

**Engineering Exhibit #1**  
**WBOC-DT Channel 21**  
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Proposal Number	DCA-8423	
Date	17-Sep-99	
Call Letters	WBOC-DT	Channel 21
Location	Salisbury, MD	
Customer		
Antenna Type	TUP-P4SP-8S-1	

## **SYSTEM SUMMARY**

### **Antenna:**

Type:	TUP-P4SP-8S-1	ERP:	635 kW	H Pol (28.03 dBk )
Channel:	21	Gain*:	38.8	( 15.89 dB )
Location:	Salisbury, MD	Input Power:	16.4 kW	(12.14 dBk )

### **Transmission Line:**

Type:	EIA/DCA	Attenuation:	1.13 dB
Size:	6-1/8 in	Efficiency:	77.1%
Impedance:	50 ohm		
Length:	950 ft		289.6 m

Combiner:	DCA	Attenuation:	0.30 dB
		Efficiency:	93.3%

### **Combiner Input:**

Power Required:	7.2 kW	( 8.55 dBk )
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\* Gain is with respect to half wave dipole.

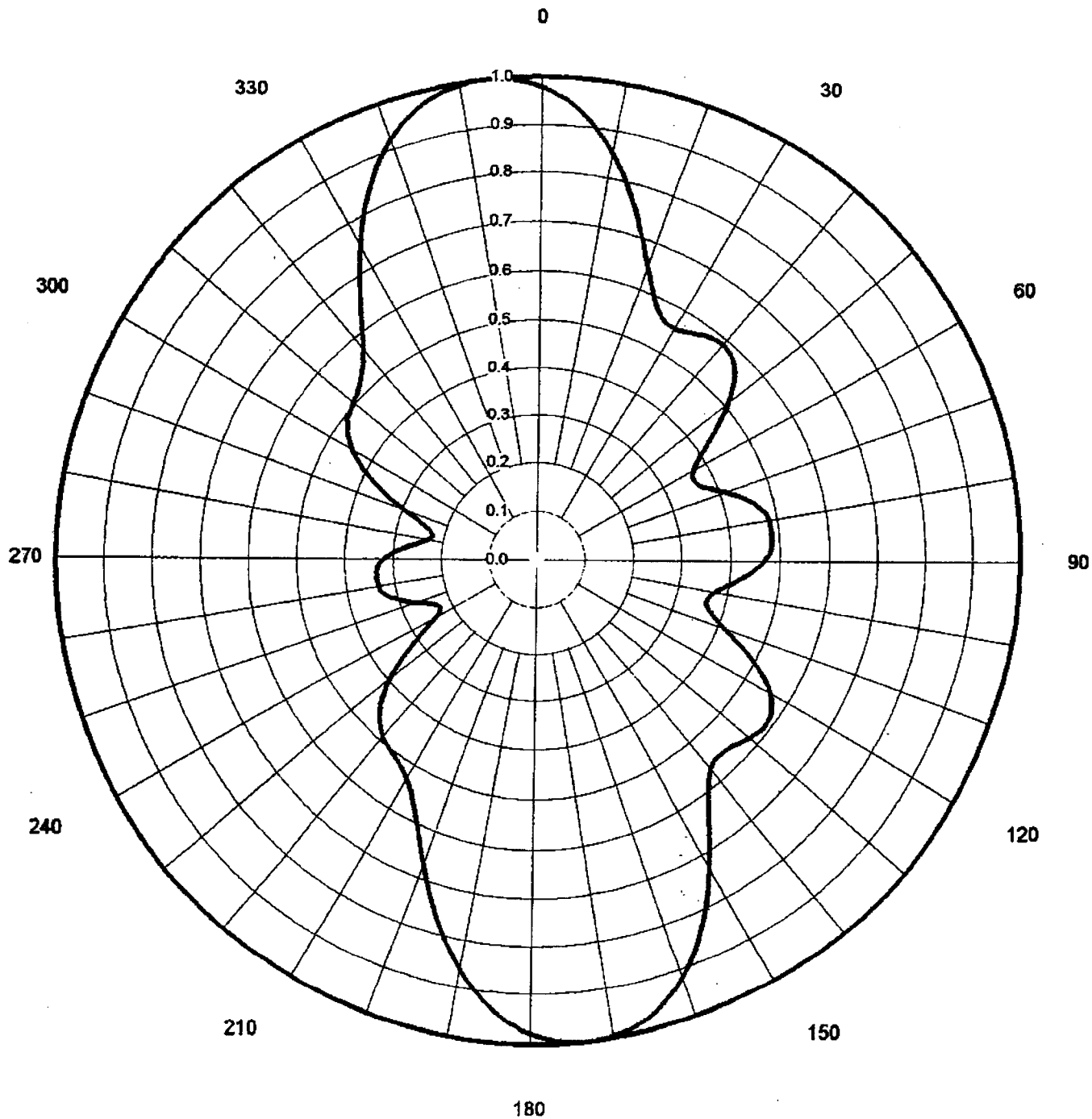
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**AZIMUTH PATTERN**

