

# **DIRECTIONAL ANTENNA**

## **Application to Modify KTMW (TV) Construction Permit**

Channel 20 Television, Salt Lake City, Utah

FCC Form 301 Section V-C Item 10.

### **EXHIBIT E-3**

It proposed that the new Channel 20 KTMW (TV) will share the same antenna with KUWB-TV. The shared antenna is side-mounted on the same tower as is used by KJZZ (TV). By having KTMW and KUWB use the same antenna, more tower space at the site will be available for use by land-mobile and other users. The change to use a common antenna by KTMW involves modifying the application from one existing tower to another existing tower at the same site. The tower now proposed is at the same site and is less than 30 meters from the location specified in the current construction permit. The increased gain of the antenna proposed in the instant amendment will permit a transmitter to be used which will consume less of the available space in the existing building. The antenna array now proposed has 2° of a combination of electrical and mechanical beam tilt at 75° True, and separate panels are mounted with 3° of mechanical beam tilt at 255° True. This amount of beam tilt has been chosen to optimize the signal in the city of license, Salt Lake City, and other densely populated parts of the service area.

The vertical plane radiation used to calculate the distance to the field intensity contour has been chosen in accordance with §73.684(c)(1) except where a different angle would be appropriate to reach the greatest population along the radial, and/or where signals radiated at the angle calculated by §73.684(c)(1) would be blocked by mountainous terrain beyond the populated area. The vertical plane radiation convention used for a particular radial is indicated in Column 'AB' of pages 4 and 5 of this exhibit.

Title: Little Farnsworth  
NAD'83: 40-39-12 NAD'27: 40-39-12  
Antenna: C:\CDS\TUPSP220.ANT  
112-12-09 112-12-06

0.0900 x 100 = % of power input to Main Panels  
0.2563 = auxf = ((aux pwr in / main pwr in) x (au

Aux Pwr Input:  
Aux % field:

40-39-12  
112-12-06

40-39-12  
112-12-09

Title: Little Farnsworth  
Antenna: C:\CDS\TUPSP220.ANT

True Radial Bearing A	Radiation Height Above Average Terrain B	Center Elevation C	73.684(c) Elevation D	F <sub>1</sub> (B)	F <sub>2</sub> (D,I)	F <sub>3</sub> (E,pg9)	Main Angle F	Abcissa MainPanel Angle G	AuxPanel RtVField Angle H	VrtPln,M MirGrp Field I	Abcissa MainPnl VrtPln,M 0 Elev Field J	F <sub>5</sub> (I,pg9)	-AI	F <sub>5</sub> (K,pg14)	L	F <sub>6</sub> (cr,pr)	M	Optimum Elevation Angle N	MainAnt VrtPln for Optm at O	Abcissa MainAnt Mir Grph for Optm ElvAngle P	AuxAnt VrtPln at Optm Q	Main Panels Relty Field R	Pwr Adj/ Aux Max Max Relty Field S
0	1263.2	-0.9845	-0.7595	0.984	-0.2080	0.999	0.999	0.2250	0.659	-0.7765	0.982	-1.29	-1.0650	0.986	-2.066	0.874	0.916	0.0172					
5	1275.5	-0.9893	-0.6803	0.972	0.0368	1.000	0.3090	0.3090	0.618	-1.0261	0.968	-1.0272	0.999	-1.026	0.968	0.961	0.0208						
10	1289.1	-0.9945	-0.6038	0.961	0.2733	0.998	0.3907	0.3907	0.578	-1.2679	0.952	-1.38	0.9893	0.999	-2.648	0.799	0.992	0.0231					
15	1299.0	-0.9984	-0.5289	0.942	0.5016	0.992	0.4695	0.4695	0.538	-1.5000	0.933	-1.337	0.9875	0.993	-2.837	0.772	1.000	0.0238					
20	1321.4	-1.0069	-0.4623	0.926	0.7138	0.984	0.5446	0.5446	0.501	-1.7207	0.912	-1.33	0.9784	0.988	-3.051	0.740	0.992	0.0236					
25	1328.6	-0.9920	-0.3764	0.902	0.9363	0.974	0.6157	0.6157	0.466	-1.9284	0.890	-1.33	0.9587	0.998	-1.928	0.830	0.961	0.0218					
30	1276.4	-0.9896	-0.3076	0.880	1.1317	0.961	0.6820	0.6820	0.434	-2.1213	0.868	-1.814	-1.1320	0.993	-3.935	0.592	0.916	0.0192					
35	1251.9	-0.9801	-0.2369	0.856	1.3780	0.948	0.7431	0.7431	0.405	-2.2961	0.846	-2.084	-1.2087	0.988	-2.298	0.846	0.863	0.0167					
40	1257.4	-0.9822	-0.1836	0.837	1.4752	0.935	0.7986	0.7986	0.379	-2.4573	0.825	-2.084	-1.2854	0.975	-4.541	0.483	0.802	0.0149					
45	1264.9	-0.9852	-0.1371	0.819	1.6129	0.923	0.8480	0.8480	0.358	-2.5981	0.806	-2.176	-1.3280	0.969	-4.774	0.441	0.727	0.0138					
50	1277.9	-0.9902	-0.0992	0.803	1.7287	0.911	0.8910	0.8910	0.340	-2.7189	0.789	-2.167	-1.2760	0.977	-4.886	0.421	0.624	0.0151					
55	1292.0	-0.9956	-0.0685	0.791	1.8234	0.901	0.9272	0.9272	0.325	-2.8191	0.775	-2.167	-1.3788	0.960	-2.819	0.775	0.553	0.0187					
60	1289.2	-0.9868	-0.0305	0.775	1.9109	0.892	0.9563	0.9563	0.312	-2.8978	0.763	-2.438	-1.4817	0.936	-2.438	0.763	0.526	0.0236					
65	1293.8	-0.9690	-0.0091	0.759	1.9854	0.884	0.9781	0.9781	0.303	-2.9844	0.755	-2.431	-1.4601	0.942	-2.954	0.755	0.534	0.0287					
70	1195.4	-0.9578	0.0348	0.747	2.0309	0.878	0.9925	0.9925	0.297	-2.9886	0.750	-2.431	-1.4385	0.947	-5.420	0.748	0.550	0.0315					
75	1195.5	-0.9578	0.0416	0.744	2.0422	0.877	0.9934	0.9934	0.294	-3.0000	0.748	-2.299	-1.3694	0.962	-3.000	0.748	0.545	0.0351					
80	1198.7	-0.9590	0.0396	0.745	2.0295	0.879	0.9986	0.9986	0.295	-2.9886	0.750	-2.299	-1.3004	0.973	-5.288	0.748	0.522	0.0315					
85	1182.3	-0.9525	0.0378	0.746	2.0020	0.882	0.9903	0.9903	0.298	-2.9844	0.755	-2.299	-1.4270	0.950	-2.954	0.755	0.493	0.0287					
90	1173.2	-0.9488	0.0256	0.751	1.9490	0.888	0.9744	0.9744	0.305	-2.8978	0.763	-2.528	-1.5336	0.918	-2.528	0.763	0.493	0.0236					
95	1162.4	-0.9444	0.0067	0.760	1.8747	0.896	0.9511	0.9511	0.315	-2.8191	0.775	-2.459	-1.5461	0.920	-2.819	0.775	0.539	0.0187					
100	1123.8	-0.9286	-0.0081	0.766	1.7903	0.905	0.9205	0.9205	0.327	-2.7189	0.789	-2.459	-1.5385	0.922	-2.459	0.789	0.622	0.0151					
105	1082.5	-0.9114	-0.0284	0.775	1.6867	0.915	0.8829	0.8829	0.343	-2.5981	0.806	-2.459	-1.4667	0.940	-2.598	0.806	0.727	0.0138					
110	1053.5	-0.8991	-0.0604	0.787	1.5884	0.928	0.8387	0.8387	0.362	-2.4575	0.825	-2.235	-1.3948	0.958	-2.235	0.825	0.802	0.0149					
115	1038.4	-0.8926	-0.1046	0.805	1.4955	0.941	0.7880	0.7880	0.384	-2.2981	0.846	-2.235	-1.3948	0.958	-2.235	0.846	0.863	0.0167					
120	1020.6	-0.8849	-0.1536	0.821	1.2364	0.954	0.7314	0.7314	0.411	-2.1213	0.868	-2.447	-1.7156	0.867	-4.568	0.748	0.916	0.0192					
125	969.8	-0.8626	-0.1935	0.841	1.0657	0.966	0.6691	0.6691	0.440	-1.9284	0.890	-2.447	-1.7392	0.860	-4.568	0.748	0.961	0.0218					
130	924.4	-0.8422	-0.2404	0.857	0.8785	0.977	0.6018	0.6018	0.472	-1.7207	0.912	-1.6445	-1.0427	0.998	-3.365	0.690	0.992	0.0236					
135	862.7	-0.8136	-0.2837	0.872	0.6864	0.986	0.5299	0.5299	0.508	-1.5000	0.933	-1.523	-0.9931	1.000	-3.023	0.744	1.000	0.0238					
140	807.4	-0.7871	-0.3331	0.888	0.4808	0.993	0.4540	0.4540	0.546	-1.2679	0.952	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
145	732.7	-0.7498	-0.3752	0.902	0.2762	0.997	0.3746	0.3746	0.585	-1.0261	0.968	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
150	616.5	-0.6878	-0.3954	0.908	0.0887	1.000	0.2924	0.2924	0.626	-0.7765	0.982	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
155	553.5	-0.6517	-0.4438	0.921	-0.1307	0.999	0.2079	0.2079	0.667	-0.5209	0.991	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
160	503.3	-0.6214	-0.4996	0.935	-0.3600	0.996	0.1219	0.1219	0.707	-0.2615	0.998	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
165	493.0	-0.6151	-0.5802	0.955	-0.6151	0.998	0.0349	0.0349	0.747	-0.0000	1.000	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
170	395.8	-0.5511	-0.6034	0.961	-0.8125	0.980	-0.0523	0.784	0.2615	0.0000	1.000	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					
175	499.0	-0.6188	-0.7579	0.984	-1.1397	0.961	-0.1392	0.819	0.5209	0.0000	1.000	-1.378	-0.9340	0.996	-2.623	0.800	0.992	0.0231					

