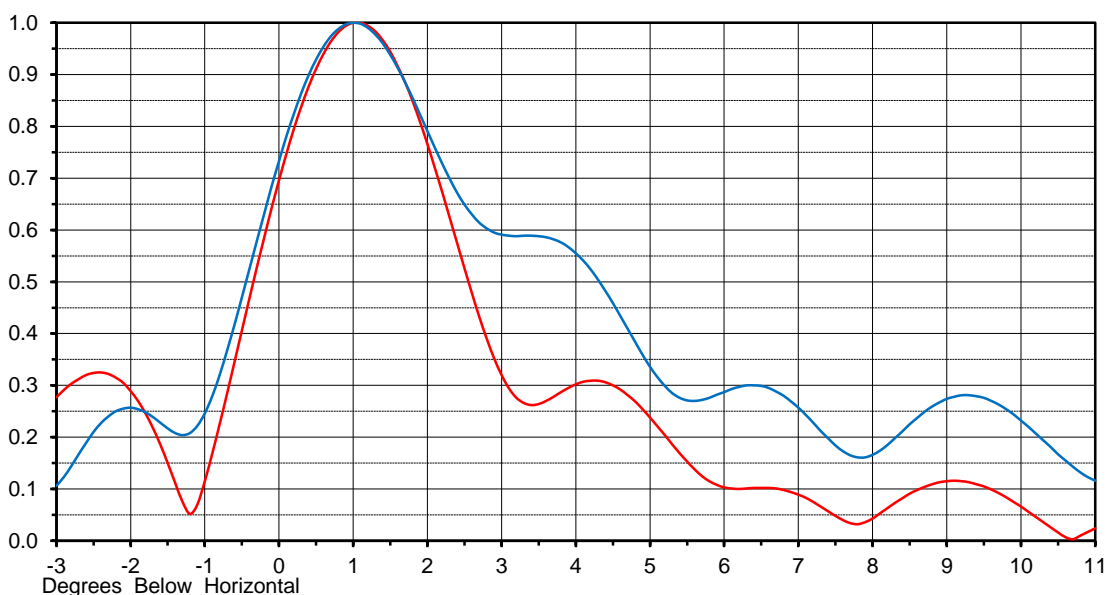
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***FutureFill** refers to broadband panels or limited bandwidth slotted coaxial antennas that can be modified in the field to provide the flexibility to customize the null structure at a future date.*

## FutureFill OVERLAY

Proposal No. **C-70634**  
 Date **11-Apr-17**  
 Call Letters **WCNC**  
 Channel **24**  
 Frequency **533 MHz**  
 Antenna Type **TFU-24JTH/VP-R 4C170 (**

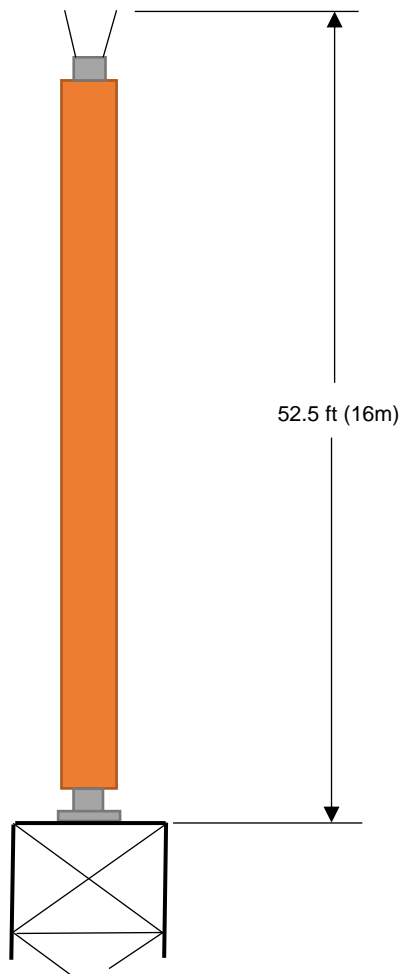
RMS Directivity 22.7 **(13.56dB)** Beam Tilt 1.00 Pattern No. 24J227100 **Red**  
 RMS Directivity 13.8 **(11.40dB)** Beam Tilt 1.00 Pattern No. 24J227100\_FF **Blue**  
 Calculated