Gain	2.60	(4.15 dB)
Calculated / Measured	Calculated	

Frequency	515.00 MHz
Drawing #	TUP-P4SP-21



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**TABULATION OF AZIMUTH PATTERN**

Azimuth Pattern Drawing #: **TUP-P4SP-21**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.980	45	0.569	90	0.468	135	0.561	180	0.979	225	0.456	270	0.319	315	0.525
1	0.972	46	0.560	91	0.461	136	0.560	181	0.972	226	0.447	271	0.312	316	0.532
2	0.963	47	0.550	92	0.452	137	0.559	182	0.963	227	0.435	272	0.303	317	0.540
3	0.955	48	0.537	93	0.444	138	0.560	183	0.955	228	0.422	273	0.296	318	0.548
4	0.944	49	0.524	94	0.434	139	0.564	184	0.945	229	0.409	274	0.286	319	0.559
5	0.931	50	0.509	95	0.423	140	0.568	185	0.933	230	0.394	275	0.276	320	0.570
6	0.918	51	0.494	96	0.413	141	0.576	186	0.921	231	0.378	276	0.267	321	0.584
7	0.903	52	0.478	97	0.402	142	0.587	187	0.907	232	0.362	277	0.257	322	0.599
8	0.888	53	0.462	98	0.391	143	0.600	188	0.892	233	0.346	278	0.247	323	0.615
9	0.871	54	0.447	99	0.383	144	0.615	189	0.878	234	0.330	279	0.239	324	0.633
10	0.854	55	0.431	100	0.375	145	0.632	190	0.861	235	0.313	280	0.233	325	0.651
11	0.833	56	0.415	101	0.368	146	0.649	191	0.843	236	0.297	281	0.227	326	0.669
12	0.814	57	0.401	102	0.364	147	0.668	192	0.826	237	0.281	282	0.225	327	0.689
13	0.795	58	0.390	103	0.362	148	0.689	193	0.808	238	0.266	283	0.226	328	0.709
14	0.773	59	0.379	104	0.362	149	0.709	194	0.788	239	0.253	284	0.228	329	0.728
15	0.752	60	0.371	105	0.366	150	0.730	195	0.769	240	0.242	285	0.234	330	0.749
16	0.730	61	0.366	106	0.371	151	0.752	196	0.749	241	0.234	286	0.242	331	0.769
17	0.709	62	0.362	107	0.379	152	0.773	197	0.728	242	0.228	287	0.253	332	0.788
18	0.689	63	0.362	108	0.390	153	0.795	198	0.709	243	0.226	288	0.266	333	0.808
19	0.668	64	0.364	109	0.401	154	0.814	199	0.689	244	0.225	289	0.281	334	0.826
20	0.649	65	0.368	110	0.415	155	0.833	200	0.669	245	0.227	290	0.297	335	0.843
