



Antenna Model:

**TFU-21ETT/VP-R 04**

Proposal Number: **C-71409**  
Date: **10-Oct-19**  
Customer: **TEGNA**  
Location: **Scranton, PA**

### Electrical Specifications

Polarization: **Elliptical**  
Azimuth Pattern: **Directional**  
Antenna Input: **6-1/8"** **75 Ohm** **EIA/DCA**  
VSWR: **Channel** **1.08 : 1**  
Bandwidth: **6 MHz**  
Rated Input Power: **60 kW** **(17.78 dBk)** **Maximum Average Power**

### Mechanical Specifications

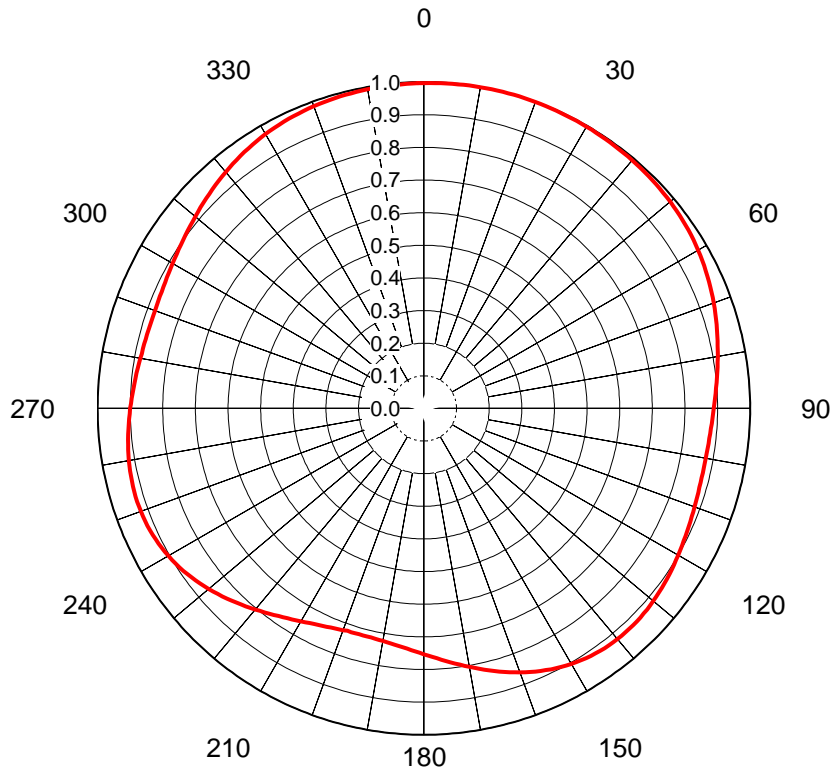
Mounting: **Top Mounted**  
Environmental Protection: **Full Radome**  
Height: **46.1 ft (14.1m)** less Lightning Protector **50.1 ft (15.3m)** with Lightning Protector  
Weight: **6600 lb (3t)**  
Effective Projected Area: **47.8 ft² (4.4m²)** **TIA-222-G** Basic Wind Speed: **90 m/h (144.8 km/h)**

### 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
WNEP	21	515 MHz	760 kW (28.81 dBk)	190 kW (22.79 dBk)	44.8 kW (16.51 dBk)	21.31 (13.29dB)	5.33 (7.27dB)	13.30 (11.24dB)	3.33 (5.22dB)

## AZIMUTH PATTERN Horizontal Polarization

Proposal No. **C-71409**  
 Date **10-Oct-19**  
 Call Letters **WNEP**  
 Channel **21**  
 Frequency **515 MHz**  
 Antenna Type **TFU-21ETT/VP-R 04**  
 Gain **1.22 (0.86dB)**  
 Calculated