Negative Elevations on this chart are Below the horizontal, positive Elevations are Above the horizontal.

Antenna and Coverage Calculations

Title: Little Farnsworth  
Antenna: C:\CDS\TUPSF2.ANT

NAD: 83; 40-39-12 NAD: 27: 40-39-12  
112-12-09 112-12-06

Aux Pwr Input: 0.0900 x 100 = % of power input to Main Panels

0.2563 = auxf = ((aux pwr in / main pwr in) x (aux pwr gain / main pwr gain))0.5

Aux % field:

True Radial Bearing	F <sub>0</sub> (A, Terr)	F <sub>1</sub> (B)	F <sub>2</sub> (D,I)	F <sub>3</sub> (E,pg9)	F <sub>4</sub> (A,D)	F <sub>5</sub> (G,pg14)	F <sub>6</sub> (I,pg9)	F <sub>7</sub> (J,pg9)	F <sub>8</sub> (K,pg14)	F <sub>9</sub> (L,pg14)	F <sub>10</sub> (M,pg9)	F <sub>11</sub> (N,pg9)	F <sub>12</sub> (O,pg9)	F <sub>13</sub> (P,pg14)	F <sub>14</sub> (Q,pg14)	F <sub>15</sub> (R,pg9)	F <sub>16</sub> (S,pg9)	Radiation Center		Height Above		Average Terrain		Average		Average																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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180	587.6	-0.6715	-0.8964	0.995	-1.4479	0.937	-0.2250	0.852	0.7765	0.982	-5.3	0.020	-2.843	0.772	0.045	0.1697	0.504	0.0287																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</



## Antenna and Coverage Calculations

[illegible]

Max	1.000000
Min	0.177981
Min null	-14.9925 db ref Max

# DIELECTRIC

EXHIBIT E-3

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Date 23 Jul 1996

Call Letters

Channel 20

Location

Salt Lake City, UT

Customer

Antenna Type TUP-SP2-12-1

## TABULATION OF AZIMUTH PATTERN

Azimuth Pattern Drawing #

TUP-SP2-20

### PATTERN FOR 'MAIN' ANTENNA OPERATING ALONE

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.916	45	0.727	90	0.493	135	1.000	180	0.504	225	0.009	270	0.000	315	0.274
1	0.925	46	0.702	91	0.498	136	0.999	181	0.487	226	0.006	271	0.000	316	0.287
2	0.935	47	0.678	92	0.505	137	0.999	182	0.471	227	0.003	272	0.000	317	0.300
3	0.944	48	0.654	93	0.514	138	0.997	183	0.455	228	0.001	273	0.000	318	0.315
4	0.953	49	0.639	94	0.525	139	0.995	184	0.439	229	0.000	274	0.000	319	0.331
5	0.961	50	0.624	95	0.539	140	0.992	185	0.424	230	0.000	275	0.000	320	0.346
6	0.969	51	0.607	96	0.555	141	0.988	186	0.409	231	0.000	276	0.000	321	0.361
7	0.976	52	0.590	97	0.569	142	0.983	187	0.392	232	0.000	277	0.000	322	0.376
8	0.983	53	0.577	98	0.585	143	0.976	188	0.376	233	0.000	278	0.000	323	0.392
9	0.988	54	0.565	99	0.604	144	0.969	189	0.361	234	0.000	279	0.000	324	0.409
10	0.992	55	0.553	100	0.622	145	0.961	190	0.346	235	0.000	280	0.000	325	0.424
11	0.995	56	0.543	101	0.638	146	0.953	191	0.331	236	0.000	281	0.000	326	0.439
12	0.997	57	0.536	102	0.653	147	0.944	192	0.315	237	0.000	282	0.001	327	0.455
13	0.999	58	0.531	103	0.678	148	0.935	193	0.300	238	0.000	283	0.003	328	0.471
14	0.999	59	0.527	104	0.702	149	0.925	194	0.287	239	0.000	284	0.006	329	0.487
15	1.000	60	0.526	105	0.727	150	0.916	195	0.274	240	0.000	285	0.009	330	0.504
16	0.999	61	0.524	106	0.742	151	0.906	196	0.262	241	0.000	286	0.019	331	0.519
17	0.999	62	0.525	107	0.759	152	0.896	197	0.249	242	0.000	287	0.029	332	0.536
18	0.997	63	0.527	108	0.775	153	0.885	198	0.237	243	0.000	288	0.039	333	0.551
19	0.995	64	0.529	109	0.789	154	0.874	199	0.224	244	0.000	289	0.041	334	0.567
20	0.992	65	0.534	110	0.802	155	0.863	200	0.212	245	0.000	290	0.045	335	0.584
21	0.988	66	0.539	111	0.813	156	0.851	201	0.201	246	0.000	291	0.051	336	0.601
22	0.983	67	0.542	112	0.826	157	0.839	202	0.189	247	0.000	292	0.058	337	0.617
23	0.976	68	0.545	113	0.839	158	0.826	203	0.179	248	0.000	293	0.063	338	0.632
24	0.969	69	0.548	114	0.851	159	0.813	204	0.166	249	0.000	294	0.068	339	0.647
25	0.961	70	0.550	115	0.863	160	0.802	205	0.157	250	0.000	295	0.075	340	0.662
26	0.953	71	0.552	116	0.874	161	0.789	206	0.145	251	0.000	296	0.083	341	0.677
27	0.944	72	0.551	117	0.885	162	0.776	207	0.137	252	0.000	297	0.091	342	0.691
28	0.935	73	0.550	118	0.896	163	0.763	208	0.129	253	0.000	298	0.098	343	0.707
29	0.925	74	0.548	119	0.906	164	0.749	209	0.120	254	0.000	299	0.104	344	0.721
30	0.916	75	0.545	120	0.916	165	0.735	210	0.112	255	0.000	300	0.112	345	0.735
31	0.906	76	0.542	121	0.925	166	0.721	211	0.104	256	0.000	301	0.120	346	0.749
32	0.896	77	0.537	122	0.935	167	0.707	212	0.098	257	0.000	302	0.129	347	0.763
33	0.885	78	0.533	123	0.944	168	0.691	213	0.091	258	0.000	303	0.137	348	0.776
34	0.874	79	0.528	124	0.953	169	0.677	214	0.083	259	0.000	304	0.145	349	0.789
35	0.863	80	0.522	125	0.961	170	0.662	215	0.075	260	0.000	305	0.157	350	0.802
36	0.851	81	0.516	126	0.969	171	0.647	216	0.068	261	0.000	306	0.168	351	0.813
37	0.839	82	0.508	127	0.976	172	0.632	217	0.063	262	0.000	307	0.179	352	0.826
38	0.826	83	0.503	128	0.983	173	0.617	218	0.058	263	0.000	308	0.189	353	0.839
39	0.813	84	0.499	129	0.988	174	0.601	219	0.051	264	0.000	309	0.201	354	0.851
40	0.802	85	0.493	130	0.992	175	0.584	220	0.045	265	0.000	310	0.212	355	0.863
41	0.789	86	0.488	131	0.995	176	0.567	221	0.041	266	0.000	311	0.224	356	0.874
42	0.775	87	0.487	132	0.997	177	0.551	222	0.039	267	0.000	312	0.237	357	0.885
43	0.759	88	0.486	133	0.999	178	0.536	223	0.029	268	0.000	313	0.249	358	0.896
44	0.742	89	0.488	134	0.999	179	0.519	224	0.019	269	0.000	314	0.262	359	0.906