21	0.632	66	0.375	111	0.431	156	0.854	201	0.651	246	0.233	291	0.313	336	0.861
22	0.615	67	0.383	112	0.447	157	0.871	202	0.633	247	0.239	292	0.330	337	0.878
23	0.600	68	0.391	113	0.462	158	0.888	203	0.615	248	0.247	293	0.346	338	0.892
24	0.588	69	0.402	114	0.479	159	0.903	204	0.599	249	0.257	294	0.363	339	0.907
25	0.577	70	0.413	115	0.494	160	0.918	205	0.585	250	0.267	295	0.379	340	0.921
26	0.569	71	0.423	116	0.510	161	0.931	206	0.571	251	0.276	296	0.394	341	0.933
27	0.564	72	0.434	117	0.524	162	0.944	207	0.559	252	0.286	297	0.409	342	0.945
28	0.560	73	0.444	118	0.537	163	0.955	208	0.548	253	0.296	298	0.422	343	0.955
29	0.559	74	0.452	119	0.550	164	0.963	209	0.540	254	0.303	299	0.435	344	0.963
30	0.559	75	0.461	120	0.560	165	0.972	210	0.531	255	0.312	300	0.446	345	0.972
31	0.560	76	0.468	121	0.568	166	0.980	211	0.524	256	0.319	301	0.456	346	0.979
32	0.564	77	0.473	122	0.576	167	0.985	212	0.519	257	0.324	302	0.465	347	0.984
33	0.567	78	0.480	123	0.581	168	0.991	213	0.515	258	0.329	303	0.472	348	0.990
34	0.571	79	0.483	124	0.585	169	0.994	214	0.510	259	0.332	304	0.479	349	0.993
35	0.576	80	0.484	125	0.587	170	0.996	215	0.507	260	0.333	305	0.485	350	0.996
36	0.580	81	0.485	126	0.588	171	0.999	216	0.505	261	0.334	306	0.491	351	0.999
37	0.583	82	0.485	127	0.587	172	1.000	217	0.501	262	0.334	307	0.494	352	1.000
38	0.586	83	0.486	128	0.586	173	1.000	218	0.497	263	0.335	308	0.497	353	1.000
39	0.587	84	0.485	129	0.583	174	1.000	219	0.494	264	0.334	309	0.501	354	1.000
40	0.588	85	0.485	130	0.580	175	0.999	220	0.491	265	0.334	310	0.505	355	0.999
41	0.587	86	0.484	131	0.576	176	0.996	221	0.485	266	0.333	311	0.507	356	0.996
42	0.585	87	0.483	132	0.571	177	0.993	222	0.479	267	0.332	312	0.510	357	0.994
43	0.581	88	0.480	133	0.567	178	0.990	223	0.472	268	0.329	313	0.515	358	0.991
44	0.576	89	0.473	134	0.564	179	0.984	224	0.465	269	0.324	314	0.519	359	0.985