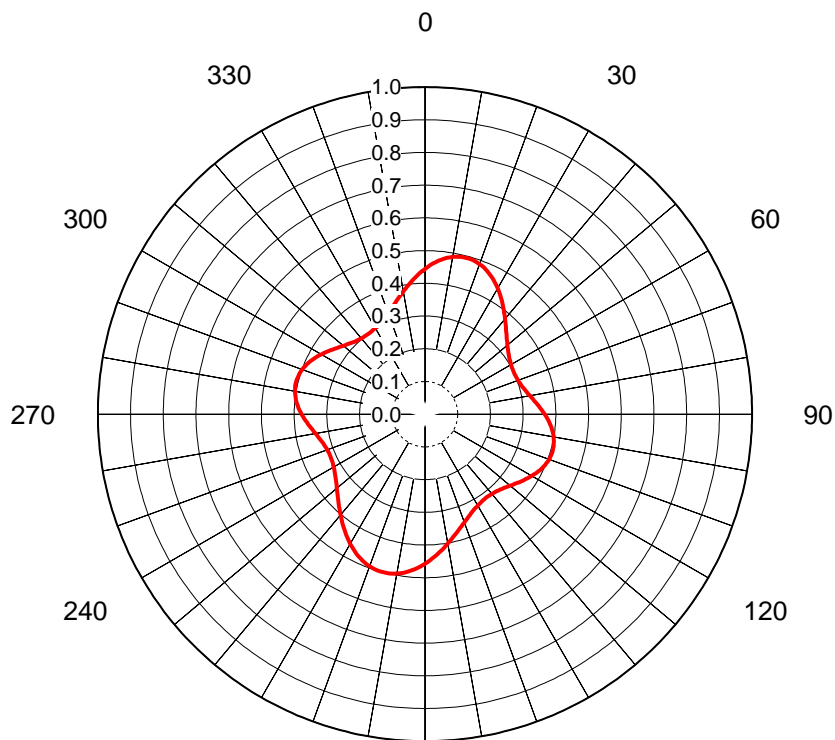


Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.997	36	0.995	72	0.939	108	0.880	144	0.919	180	0.753	216	0.782	252	0.924	288	0.877	324	0.956
1	0.997	37	0.994	73	0.936	109	0.881	145	0.917	181	0.749	217	0.788	253	0.924	289	0.877	325	0.959
2	0.998	38	0.994	74	0.933	110	0.883	146	0.915	182	0.745	218	0.793	254	0.923	290	0.877	326	0.962
3	0.998	39	0.993	75	0.930	111	0.884	147	0.913	183	0.742	219	0.799	255	0.923	291	0.878	327	0.964
4	0.998	40	0.993	76	0.927	112	0.885	148	0.910	184	0.738	220	0.804	256	0.922	292	0.878	328	0.966
5	0.999	41	0.992	77	0.924	113	0.887	149	0.907	185	0.735	221	0.810	257	0.922	293	0.879	329	0.968
6	0.999	42	0.992	78	0.921	114	0.889	150	0.904	186	0.732	222	0.816	258	0.921	294	0.880	330	0.971
7	0.999	43	0.991	79	0.918	115	0.890	151	0.901	187	0.730	223	0.822	259	0.919	295	0.881	331	0.973
8	0.999	44	0.991	80	0.915	116	0.892	152	0.897	188	0.727	224	0.827	260	0.918	296	0.882	332	0.974
9	0.999	45	0.990	81	0.912	117	0.894	153	0.893	189	0.725	225	0.833	261	0.917	297	0.884	333	0.976
10	1.000	46	0.989	82	0.909	118	0.896	154	0.889	190	0.724	226	0.839	262	0.915	298	0.885	334	0.978
11	1.000	47	0.988	83	0.906	119	0.898	155	0.885	191	0.722	227	0.844	263	0.913	299	0.887	335	0.979
12	1.000	48	0.988	84	0.903	120	0.900	156	0.881	192	0.721	228	0.850	264	0.912	300	0.889	336	0.981
13	1.000	49	0.987	85	0.900	121	0.902	157	0.876	193	0.721	229	0.855	265	0.910	301	0.891	337	0.982
14	1.000	50	0.986	86	0.898	122	0.904	158	0.871	194	0.720	230	0.861	266	0.908	302	0.893	338	0.983
15	1.000	51	0.985	87	0.895	123	0.906	159	0.866	195	0.720	231	0.866	267	0.906	303	0.895	339	0.985
16	1.000	52	0.983	88	0.893	124	0.908	160	0.861	196	0.720	232	0.871	268	0.904	304	0.898	340	0.986
17	1.000	53	0.982	89	0.891	125	0.910	161	0.855	197	0.721	233	0.876	269	0.902	305	0.900	341	0.987