Pattern is for Maximum Radiation at any elevation.

DIELECTRIC COMMUNICATIONS

RAYMOND, ME TEL 207-656-4555 FAX 207-656-7120

Page 6 of 15 pages.

# DIELECTRIC

EXHIBIT E-3  
page 7 of 15 pages.

Date 23 Jul 1996  
Call Letters  
Location Salt Lake City, UT  
Customer  
Antenna Type TUP-SP2-12-1  
Channel 20

PATTERN FOR 'MAIN' ANTENNA OPERATING ALONE:

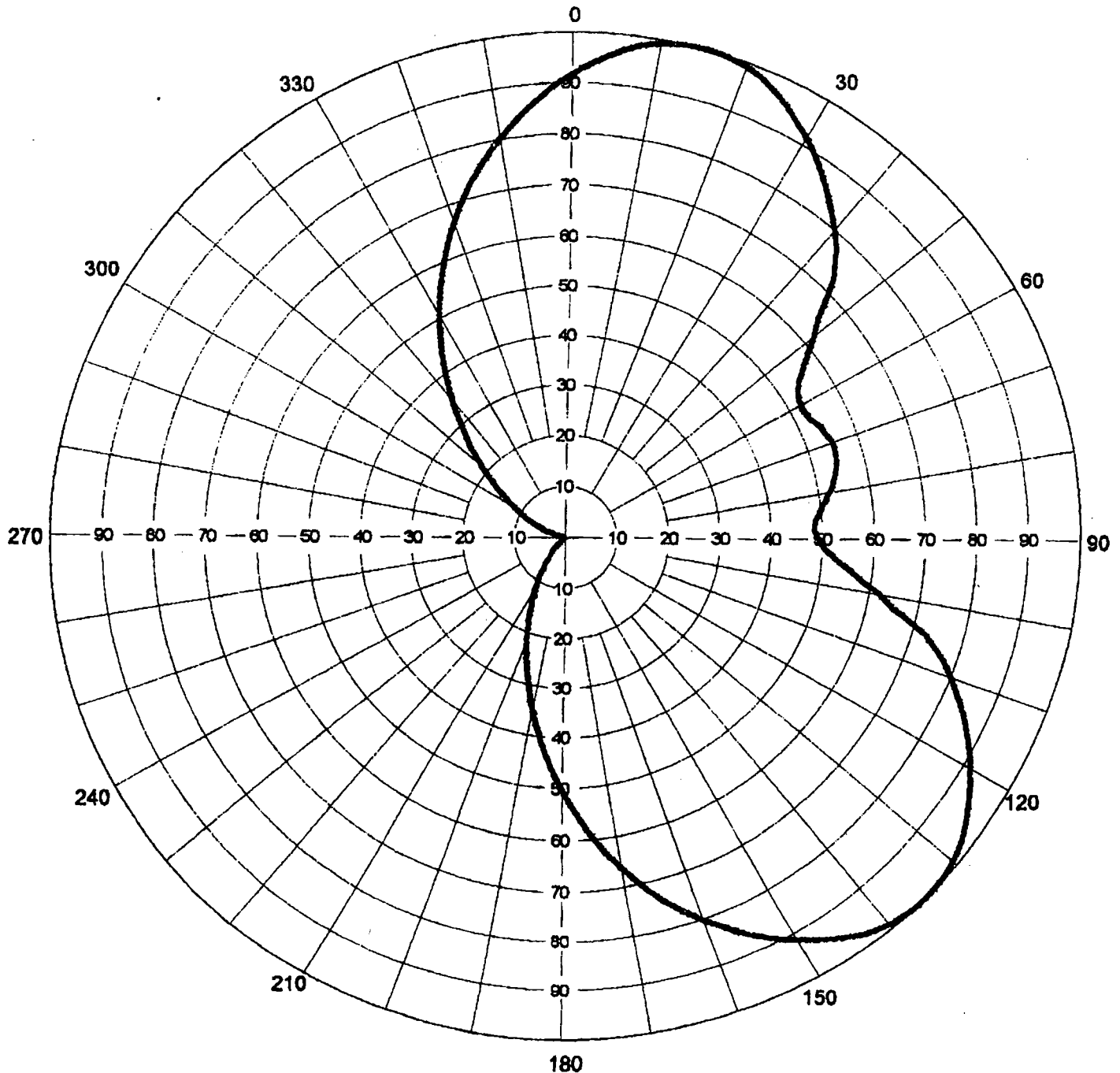
## AZIMUTH PATTERN

RMS Gain at Main Lobe  
Calculated / Measured

2.70 (4.31 dB)  
Calculated

Frequency  
Drawing #

509 MHz  
TUP-SP2-20



(Pattern is for Maximum Radiation at any elevation.)

**DIELECTRIC COMMUNICATIONS**  
A UNIT OF GENERAL SIGNAL

RAYMOND, ME TEL 207-855-4855 FAX 207-855-7120

Page 7 of 15 pages.

