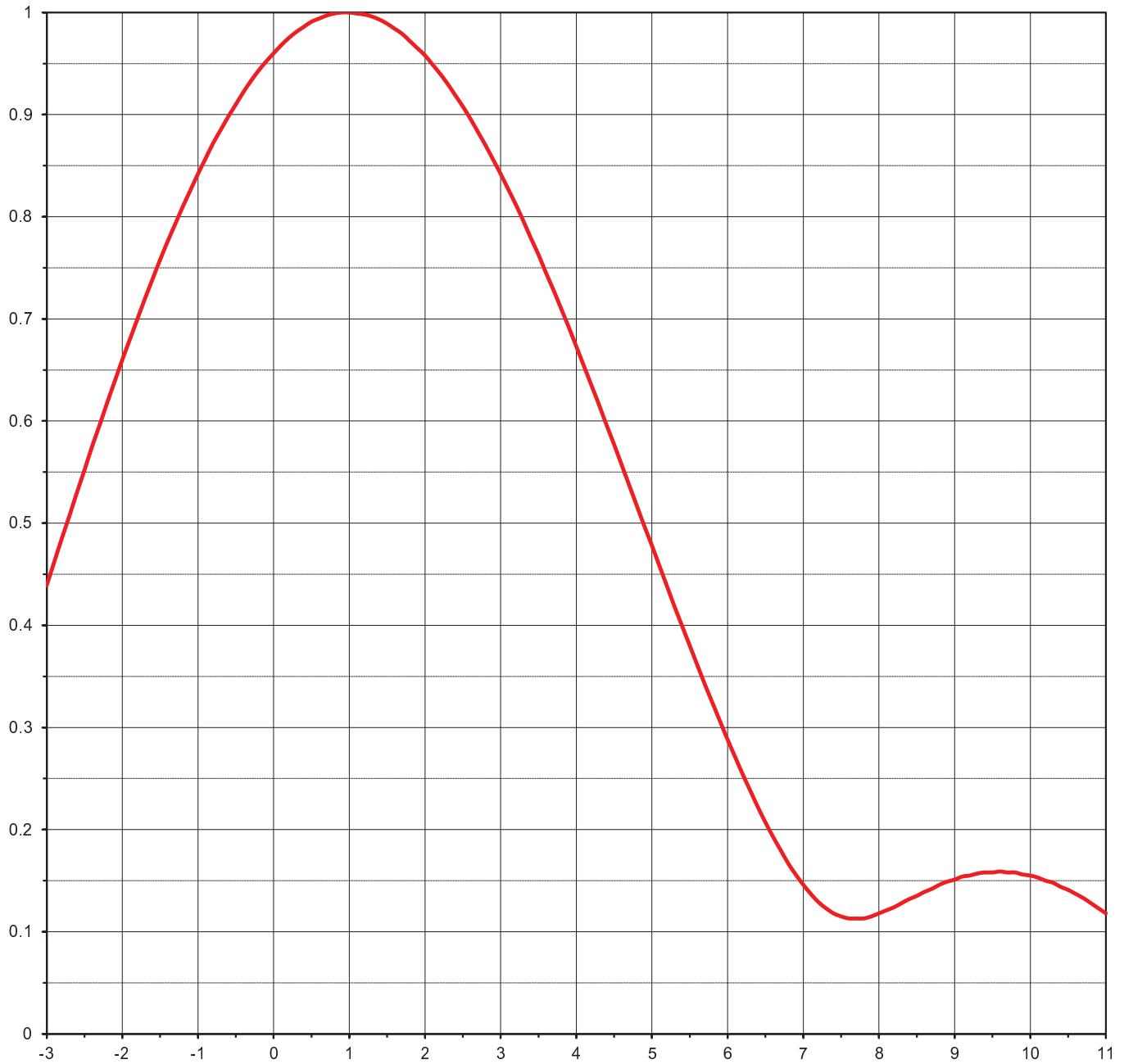


ELEVATION PATTERN

RMS Gain at Main Lobe **8.7 (9.40 dB)**Beam Tilt **1.00 deg**RMS Gain at Horizontal **8.0 (9.03 dB)**Frequency **605.00 MHz**Calculated / Measured **Calculated**Drawing # **04C087100**