18	1.000	54	0.981	90	0.889	126	0.912	162	0.850	198	0.721	234	0.881	270	0.900	306	0.903	342	0.988
19	1.000	55	0.979	91	0.887	127	0.913	163	0.844	199	0.720	235	0.885	271	0.898	307	0.906	343	0.988
20	1.000	56	0.978	92	0.885	128	0.915	164	0.839	200	0.724	236	0.889	272	0.896	308	0.909	344	0.989
21	0.999	57	0.976	93	0.884	129	0.917	165	0.833	201	0.725	237	0.893	273	0.894	309	0.912	345	0.990
22	0.999	58	0.974	94	0.882	130	0.918	166	0.827	202	0.727	238	0.897	274	0.892	310	0.915	346	0.991
23	0.999	59	0.973	95	0.881	131	0.919	167	0.822	203	0.730	239	0.901	275	0.890	311	0.918	347	0.991
24	0.999	60	0.971	96	0.880	132	0.921	168	0.816	204	0.732	240	0.904	276	0.889	312	0.921	348	0.992
25	0.999	61	0.968	97	0.879	133	0.922	169	0.810	205	0.735	241	0.907	277	0.887	313	0.924	349	0.992
26	0.998	62	0.966	98	0.878	134	0.922	170	0.804	206	0.738	242	0.910	278	0.885	314	0.927	350	0.993
27	0.998	63	0.964	99	0.878	135	0.923	171	0.799	207	0.742	243	0.913	279	0.884	315	0.930	351	0.993
28	0.998	64	0.962	100	0.877	136	0.923	172	0.793	208	0.745	244	0.915	280	0.883	316	0.933	352	0.994
29	0.997	65	0.959	101	0.877	137	0.924	173	0.788	209	0.749	245	0.917	281	0.880	317	0.936	353	0.994
30	0.997	66	0.956	102	0.877	138	0.924	174	0.782	210	0.753	246	0.919	282	0.880	318	0.939	354	0.995
31	0.997	67	0.954	103	0.877	139	0.923	175	0.777	211	0.758	247	0.920	283	0.879	319	0.942	355	0.995
32	0.996	68	0.951	104	0.877	140	0.923	176	0.772	212	0.762	248	0.921	284	0.879	320	0.945	356	0.996
33	0.996	69	0.948	105	0.878	141	0.922	177	0.767	213	0.767	249	0.922	285	0.878	321	0.948	357	0.996
34	0.996	70	0.945	106	0.879	142	0.921	178	0.762	214	0.772	250	0.923	286	0.877	322	0.951	358	0.996
35	0.995	71	0.942	107	0.879	143	0.920	179	0.758	215	0.777	251	0.923	287	0.877	323	0.954	359	0.997