**DIELECTRIC**EXHIBIT E-3  
Page 8 of 15 pages.Proposal Number **DCA-7422**Date **22-Jul-96**

Call Letters

Channel **20**Location **Salt Lake City, UT**

Customer

Antenna Type **TUP-SP2-12-1****TABULATION OF ELEVATION PATTERN**

MAIN ANTENNA

Elevation Pattern Drawing #: **12U240100-90**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.079	2.4	0.569	10.8	0.041	30.5	0.007	51.0	0.011	71.5	0.005
-9.5	0.067	2.6	0.471	10.8	0.026	31.0	0.002	51.5	0.005	72.0	0.005
-9.0	0.029	2.8	0.377	11.0	0.023	31.5	0.015	52.0	0.002	72.5	0.004
-8.5	0.038	3.0	0.294	11.5	0.054	32.0	0.029	52.5	0.008	73.0	0.003
-8.0	0.063	3.2	0.232	12.0	0.071	32.5	0.040	53.0	0.013	73.5	0.003
-7.5	0.104	3.4	0.198	12.5	0.061	33.0	0.046	53.5	0.015	74.0	0.003
-7.0	0.087	3.6	0.194	13.0	0.030	33.5	0.044	54.0	0.016	74.5	0.003
-6.5	0.046	3.8	0.208	13.5	0.020	34.0	0.036	54.5	0.015	75.0	0.003
-6.0	0.071	4.0	0.225	14.0	0.051	34.5	0.025	55.0	0.012	75.5	0.003
-5.5	0.134	4.2	0.236	14.5	0.067	35.0	0.019	55.5	0.008	76.0	0.004
-5.0	0.168	4.4	0.238	15.0	0.080	35.5	0.023	56.0	0.003	76.5	0.004
-4.5	0.154	4.6	0.229	15.5	0.033	36.0	0.028	56.5	0.003	77.0	0.004
-4.0	0.110	4.8	0.211	16.0	0.004	36.5	0.029	57.0	0.007	77.5	0.004
-3.5	0.121	5.0	0.185	16.5	0.036	37.0	0.024	57.5	0.010	78.0	0.004
-3.0	0.197	5.2	0.155	17.0	0.054	37.5	0.017	58.0	0.011	78.5	0.003
-2.8	0.224	5.4	0.125	17.5	0.054	38.0	0.015	58.5	0.011	79.0	0.003
-2.6	0.242	5.6	0.103	18.0	0.037	38.5	0.020	59.0	0.010	79.5	0.003
-2.4	0.250	5.8	0.096	18.5	0.012	39.0	0.026	59.5	0.008	80.0	0.003
-2.2	0.248	6.0	0.105	19.0	0.019	39.5	0.027	60.0	0.006	80.5	0.002
-2.0	0.234	6.2	0.122	19.5	0.036	40.0	0.024	60.5	0.003	81.0	0.002
-1.8	0.215	6.4	0.140	20.0	0.039	40.5	0.016	61.0	0.003	81.5	0.002
-1.6	0.198	6.6	0.152	20.5	0.029	41.0	0.008	61.5	0.005	82.0	0.002
-1.4	0.199	6.8	0.159	21.0	0.011	41.5	0.009	62.0	0.007	82.5	0.001
-1.2	0.231	7.0	0.157	21.5	0.016	42.0	0.017	62.5	0.009	83.0	0.001
-1.0	0.294	7.2	0.149	22.0	0.030	42.5	0.021	63.0	0.010	83.5	0.001
-0.8	0.378	7.4	0.133	22.5	0.035	43.0	0.021	63.5	0.010	84.0	0.001
-0.6	0.473	7.6	0.112	23.0	0.028	43.5	0.017	64.0	0.009	84.5	0.001
-0.4	0.573	7.8	0.087	23.5	0.015	44.0	0.011	64.5	0.007	85.0	0.001
-0.2	0.671	8.0	0.061	24.0	0.014	44.5	0.005	65.0	0.005	85.5	0.001
0.0	0.763	8.2	0.039	24.5	0.026	45.0	0.009	65.5	0.004	86.0	0.001
0.2	0.844	8.4	0.034	25.0	0.033	45.5	0.015	66.0	0.003	86.5	0.000
0.4	0.910	8.6	0.048	25.5	0.032	46.0	0.017	66.5	0.003	87.0	0.000
0.6	0.960	8.8	0.067	26.0	0.023	46.5	0.017	67.0	0.005	87.5	0.000
0.8	0.990	9.0	0.083	26.5	0.015	47.0	0.013	67.5	0.006	88.0	0.000
1.0	1.000	9.2	0.094	27.0	0.017	47.5	0.007	68.0	0.007	88.5	0.000
1.2	0.989	9.4	0.100	27.5	0.022	48.0	0.004	68.5	0.008	89.0	0.000
1.4	0.957	9.6	0.099	28.0	0.022	48.5	0.009	69.0	0.008	89.5	0.000
1.6	0.906	9.8	0.087	28.5	0.018	49.0	0.015	69.5	0.008	90.0	0.000
1.8	0.839	10.0	0.088	29.0	0.012	49.5	0.018	70.0	0.008		
2.0	0.758	10.2	0.075	29.5	0.009	50.0	0.018	70.5	0.007		
2.2	0.666	10.4	0.059	30.0	0.010	50.5	0.016	71.0	0.006		

Add  $1/\cos(77^\circ - \text{azimuth})$  to the numbers in the "Angle" column to correct the table for fields in a particular direction.

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# DIELECTRIC

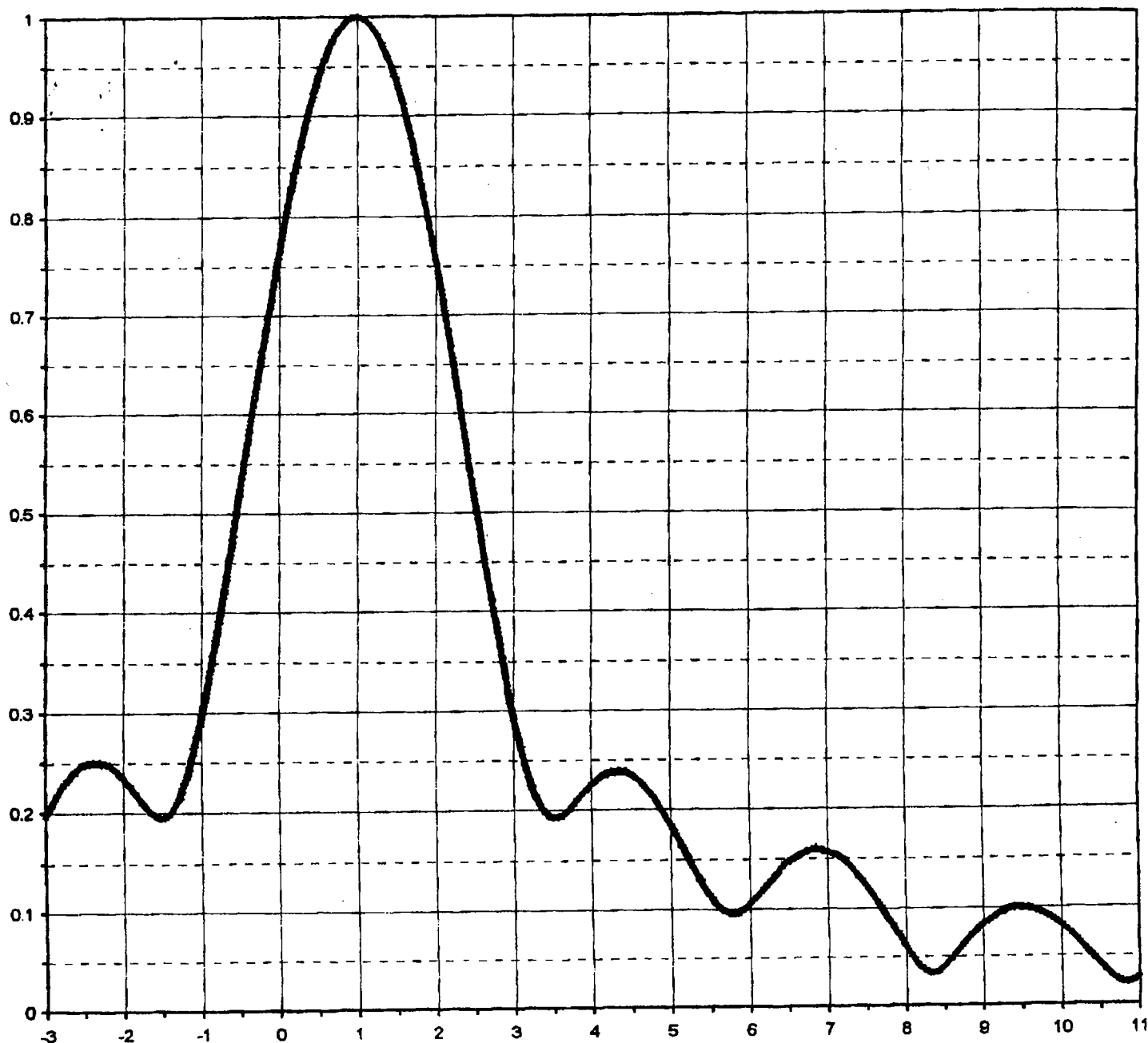


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Proposal Number **DCA-7422**  
Date **22-Jul-96**  
Call Letters  
Location **Salt Lake City, UT**  
Customer  
Antenna Type **TUP-SP2-12-1**  
Channel **20**