Degrees Below Horizontal

ELEVATION PATTERN

RMS Gain at Main Lobe **8.7 (9.40 dB)**

Beam Tilt **1.00 deg**

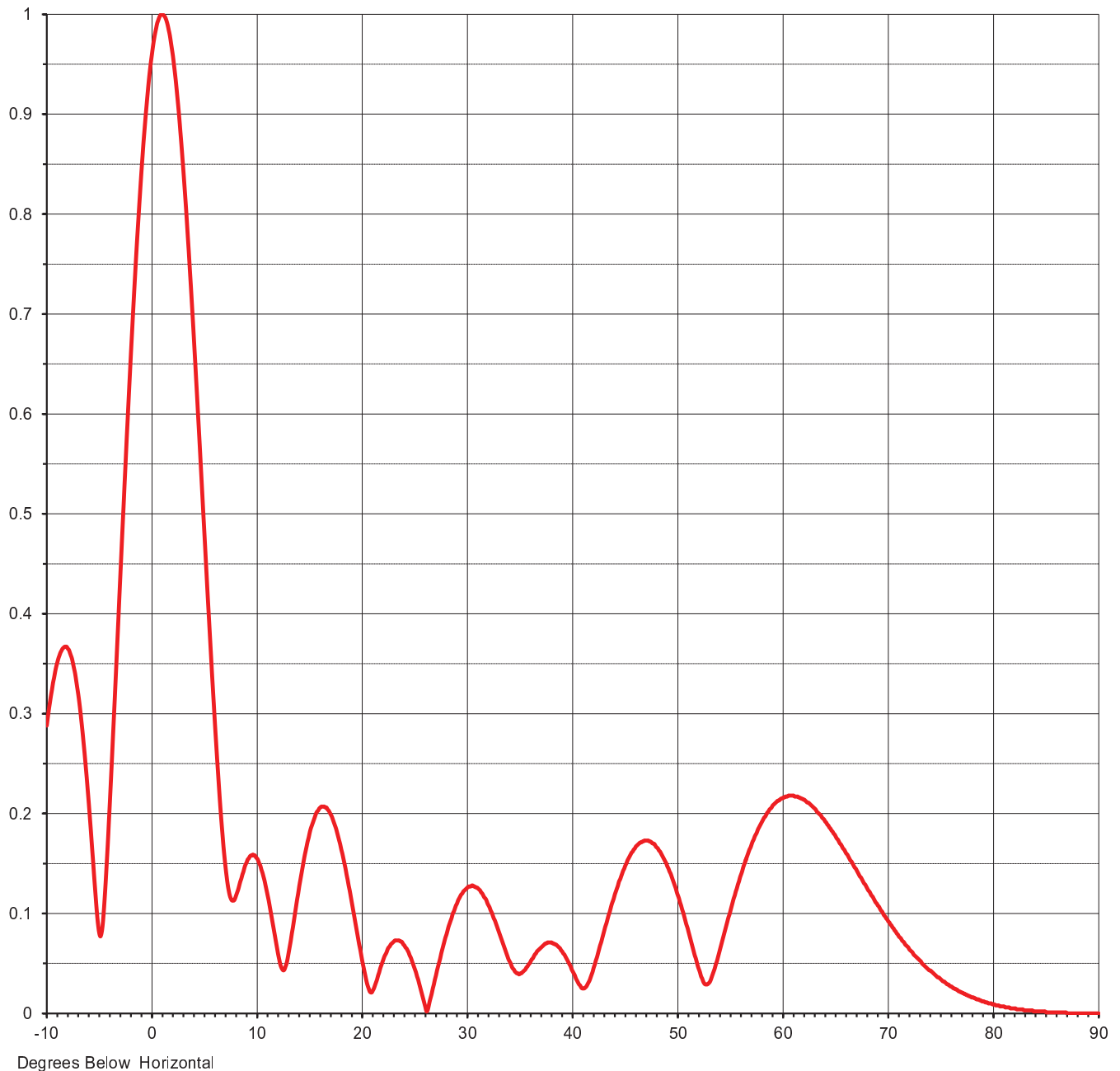
RMS Gain at Horizontal **8.0 (9.03 dB)**