This document contains proprietary and confidential information of Dielectric. It is to be used solely for the purpose for which it is provided. No disclosure, reproduction, or use of this document or any part of it may be made without the written permission of Dielectric.

## AZIMUTH PATTERN Vertical Polarization

Proposal No. **C-71409**  
 Date **10-Oct-19**  
 Call Letters **WNEP**  
 Channel **21**  
 Frequency **515 MHz**  
 Antenna Type **TFU-21ETT/VP-R 04**  
 Gain **1.71 (2.32dB)**  
 Calculated



210		180		150													
Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.444	36	0.406	72	0.305	108	0.406	144	0.317	180	0.458	216	0.425	252	0.320	288	0.403
1	0.450	37	0.400	73	0.307	109	0.405	145	0.317	181	0.463	217	0.419	253	0.322	289	0.401
2	0.456	38	0.393	74	0.309	110	0.404	146	0.317	182	0.467	218	0.413	254	0.324	290	0.399
3	0.461	39	0.387	75	0.311	111	0.402	147	0.318	183	0.472	219	0.407	255	0.326	291	0.397
4	0.466	40	0.381	76	0.313	112	0.400	148	0.319	184	0.476	220	0.402	256	0.328	292	0.395
5	0.471	41	0.375	77	0.316	113	0.398	149	0.321	185	0.480	221	0.396	257	0.331	293	0.392
6	0.475	42	0.369	78	0.319	114	0.396	150	0.322	186	0.484	222	0.391	258	0.334	294	0.389
7	0.479	43	0.363	79	0.322	115	0.393	151	0.324	187	0.487	223	0.385	259	0.337	295	0.385
8	0.482	44	0.357	80	0.326	116	0.390	152	0.326	188	0.490	224	0.380	260	0.340	296	0.382
9	0.485	45	0.352	81	0.329	117	0.387	153	0.329	189	0.493	225	0.375	261	0.343	297	0.378
10	0.488	46	0.347	82	0.333	118	0.384	154	0.331	190	0.495	226	0.370	262	0.347	298	0.374
11	0.490	47	0.342	83	0.337	119	0.381	155	0.334	191	0.497	227	0.365	263	0.351	299	0.370
12	0.492	48	0.337	84	0.341	120	0.377	156	0.337	192	0.498	228	0.360	264	0.354	300	0.366
13	0.493	49	0.333	85	0.345	121	0.373	157	0.341	193	0.499	229	0.356	265	0.358	301	0.362
14	0.494	50	0.329	86	0.349	122	0.370	158	0.344	194	0.500	230	0.352	266	0.362	302	0.357
15	0.494	51	0.325	87	0.353	123	0.366	159	0.348	195	0.500	231	0.348	267	0.366	303	0.353
16	0.494	52	0.322	88	0.357	124	0.362	160	0.352	196	0.500	232	0.344	268	0.370	304	0.349
17	0.493	53	0.319	89	0.362	125	0.358	161	0.356	197	0.499	233	0.341	269	0.373	305	0.345
18	0.492	54	0.316	90	0.366	126	0.354	162	0.360	198	0.498	234	0.337	270	0.377	306	0.341
19	0.490	55	0.313	91	0.370	127	0.351	163	0.365	199	0.497	235	0.334	271	0.381	307	0.337
20	0.488	56	0.311	92	0.374	128	0.347	164	0.370	200	0.495	236	0.331	272	0.384	308	0.333
21	0.485	57	0.309	93	0.378	129	0.343	165	0.375	201	0.493	237	0.329	273	0.387	309	0.329
22	0.482	58	0.307	94	0.382	130	0.340	166	0.380	202	0.490	238	0.326	274	0.390	310	0.326
23	0.479	59	0.305	95	0.385	131	0.337	167	0.385	203	0.487	239	0.324	275	0.393	311	0.322
24	0.475	60	0.304	96	0.389	132	0.334	168	0.391	204	0.484	240	0.322	276	0.396	312	0.319
25	0.471	61	0.303	97	0.392	133	0.331	169	0.396	205	0.480	241	0.321	277	0.398	313	0.316
26	0.466	62	0.302	98	0.395	134	0.328	170	0.402	206	0.476	242	0.319	278	0.400	314	0.313
27	0.461	63	0.301	99	0.397	135	0.326	171	0.407	207	0.472	243	0.318	279	0.402	315	0.311
28	0.456	64	0.301	100	0.399	136	0.324	172	0.413	208	0.467	244	0.317	280	0.404	316	0.309
29	0.450	65	0.300	101	0.401	137	0.322	173	0.419	209	0.463	245	0.317	281	0.405	317	0.307
30	0.444	66	0.300	102	0.403	138	0.320	174	0.425	210	0.458	246	0.317	282	0.406	318	0.305
31	0.438	67	0.301	103	0.404	139	0.319	175	0.430	211	0.452	247	0.316	283	0.406	319	0.304
32	0.432	68	0.301	104	0.405	140	0.318	176	0.436	212	0.447	248	0.317	284	0.406	320	0.303
33	0.426	69	0.302	105	0.406	141	0.317	177	0.442	213	0.442	249	0.317	285	0.406	321	0.302
34	0.419	70	0.303	106	0.406	142	0.317	178	0.447	214	0.436	250	0.318	286	0.405	322	0.301
35	0.413	71	0.304	107	0.406	143	0.316	179	0.452	215	0.430	251	0.319	287	0.404	323	0.301