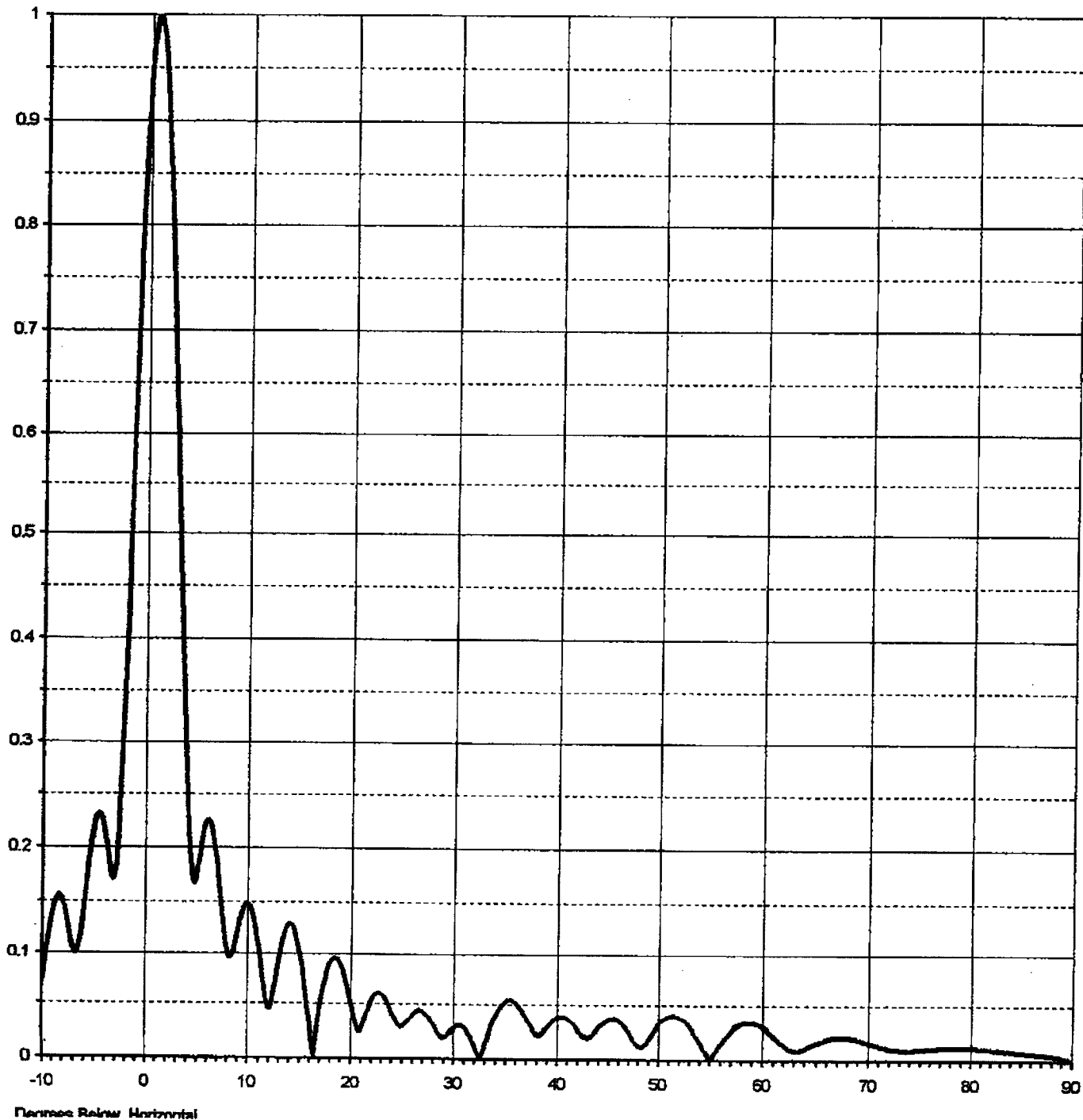
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ELEVATION PATTERN