Tabulations for 24J227100\_FF

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.122	10.0	0.232	30.0	0.070	50.0	0.073	70.0	0.110
-9.0	0.070	11.0	0.116	31.0	0.087	51.0	0.089	71.0	0.103
-8.0	0.248	12.0	0.129	32.0	0.107	52.0	0.079	72.0	0.095
-7.0	0.306	13.0	0.145	33.0	0.078	53.0	0.067	73.0	0.088
-6.0	0.329	14.0	0.076	34.0	0.048	54.0	0.076	74.0	0.085
-5.0	0.460	15.0	0.050	35.0	0.055	55.0	0.096	75.0	0.084
-4.0	0.347	16.0	0.122	36.0	0.047	56.0	0.111	76.0	0.083
-3.0	0.106	17.0	0.080	37.0	0.020	57.0	0.114	77.0	0.082
-2.0	0.257	18.0	0.020	38.0	0.021	58.0	0.100	78.0	0.078
-1.0	0.246	19.0	0.036	39.0	0.060	59.0	0.065	79.0	0.072
0.0	0.733	20.0	0.016	40.0	0.073	60.0	0.017	80.0	0.064
1.0	1.000	21.0	0.057	41.0	0.048	61.0	0.035	81.0	0.055
2.0	0.791	22.0	0.032	42.0	0.026	62.0	0.078	82.0	0.046
3.0	0.591	23.0	0.056	43.0	0.046	63.0	0.104	83.0	0.037
4.0	0.555	24.0	0.087	44.0	0.045	64.0	0.111	84.0	0.029
5.0	0.336	25.0	0.069	45.0	0.047	65.0	0.107	85.0	0.021
6.0	0.287	26.0	0.036	46.0	0.072	66.0	0.101	86.0	0.015
7.0	0.257	27.0	0.029	47.0	0.072	67.0	0.102	87.0	0.010
8.0	0.166	28.0	0.088	48.0	0.038	68.0	0.107	88.0	0.005
9.0	0.274	29.0	0.102	49.0	0.033	69.0	0.111	89.0	0.002
								90.0	0.000

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## MECHANICAL SPECIFICATIONS

Proposal No. **C-70634**  
 Date **11-Apr-17**  
 Call Letters **WCNC**  
 Channel **24**  
 Frequency **533 MHz**  
 Antenna Type **TFU-24JTH/VP-R 4C170 (SI**

### Preliminary Specifications

#### Top Mounted

##### With ice TIA-222-G

Height AGL(z) 1969 ft (600.2 m)  
 Basic Wind Speed 90 m/h (144.8 km/h)

Structure Class II  
 Exposure Category C  
 Topography Category 1

Design Ice 0.75 in  $t_{iz} = 2.10$  in  
 Wind Speed w/Ice 30 m/h (48.3 km/h)

#### Mechanical Specifications

		without ice	with ice
Height with Lightning Protector	H4	52.5 ft (16m)	
Height less Lightning Protector	H2	48.5 ft (14.8m)	
Height of Center of Radiation	H3	24.25 ft (7.4m)	
Effective Projected Area	(EPA) <sub>S</sub>	50.3 ft <sup>2</sup> (4.7m <sup>2</sup> )	135.4 ft <sup>2</sup> (12.6m <sup>2</sup> )
Moment Arm	D1	25.9 ft (7.9m)	27 ft (8.2m)

Weight	W	7000 lb (3.2t)	10500 lb (4.8t)
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Antenna designed in accordance with AISC specifications for design of structural steel as prescribed by TIA-222-G

Prepared by: CAB

Date: 11-Apr-17

ME:

EE:

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## Summary

Proposal No.	<b>C-70634</b>
Date	<b>11-Apr-17</b>
Call Letters	<b>WCNC</b>
Channel	<b>24</b>
Frequency	<b>533 MHz</b>
Antenna Type	<b>TFU-24JTH/VP-R 40</b>

## Antenna

	Hpol		Vpol	
ERP:	<b>828 kW</b>	<b>( 29.18 dBk )</b>	<b>414 kW</b>	<b>( 26.17 dBk )</b>
Peak Gain*	31.77	( 15.02 dB )	15.89	( 12.01 dB )

<b>Antenna Input Power</b>	<b>26.1 kW</b>	<b>( 14.16 dBk )</b>
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## Transmission Line

Type:	<b>Rigid</b>	Attenuation:	<b>( 2.01 dB )</b>	
Size:	<b>7-3/16"</b>	Efficiency:	<b>63.0%</b>	
Impedance:	<b>75 Ohm</b>			
Length:	<b>2086 ft</b>	<b>635.8 m</b>		

## Transmitter Output

<b>41.4 kW</b>	<b>( 16.17 dBk )</b>
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Transmitter filter losses not included

\* Directivity and Gain are with respect to half wave dipole. The gain includes feed system losses

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