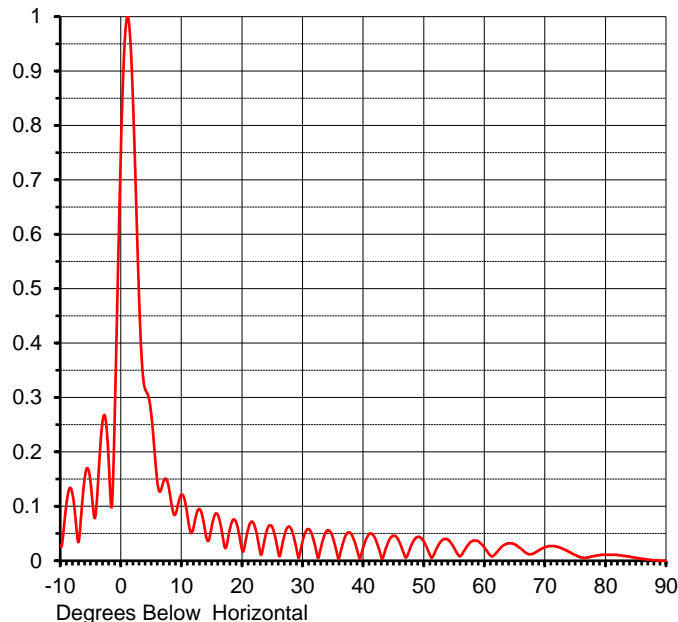
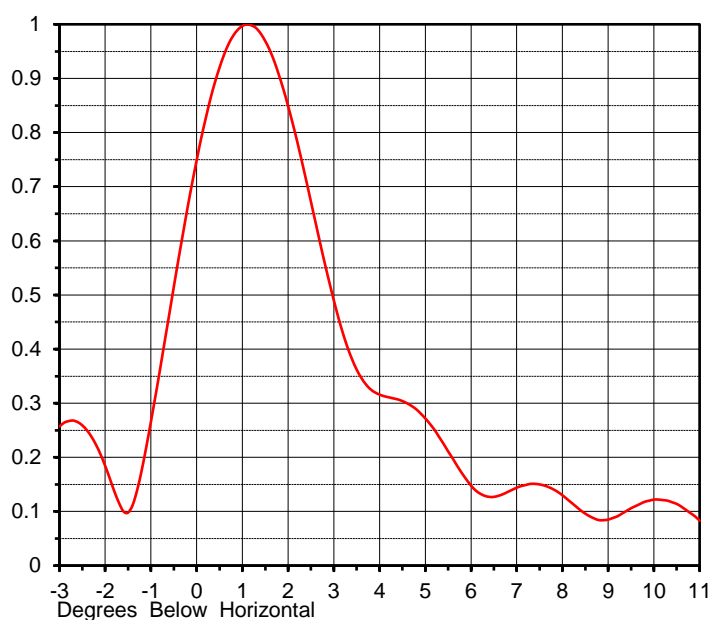
This document contains proprietary and confidential information of Dielectric. It is to be used solely for the purpose for which it is provided. No disclosure, reproduction, or use of this document or any part of it may be made without the written permission of Dielectric.

## ELEVATION PATTERN

Proposal No. **C-71409**  
 Date **10-Oct-19**  
 Call Letters **WNEP**  
 Channel **21**  
 Frequency **515 MHz**  
 Antenna Type **TFU-21ETT/VP-R 04**

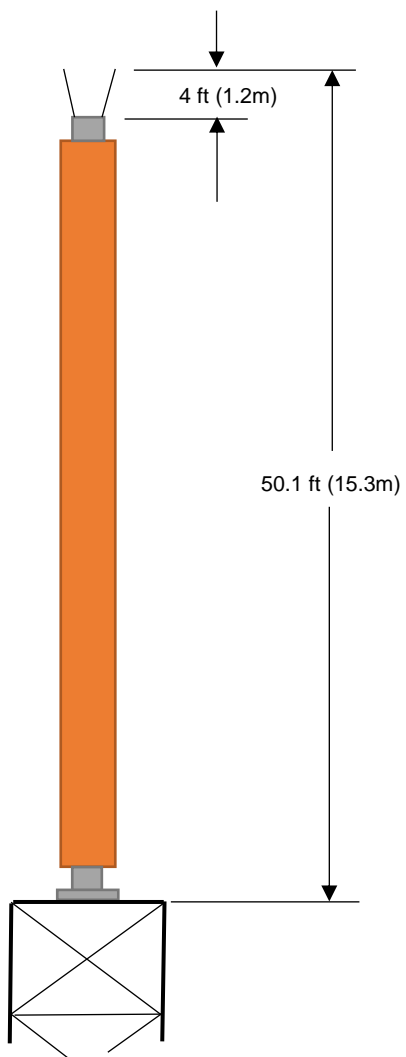
RMS Directivity at Main Lobe **20.6 ( 13.14 dB )**  
 RMS Directivity at Horizontal **12.9 ( 11.11 dB )**  
**Calculated**