## MAIN ANTENNA ELEVATION PATTERN

RMS Gain at Main Lobe	<b>24.00 (13.80 dB)</b>	Beam Tilt	<b>1.00 deg</b>
RMS Gain at Horizontal	<b>14.00 (11.46 dB)</b>	Frequency	<b>509.00 MHz</b>
Calculated / Measured	<b>Calculated</b>	Drawing #	<b>12U240100</b>



Degrees Below Horizontal

Add  $1 \cdot \cos(77^\circ - \text{azimuth})$  to the abscissa numbers to correct the graph for the elevation pattern in a particular direction.

**DIELECTRIC COMMUNICATIONS**

A UNIT OF GENERAL SIGNAL

RAYMOND, ME TEL 207-855-4555 FAX 207-855-7120

# DIELECTRIC

Proposal Number

**DCA-7422**EXHIBIT E-3  
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Date

**22-Jul-96**

Call Letters

Channel **20**

Location

**Salt Lake City, UT**

Customer

Antenna Type

**TUP-SP2-12-1**

## MAIN ANTENNA ELEVATION PATTERN

RMS Gain at Main Lobe

**24.00 (13.80 dB)**

Beam Tilt

**1.00 deg**

RMS Gain at Horizontal

**14.00 (11.46 dB)**

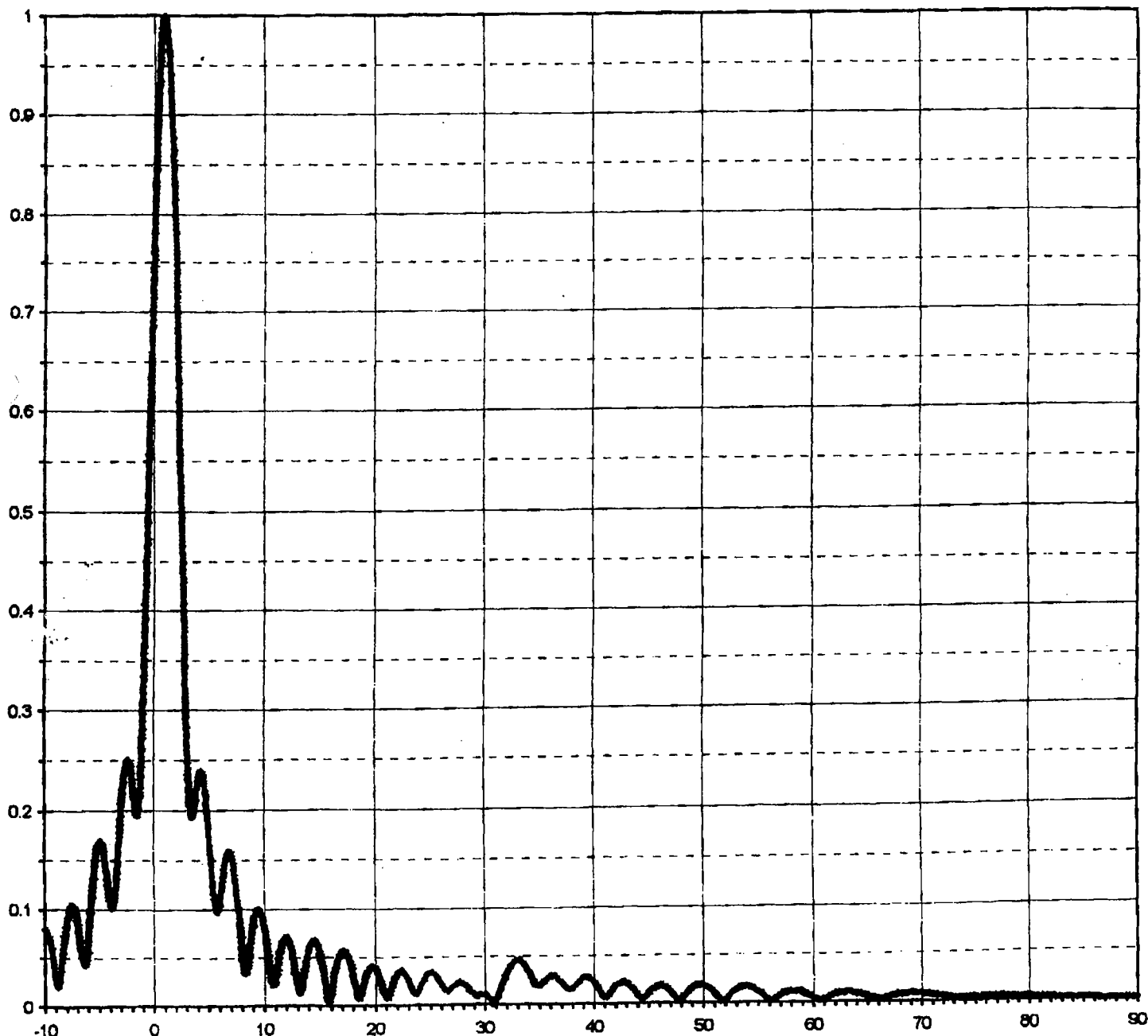
Frequency

**509.00 MHz**

Calculated / Measured

**Calculated**

Drawing #

**12U240100-90**

Degrees Below Horizontal

Add  $1 \cdot \cos(77^\circ - \text{azimuth})$  to the abscissa numbers to correct the graph for the elevation pattern in a particular direction.

**DIELECTRIC COMMUNICATIONS**

A UNIT OF GENERAL SIGNAL

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**DIELECTRIC**Proposal Number **DGA-7472**EXHIBIT E-3  
Page 11 of 15.Date **03 Oct 1996**

Call Letters

Channel **20**

Location

**Salt Lake City, UT**

Customer

Antenna Type **TUP-SP1-4-1****AUXILARY ANTENNA****TABULATION OF AZIMUTH PATTERN**

For the contribution of this antenna to  
the composite pattern multiply the fields  
given by 0.2563.