Frequency

605.00 MHz

Calculated / Measured **Calculated**

Drawing #

04C087100-90




Proposal Number

Date **20-May-14**

Call Letters

Channel **36**

Location

Customer

Antenna Type **TUM-LP-SP4-4/14M-1**

TABULATION OF ELEVATION PATTERN

Elevation Pattern Drawing #: **04C087100-90**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.288	2.4	0.919	10.6	0.141	30.5	0.128	51.0	0.086	71.5	0.071
-9.5	0.324	2.6	0.896	10.8	0.133	31.0	0.126	51.5	0.066	72.0	0.064
-9.0	0.351	2.8	0.870	11.0	0.123	31.5	0.120	52.0	0.047	72.5	0.058
-8.5	0.365	3.0	0.842	11.5	0.095	32.0	0.110	52.5	0.032	73.0	0.053
-8.0	0.365	3.2	0.812	12.0	0.065	32.5	0.098	53.0	0.030	73.5	0.047
-7.5	0.350	3.4	0.779	12.5	0.044	33.0	0.084	53.5	0.042	74.0	0.043
-7.0	0.319	3.6	0.745	13.0	0.055	33.5	0.069	54.0	0.060	74.5	0.038
-6.5	0.271	3.8	0.710	13.5	0.086	34.0	0.054	54.5	0.080	75.0	0.034
-6.0	0.210	4.0	0.673	14.0	0.120	34.5	0.044	55.0	0.099	75.5	0.030
-5.5	0.138	4.2	0.635	14.5	0.151	35.0	0.039	55.5	0.118	76.0	0.027
-5.0	0.080	4.4	0.596	15.0	0.176	35.5	0.043	56.0	0.136	76.5	0.024
-4.5	0.114	4.6	0.557	15.5	0.194	36.0	0.050	56.5	0.152	77.0	0.021
-4.0	0.211	4.8	0.517	16.0	0.205	36.5	0.059	57.0	0.166	77.5	0.018
-3.5	0.323	5.0	0.478	16.5	0.207	37.0	0.065	57.5	0.179	78.0	0.016
-3.0	0.439	5.2	0.438	17.0	0.201	37.5	0.070	58.0	0.190	78.5	0.014
-2.8	0.485	5.4	0.399	17.5	0.188	38.0	0.071	58.5	0.199	79.0	0.012
-2.6	0.530	5.6	0.361	18.0	0.169	38.5	0.069	59.0	0.206	79.5	0.010
-2.4	0.575	5.8	0.324	18.5	0.145	39.0	0.063	59.5	0.212	80.0	0.009
-2.2	0.618	6.0	0.288	19.0	0.117	39.5	0.055	60.0	0.215	80.5	0.008
-2.0	0.660	6.2	0.254	19.5	0.087	40.0	0.044	60.5	0.217	81.0	0.007
-1.8	0.700	6.4	0.222	20.0	0.058	40.5	0.033	61.0	0.218	81.5	0.006
-1.6	0.739	6.6	0.193	20.5	0.032	41.0	0.025	61.5	0.217	82.0	0.005
-1.4	0.776	6.8	0.167	21.0	0.021	41.5	0.029	62.0	0.214	82.5	0.004
-1.2	0.810	7.0	0.146	21.5	0.034	42.0	0.042	62.5	0.211	83.0	0.003
-1.0	0.842	7.2	0.129	22.0	0.051	42.5	0.060	63.0	0.206	83.5	0.003
-0.8	0.872	7.4	0.118	22.5	0.064	43.0	0.079	63.5	0.200	84.0	0.002
-0.6	0.898	7.6	0.113	23.0	0.071	43.5	0.098	64.0	0.194	84.5	0.002
-0.4	0.922	7.8	0.113	23.5	0.073	44.0	0.115	64.5	0.185	85.0	0.001
-0.2	0.943	8.0	0.118	24.0	0.069	44.5	0.132	65.0	0.177	85.5	0.001
0.0	0.960	8.2	0.124	24.5	0.061	45.0	0.145	65.5	0.169	86.0	0.001
0.2	0.975	8.4	0.132	25.0	0.047	45.5	0.157	66.0	0.160	86.5	0.001
0.4	0.986	8.6	0.139	25.5	0.030	46.0	0.165	66.5	0.152	87.0	0.000
0.6	0.994	8.8	0.146	26.0	0.010	46.5	0.171	67.0	0.143	87.5	0.000
0.8	0.999	9.0	0.151	26.5	0.012	47.0	0.173	67.5	0.134	88.0	0.000
1.0	1.000	9.2	0.155	27.0	0.034	47.5	0.172	68.0	0.125	88.5	0.000
1.2	0.998	9.4	0.158	27.5	0.055	48.0	0.167	68.5	0.117	89.0	0.000
1.4	0.993	9.6	0.159	28.0	0.076	48.5	0.160	69.0	0.108	89.5	0.000
1.6	0.984	9.8	0.158	28.5	0.093	49.0	0.150	69.5	0.100	90.0	0.000
1.8	0.972	10.0	0.156	29.0	0.108	49.5	0.137	70.0	0.092		
2.0	0.958	10.2	0.153	29.5	0.119	50.0	0.121	70.5	0.085		
2.2	0.940	10.4	0.148	30.0	0.125	50.5	0.104	71.0	0.077		