RMS Gain at Main Lobe	15.70 ( 11.96 dB )
RMS Gain at Horizontal	13.80 ( 11.40 dB )
Calculated / Measured	Calculated

Beam Tilt	0.75 deg
Frequency	515.00 MHz
Drawing #	8U157075-90



Pattern Relative Horizontal

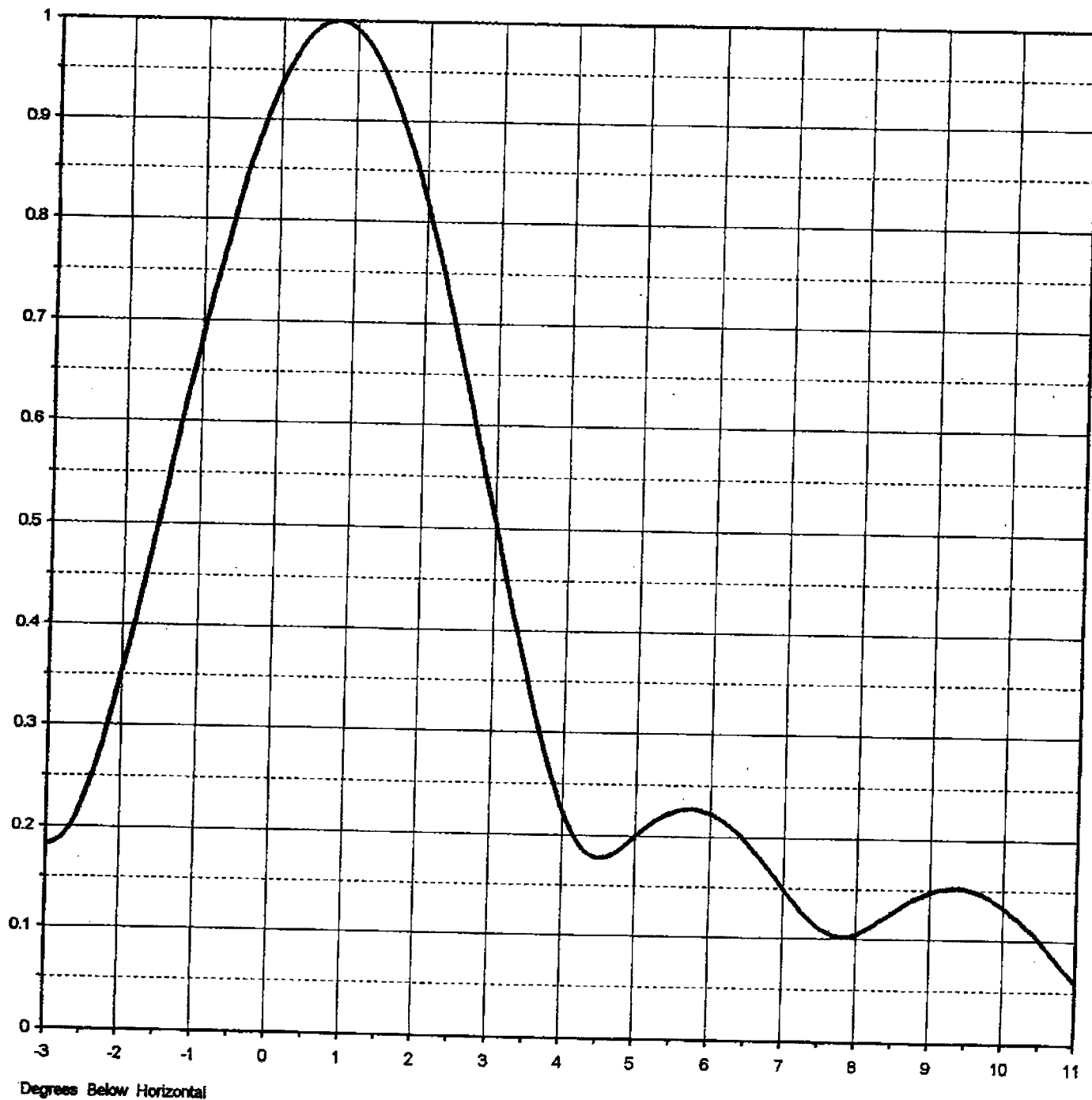
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Customer		
Antenna Type	<b>TUP-P4SP-8S-1</b>	

**ELEVATION PATTERN**

RMS Gain at Main Lobe	<b>15.70 ( 11.96 dB )</b>
RMS Gain at Horizontal	<b>13.80 ( 11.40 dB )</b>
Calculated / Measured	<b>Calculated</b>

Beam Tilt	<b>0.75 deg</b>
Frequency	<b>515.00 MHz</b>
Drawing #	<b>8U157075</b>



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## TABULATION OF ELEVATION PATTERN