Beam Tilt **1.00 deg**  
 Pattern Number **21E206100**



Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.028	10.0	0.122	30.0	0.040	50.0	0.034	70.0	0.025
-9.0	0.111	11.0	0.076	31.0	0.058	51.0	0.009	71.0	0.027
-8.0	0.118	12.0	0.066	32.0	0.026	52.0	0.022	72.0	0.026
-7.0	0.038	13.0	0.094	33.0	0.027	53.0	0.038	73.0	0.021
-6.0	0.156	14.0	0.044	34.0	0.056	54.0	0.038	74.0	0.016
-5.0	0.135	15.0	0.068	35.0	0.039	55.0	0.022	75.0	0.010
-4.0	0.119	16.0	0.082	36.0	0.008	56.0	0.009	76.0	0.006
-3.0	0.264	17.0	0.027	37.0	0.046	57.0	0.026	77.0	0.006
-2.0	0.161	18.0	0.062	38.0	0.048	58.0	0.037	78.0	0.009
-1.0	0.314	19.0	0.069	39.0	0.016	59.0	0.035	79.0	0.010
0.0	0.790	20.0	0.017	40.0	0.027	60.0	0.023	80.0	0.011
1.0	1.000	21.0	0.061	41.0	0.050	61.0	0.009	81.0	0.011
2.0	0.817	22.0	0.064	42.0	0.038	62.0	0.016	82.0	0.010
3.0	0.458	23.0	0.012	43.0	0.004	63.0	0.028	83.0	0.009
4.0	0.313	24.0	0.055	44.0	0.033	64.0	0.032	84.0	0.007
5.0	0.262	25.0	0.059	45.0	0.046	65.0	0.030	85.0	0.005
6.0	0.139	26.0	0.010	46.0	0.032	66.0	0.022	86.0	0.004
7.0	0.147	27.0	0.050	47.0	0.006	67.0	0.013	87.0	0.002
8.0	0.123	28.0	0.059	48.0	0.032	68.0	0.013	88.0	0.001
9.0	0.088	29.0	0.016	49.0	0.044	69.0	0.020	89.0	0.000
								90.0	0.000

This document contains proprietary and confidential information of Dielectric. It is to be used solely for the purpose for which it is provided.  
 No disclosure, reproduction, or use of this document or any part of it may be made without the written permission of Dielectric.



## MECHANICAL SPECIFICATIONS

Proposal No. **C-71409**  
 Date **10-Oct-19**  
 Call Letters **WNEP**  
 Channel **21**  
 Frequency **515 MHz**  
 Antenna Type **TFU-21ETT/VP-R 04**

### Preliminary Specifications

#### Top Mounted

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

Height AGL(z) 800 ft (243.8 m)  
 Basic Wind Speed 90 m/h (144.8 km/h)

Structure Class II  
 Exposure Category C  
 Topography Category 4  
 Height of Crest 700 ft (213.4 m)

Design Ice 0.75 in  $t_{iz} = 2.3$  in  
 Wind Speed w/Ice 40 m/h (64.4 km/h)

#### Mechanical Specifications

		without ice	with ice
Height with Lightning Protector	H4	50.1 ft (15.3m)	
Height less Lightning Protector	H2	46.1 ft (14.1m)	
Height of Center of Radiation	H3	23.05 ft (7m)	
Effective Projected Area	(EPA) <sub>S</sub>	47.8 ft² (4.4m²)	124.3 ft² (11.5m²)
Moment Arm	D1	24.8 ft (7.6m)	26 ft (7.9m)

Weight W 6600 lb (3t) 10250 lb (4.6t)

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

Prepared by: JBC Date: 10-Oct-19 ME: EE:

0

This document contains proprietary and confidential information of Dielectric. It is to be used solely for the purpose for which it is provided. No disclosure, reproduction, or use of this document or any part of it may be made without the written permission of Dielectric. Mechanical data is based on listed criteria and should be verified by the tower engineer.

## Summary

Proposal No.	<b>C-71409</b>
Date	<b>10-Oct-19</b>
Call Letters	<b>WNEP</b>
Channel	<b>21</b>
Frequency	<b>515 MHz</b>
Antenna Type	<b>TFU-21ETT/VP-R 04</b>

## Antenna

	Hpol		Vpol	
ERP:	<b>760 kW</b>	<b>( 28.81 dBk )</b>	<b>190 kW</b>	<b>( 22.79 dBk )</b>
Peak Gain*	21.31	( 13.29 dB )	5.33	( 7.27 dB )

<b>Antenna Input Power</b>	<b>35.7 kW</b>	<b>( 15.52 dBk )</b>
----------------------------	----------------	----------------------

## Transmission Line

Type:	<b>Rigid</b>	Attenuation:	<b>( 0.99 dB )</b>
Size:	<b>6-1/8"</b>	Efficiency:	<b>79.6%</b>
Impedance:	<b>75 Ohm</b>		
Length:	<b>900 ft</b>	<b>274.3 m</b>	

## Transmitter Output

<b>44.8 kW</b>	<b>( 16.51 dBk )</b>
----------------	----------------------

Transmitter filter losses not included

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

This document contains proprietary and confidential information of Dielectric. It is to be used solely for the purpose for which it is provided. No disclosure, reproduction, or use of this document or any part of it may be made without the written permission of Dielectric.