Azimuth Pattern Drawing # **TUP-SP1**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.067	45	0.054	90	0.092	135	0.093	180	0.112	225	0.735	270	0.916	315	0.274
1	0.071	46	0.054	91	0.089	136	0.093	181	0.120	226	0.749	271	0.806	316	0.262
2	0.073	47	0.055	92	0.085	137	0.093	182	0.129	227	0.763	272	0.896	317	0.249
3	0.076	48	0.056	93	0.081	138	0.092	183	0.137	228	0.776	273	0.885	318	0.237
4	0.079	49	0.057	94	0.076	139	0.091	184	0.145	229	0.789	274	0.874	319	0.224
5	0.081	50	0.059	95	0.073	140	0.090	185	0.157	230	0.802	275	0.863	320	0.212
6	0.084	51	0.061	96	0.070	141	0.089	186	0.168	231	0.813	276	0.851	321	0.201
7	0.086	52	0.064	97	0.067	142	0.087	187	0.179	232	0.826	277	0.839	322	0.189
8	0.087	53	0.067	98	0.064	143	0.086	188	0.189	233	0.839	278	0.826	323	0.179
9	0.089	54	0.070	99	0.061	144	0.084	189	0.201	234	0.851	279	0.813	324	0.168
10	0.090	55	0.073	100	0.059	145	0.081	190	0.212	235	0.863	280	0.802	325	0.157
11	0.091	56	0.076	101	0.057	146	0.079	191	0.224	236	0.874	281	0.789	326	0.145
12	0.092	57	0.081	102	0.056	147	0.078	192	0.237	237	0.885	282	0.776	327	0.137
13	0.093	58	0.085	103	0.055	148	0.073	193	0.249	238	0.896	283	0.763	328	0.129
14	0.093	59	0.089	104	0.054	149	0.071	194	0.262	239	0.906	284	0.749	329	0.120
15	0.093	60	0.092	105	0.054	150	0.067	195	0.274	240	0.916	285	0.735	330	0.112
16	0.094	61	0.096	106	0.055	151	0.064	196	0.287	241	0.925	286	0.721	331	0.104
17	0.093	62	0.101	107	0.055	152	0.060	197	0.300	242	0.935	287	0.707	332	0.098
18	0.093	63	0.105	108	0.055	153	0.058	198	0.315	243	0.944	288	0.691	333	0.091
19	0.093	64	0.109	109	0.057	154	0.053	199	0.331	244	0.953	289	0.677	334	0.083
20	0.092	65	0.112	110	0.058	155	0.051	200	0.346	245	0.961	290	0.662	335	0.075
21	0.090	66	0.115	111	0.060	156	0.048	201	0.361	246	0.969	291	0.647	336	0.068
22	0.089	67	0.117	112	0.060	157	0.048	202	0.376	247	0.976	292	0.632	337	0.063
23	0.087	68	0.119	113	0.062	158	0.044	203	0.392	248	0.983	293	0.617	338	0.058
24	0.086	69	0.121	114	0.063	159	0.042	204	0.409	249	0.988	294	0.601	339	0.050
25	0.085	70	0.123	115	0.065	160	0.041	205	0.424	250	0.992	295	0.584	340	0.042
26	0.083	71	0.126	116	0.066	161	0.038	206	0.439	251	0.995	296	0.567	341	0.035
27	0.081	72	0.129	117	0.068	162	0.036	207	0.455	252	0.997	297	0.551	342	0.031
28	0.078	73	0.132	118	0.070	163	0.034	208	0.471	253	0.999	298	0.536	343	0.028
29	0.077	74	0.137	119	0.073	164	0.031	209	0.487	254	0.999	299	0.519	344	0.026
30	0.075	75	0.137	120	0.075	165	0.028	210	0.504	255	1.000	300	0.504	345	0.028
31	0.073	76	0.137	121	0.077	166	0.026	211	0.519	256	0.999	301	0.487	346	0.031
32	0.070	77	0.132	122	0.078	167	0.028	212	0.536	257	0.999	302	0.471	347	0.034
33	0.068	78	0.129	123	0.081	168	0.031	213	0.551	258	0.997	303	0.455	348	0.038
34	0.066	79	0.126	124	0.083	169	0.035	214	0.567	259	0.995	304	0.439	349	0.038
35	0.065	80	0.123	125	0.085	170	0.042	215	0.584	260	0.992	305	0.424	350	0.041
36	0.063	81	0.121	126	0.086	171	0.050	216	0.601	261	0.988	306	0.409	351	0.042
37	0.062	82	0.119	127	0.087	172	0.058	217	0.617	262	0.983	307	0.392	352	0.044
38	0.060	83	0.117	128	0.089	173	0.063	218	0.632	263	0.976	308	0.376	353	0.046
39	0.060	84	0.115	129	0.090	174	0.066	219	0.647	264	0.969	309	0.361	354	0.048
40	0.058	85	0.112	130	0.092	175	0.075	220	0.662	265	0.961	310	0.346	355	0.051
41	0.057	86	0.109	131	0.093	176	0.083	221	0.677	266	0.953	311	0.331	356	0.053
42	0.055	87	0.105	132	0.093	177	0.091	222	0.691	267	0.944	312	0.315	357	0.056
43	0.055	88	0.101	133	0.093	178	0.098	223	0.707	268	0.935	313	0.300	358	0.060
44	0.055	89	0.096	134	0.094	179	0.104	224	0.721	269	0.925	314	0.287	359	0.064

**DIELECTRIC COMMUNICATIONS**

A UNIT OF GENERAL SIGNAL

RAYMOND, ME TEL 207-855-4555 FAX 207-855-7120

# DIELECTRIC



Proposal Number **DCA-7472**  
Date **03 Oct 1996**  
Call Letters  
Location **Salt Lake City, UT**  
Customer  
Antenna Type **TUP-SP1-4-1**

EXHIBIT E-3  
page 12 of 15.

Channel **20**

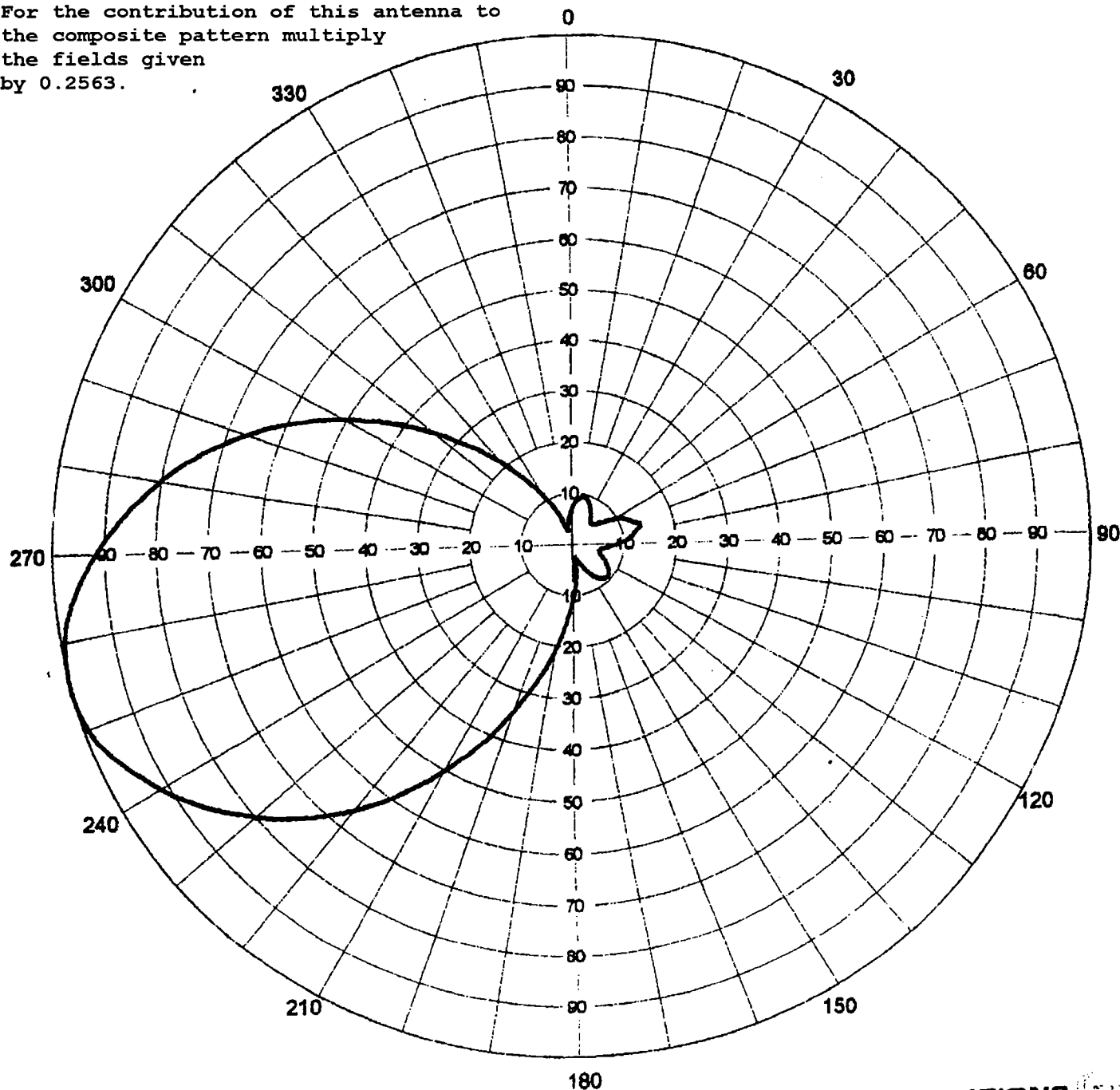
## AUXILIARY ANTENNA AZIMUTH PATTERN

RMS Gain at Main Lobe  
Calculated / Measured

**5.25 (7.20 dB)**  
Calculated

Frequency **509 MHz**  
Drawing # **TUP-SP1**

For the contribution of this antenna to  
the composite pattern multiply  
the fields given  
by 0.2563.