Elevation Pattern Drawing #: **8U157075-90**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.053	2.4	0.706	10.6	0.099	30.5	0.000	51.0	0.007	71.5	0.012
-9.5	0.062	2.6	0.641	10.8	0.083	31.0	0.015	51.5	0.016	72.0	0.011
-9.0	0.103	2.8	0.575	11.0	0.067	31.5	0.030	52.0	0.024	72.5	0.010
-8.5	0.139	3.0	0.508	11.5	0.046	32.0	0.042	52.5	0.030	73.0	0.009
-8.0	0.158	3.2	0.441	12.0	0.073	32.5	0.051	53.0	0.034	73.5	0.008
-7.5	0.155	3.4	0.377	12.5	0.107	33.0	0.056	53.5	0.037	74.0	0.008
-7.0	0.133	3.6	0.318	13.0	0.129	33.5	0.055	54.0	0.037	74.5	0.007
-6.5	0.109	3.8	0.265	13.5	0.132	34.0	0.050	54.5	0.035	75.0	0.008
-6.0	0.115	4.0	0.223	14.0	0.118	34.5	0.041	55.0	0.031	75.5	0.008
-5.5	0.154	4.2	0.194	14.5	0.087	35.0	0.032	55.5	0.026	76.0	0.008
-5.0	0.200	4.4	0.180	15.0	0.047	35.5	0.025	56.0	0.021	76.5	0.008
-4.5	0.229	4.6	0.179	15.5	0.003	36.0	0.026	56.5	0.016	77.0	0.009
-4.0	0.230	4.8	0.187	16.0	0.039	36.5	0.031	57.0	0.011	77.5	0.009
-3.5	0.204	5.0	0.200	16.5	0.072	37.0	0.036	57.5	0.010	78.0	0.009
-3.0	0.182	5.2	0.212	17.0	0.092	37.5	0.039	58.0	0.012	78.5	0.009
-2.8	0.189	5.4	0.221	17.5	0.099	38.0	0.039	58.5	0.016	79.0	0.009
-2.6	0.211	5.6	0.226	18.0	0.092	38.5	0.035	59.0	0.019	79.5	0.009
-2.4	0.248	5.8	0.227	18.5	0.074	39.0	0.030	59.5	0.022	80.0	0.009
-2.2	0.297	6.0	0.223	19.0	0.049	39.5	0.024	60.0	0.024	80.5	0.009
-2.0	0.354	6.2	0.214	19.5	0.028	40.0	0.022	60.5	0.024	81.0	0.008
-1.8	0.416	6.4	0.202	20.0	0.029	40.5	0.025	61.0	0.024	81.5	0.008
-1.6	0.482	6.6	0.186	20.5	0.045	41.0	0.031	61.5	0.023	82.0	0.008
-1.4	0.550	6.8	0.168	21.0	0.057	41.5	0.035	62.0	0.022	82.5	0.007
-1.2	0.617	7.0	0.149	21.5	0.061	42.0	0.038	62.5	0.019	83.0	0.007
-1.0	0.682	7.2	0.131	22.0	0.057	42.5	0.038	63.0	0.017	83.5	0.006
-0.8	0.744	7.4	0.116	22.5	0.047	43.0	0.034	63.5	0.015	84.0	0.006
-0.6	0.802	7.6	0.106	23.0	0.036	43.5	0.028	64.0	0.013	84.5	0.006
-0.4	0.854	7.8	0.102	23.5	0.030	44.0	0.021	64.5	0.012	85.0	0.005
-0.2	0.899	8.0	0.104	24.0	0.033	44.5	0.014	65.0	0.012	85.5	0.005
0.0	0.937	8.2	0.112	24.5	0.039	45.0	0.015	65.5	0.013	86.0	0.004
0.2	0.966	8.4	0.122	25.0	0.043	45.5	0.022	66.0	0.014	86.5	0.004
0.4	0.987	8.6	0.132	25.5	0.042	46.0	0.030	66.5	0.015	87.0	0.004
0.6	0.998	8.8	0.141	26.0	0.037	46.5	0.037	67.0	0.016	87.5	0.003
0.8	1.000	9.0	0.147	26.5	0.029	47.0	0.041	67.5	0.017	88.0	0.003
1.0	0.992	9.2	0.151	27.0	0.022	47.5	0.043	68.0	0.017	88.5	0.002
1.2	0.975	9.4	0.152	27.5	0.021	48.0	0.041	68.5	0.017	89.0	0.002
1.4	0.948	9.6	0.149	28.0	0.025	48.5	0.037	69.0	0.017	89.5	0.001
1.6	0.914	9.8	0.146	28.5	0.029	49.0	0.031	69.5	0.016	90.0	0.000
1.8	0.871	10.0	0.138	29.0	0.028	49.5	0.022	70.0	0.015		
2.0	0.822	10.2	0.127	29.5	0.023	50.0	0.013	70.5	0.014		
2.2	0.766	10.4	0.114	30.0	0.013	50.5	0.003	71.0	0.013		