**DIELECTRIC COMMUNICATIONS**  
A UNIT OF FEDERAL SIGNAL  
RAYMOND, ME TEL 207-655-4555 FAX 207-655-7120

**DIELECTRIC**

Proposal Number **DCA-7472**  
 Date **03 Oct 1996**  
 Call Letters  
 Location **Salt Lake City, UT**  
 Customer  
 Antenna Type **TUP-SP1-4-1**

EXHIBIT E-3  
 Page 13 of 15.

Channel **20**

# AUXILARY ANTENNA

## TABULATION OF ELEVATION PATTERN

Elevation Pattern Drawing # **04U085000-90**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.233	2.4	0.833	10.6	0.235	30.5	0.009	51.0	0.013	71.5	0.034
-9.5	0.220	2.6	0.806	10.8	0.233	31.0	0.006	51.5	0.020	72.0	0.034
-9.0	0.198	2.8	0.778	11.0	0.230	31.5	0.021	52.0	0.026	72.5	0.034
-8.5	0.167	3.0	0.748	11.5	0.215	32.0	0.034	52.5	0.032	73.0	0.034
-8.0	0.131	3.2	0.716	12.0	0.193	32.5	0.046	53.0	0.037	73.5	0.034
-7.5	0.103	3.4	0.684	12.5	0.165	33.0	0.056	53.5	0.042	74.0	0.033
-7.0	0.109	3.6	0.650	13.0	0.132	33.5	0.063	54.0	0.045	74.5	0.032
-6.5	0.157	3.8	0.616	13.5	0.097	34.0	0.069	54.5	0.048	75.0	0.032
-6.0	0.229	4.0	0.580	14.0	0.060	34.5	0.072	55.0	0.050	75.5	0.031
-5.5	0.311	4.2	0.545	14.5	0.023	35.0	0.073	55.5	0.052	76.0	0.030
-5.0	0.400	4.4	0.509	15.0	0.012	35.5	0.072	56.0	0.052	76.5	0.029
-4.5	0.491	4.6	0.472	15.5	0.044	36.0	0.069	56.5	0.052	77.0	0.028
-4.0	0.580	4.8	0.436	16.0	0.073	36.5	0.064	57.0	0.051	77.5	0.027
-3.5	0.667	5.0	0.400	16.5	0.097	37.0	0.057	57.5	0.050	78.0	0.026
-3.0	0.748	5.2	0.364	17.0	0.116	37.5	0.049	58.0	0.048	78.5	0.025
-2.8	0.778	5.4	0.329	17.5	0.129	38.0	0.041	58.5	0.045	79.0	0.024
-2.6	0.806	5.6	0.294	18.0	0.137	38.5	0.032	59.0	0.042	79.5	0.022
-2.4	0.833	5.8	0.261	18.5	0.139	39.0	0.025	59.5	0.039	80.0	0.021
-2.2	0.859	6.0	0.229	19.0	0.135	39.5	0.021	60.0	0.035	80.5	0.020
-2.0	0.882	6.2	0.198	19.5	0.127	40.0	0.022	60.5	0.032	81.0	0.019
-1.8	0.904	6.4	0.170	20.0	0.115	40.5	0.027	61.0	0.028	81.5	0.018
-1.6	0.924	6.6	0.145	20.5	0.099	41.0	0.034	61.5	0.024	82.0	0.017
-1.4	0.941	6.8	0.124	21.0	0.081	41.5	0.042	62.0	0.021	82.5	0.016
-1.2	0.957	7.0	0.109	21.5	0.063	42.0	0.049	62.5	0.018	83.0	0.015
-1.0	0.970	7.2	0.101	22.0	0.046	42.5	0.054	63.0	0.015	83.5	0.014
-0.8	0.981	7.4	0.101	22.5	0.035	43.0	0.059	63.5	0.014	84.0	0.013
-0.6	0.989	7.6	0.107	23.0	0.035	43.5	0.062	64.0	0.013	84.5	0.012
-0.4	0.995	7.8	0.118	23.5	0.046	44.0	0.064	64.5	0.014	85.0	0.012
-0.2	0.999	8.0	0.131	24.0	0.059	44.5	0.064	65.0	0.015	85.5	0.011
0.0	1.000	8.2	0.145	24.5	0.071	45.0	0.063	65.5	0.017	86.0	0.010
0.2	0.999	8.4	0.160	25.0	0.082	45.5	0.061	66.0	0.020	86.5	0.009
0.4	0.995	8.6	0.173	25.5	0.089	46.0	0.057	66.5	0.022	87.0	0.008
0.6	0.989	8.8	0.186	26.0	0.093	46.5	0.053	67.0	0.024	87.5	0.007
0.8	0.981	9.0	0.198	26.5	0.094	47.0	0.047	67.5	0.026	88.0	0.007
1.0	0.970	9.2	0.208	27.0	0.091	47.5	0.041	68.0	0.028	88.5	0.006
1.2	0.957	9.4	0.216	27.5	0.085	48.0	0.034	68.5	0.029	89.0	0.005
1.4	0.941	9.6	0.223	28.0	0.077	48.5	0.028	69.0	0.031	89.5	0.003
1.6	0.924	9.8	0.229	28.5	0.066	49.0	0.018	69.5	0.032	90.0	0.000
1.8	0.904	10.0	0.233	29.0	0.053	49.5	0.010	70.0	0.033		
2.0	0.882	10.2	0.235	29.5	0.039	50.0	0.002	70.5	0.034		
2.2	0.859	10.4	0.236	30.0	0.024	50.5	0.005	71.0	0.034		

Positive Numbers  
 for elevation angle  
 are below the  
 Horizontal.

Add  $3 \cdot \cos(255^\circ - \text{azimuth})$  to the  
 numbers in the "Angle" column to  
 correct the table for fields in a  
 particular direction.

**DIELECTRIC COMMUNICATIONS**

A UNIT OF GENERAL SIGNAL  
 RAYMOND, ME TEL 207-855-4555 FAX 207-855-7120

# DIELECTRIC



Proposal Number **DCA-7472**  
Date **03 Oct 1996**  
Call Letters  
Location **Salt Lake City, UT**  
Customer  
Antenna Type **TUP-SP1-4-1**

EXHIBIT E-3  
Page 14 of 15.

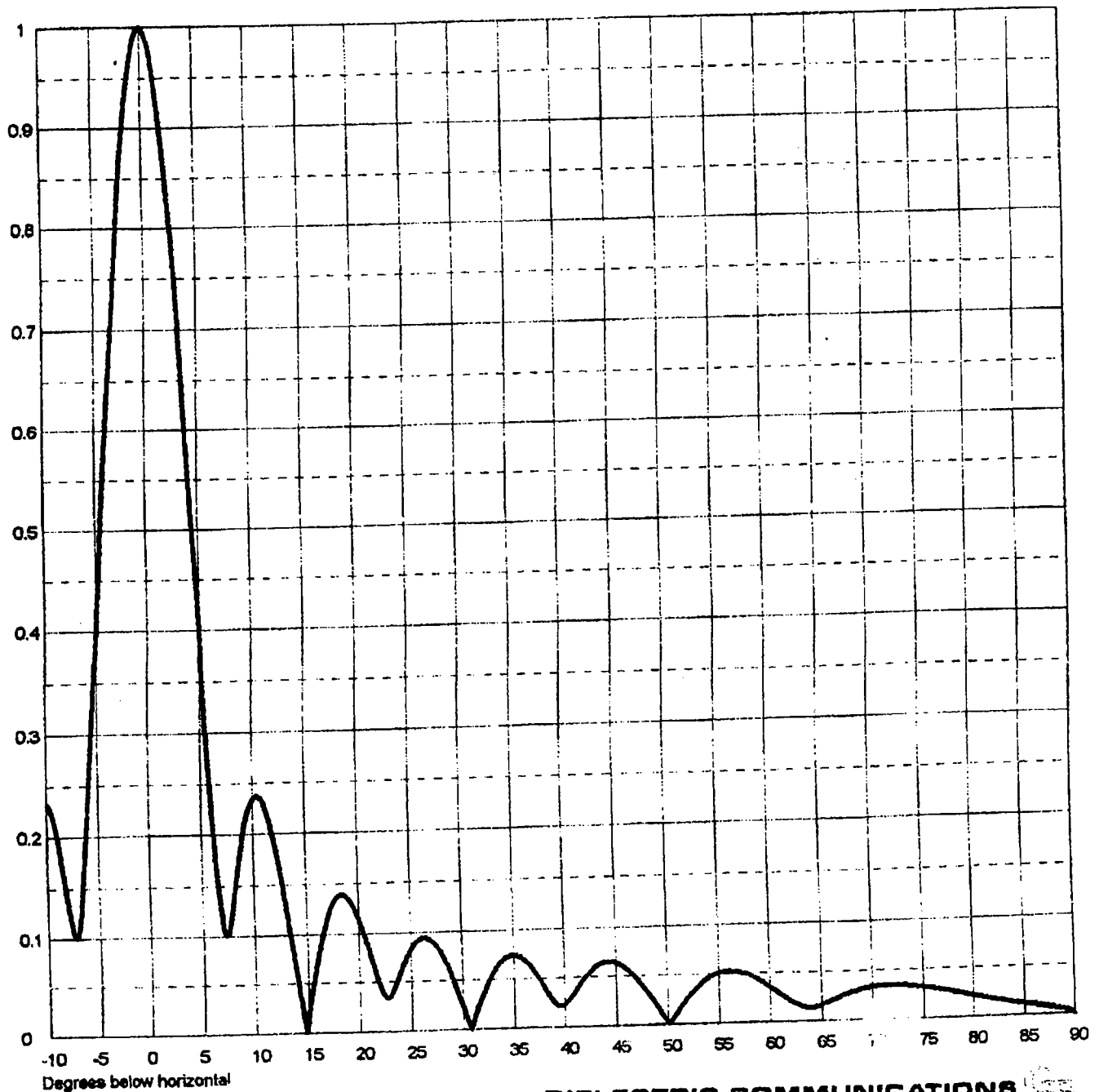
Channel **20**

## AUXILARY ANTENNA ELEVATION PATTERN

RMS Gain at Main Lobe  
RMS Gain at Horizontal  
Calculated / Measured

**8.5 (9.29 dB)**  
**8.5 (9.29 dB)**  
**Calculated**

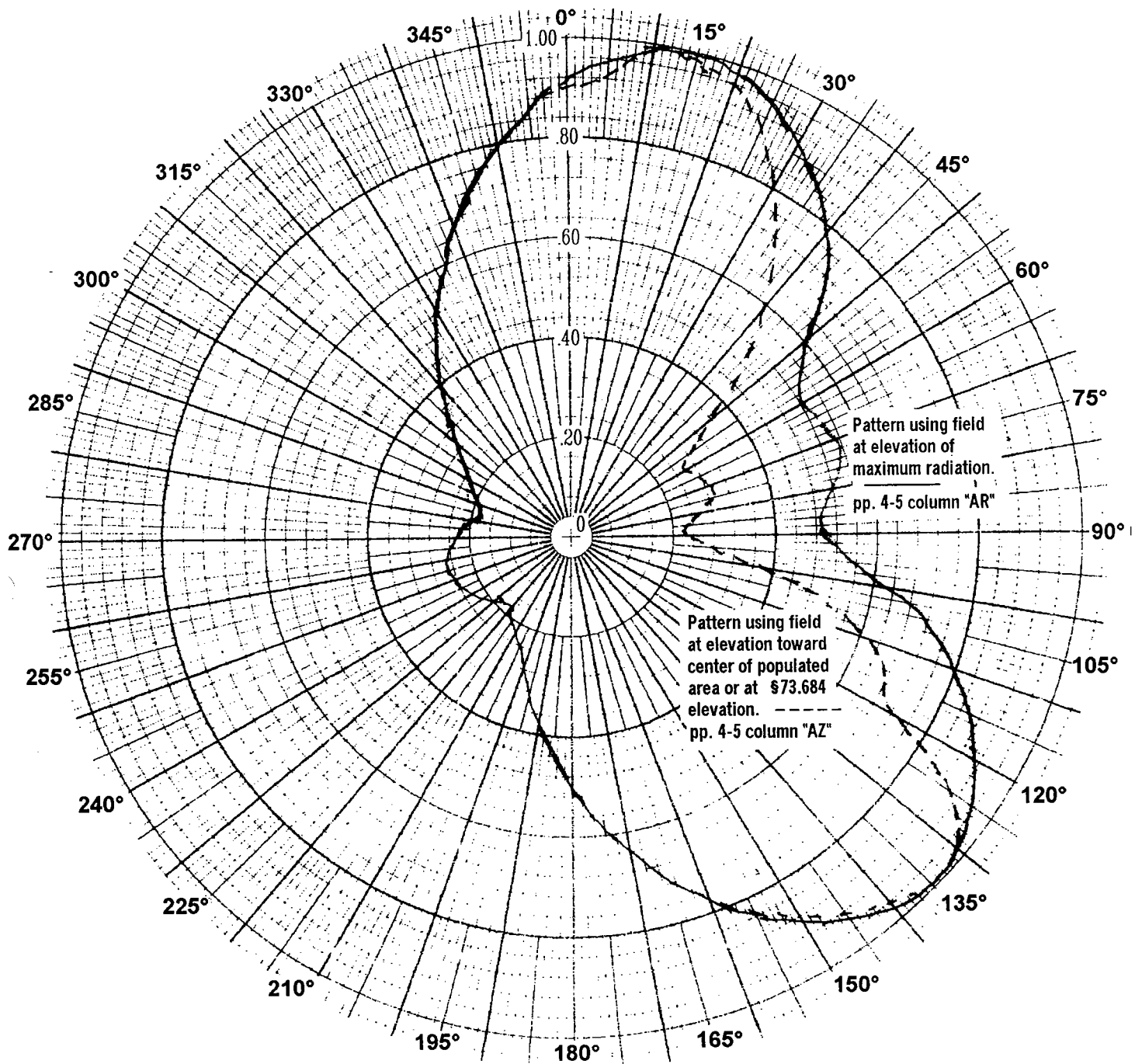
Beam Tilt **0.00 Degrees**  
Frequency **509.00 MHz**  
Drawing # **04U085000-90**



Add  $3 \cdot \cos(255^\circ - \text{azimuth})$  to the abscissa to correct the graph for the elevation pattern in a particular direction.

**DIELECTRIC COMMUNICATIONS**  
RAYMOND, ME TEL 207-855-4555 FAX 207-655-7120

# COMBINED ANTENNA PATTERN Channel 20



Patterns calculated from operation of:  
Dielectric TUP-SP2-12-1 0.9174 power at 75°T. and  
Dielectric TUP-SP1-4-1 0.0826 power at 255°T.