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ELEVATION PATTERN

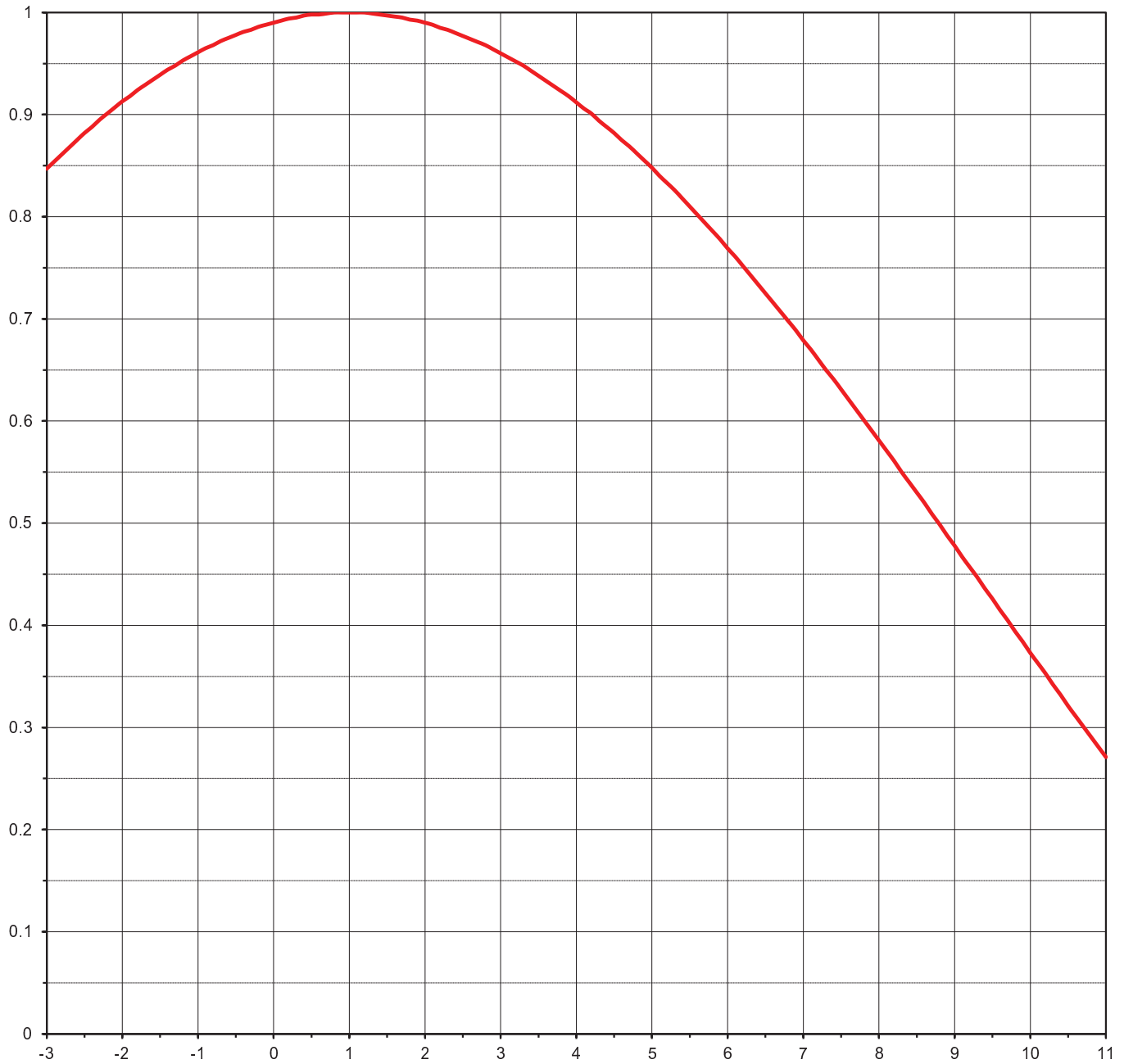
RMS Gain at Main Lobe **4.6 (6.63 dB)**

Beam Tilt **1.00 deg**

RMS Gain at Horizontal **4.5 (6.53 dB)**

Frequency **473.00 MHz**

Calculated / Measured **Calculated**

Drawing # **02C046100**


Degrees Below Horizontal

ELEVATION PATTERN

RMS Gain at Main Lobe **4.6 (6.63 dB)**

Beam Tilt **1.00 deg**

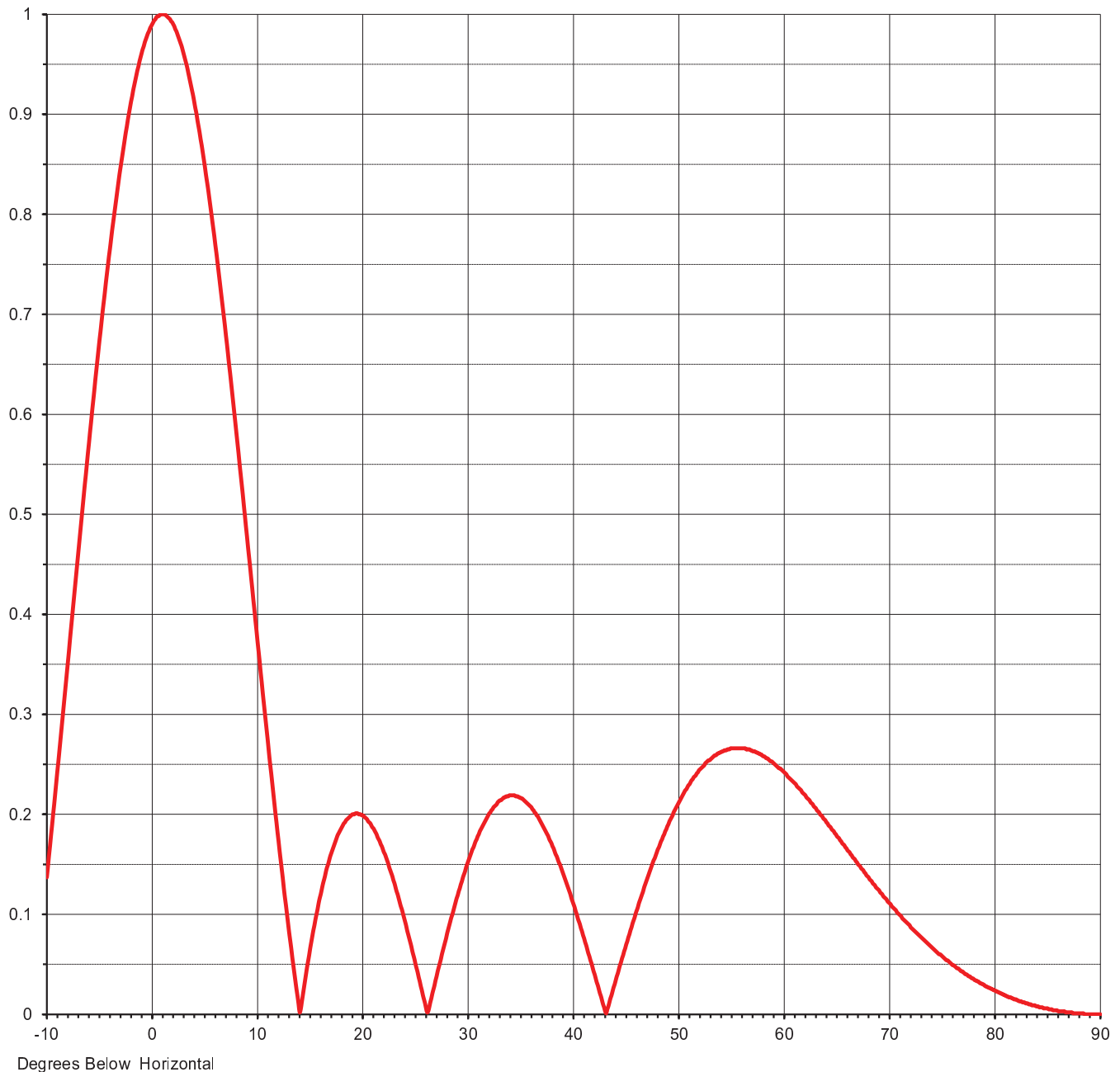
RMS Gain at Horizontal **4.5 (6.53 dB)**

Frequency

473.00 MHz

Calculated / Measured **Calculated**

Drawing #

02C046100-90




Proposal Number

Date **20-May-14**

Call Letters

Channel **36**

Location ,

Customer

Antenna Type **TUM-LP-SP4-4/14M-1**

TABULATION OF ELEVATION PATTERN

Elevation Pattern Drawing #: **02C046100-90**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.137	2.4	0.980	10.6	0.321	30.5	0.165	51.0	0.229	71.5	0.093
-9.5	0.189	2.6	0.974	10.8	0.301	31.0	0.178	51.5	0.237	72.0	0.087
-9.0	0.243	2.8	0.968	11.0	0.281	31.5	0.189	52.0	0.244	72.5	0.082
-8.5	0.297	3.0	0.960	11.5	0.231	32.0	0.199	52.5	0.249	73.0	0.077
-8.0	0.352	3.2	0.952	12.0	0.182	32.5	0.207	53.0	0.254	73.5	0.072
-7.5	0.408	3.4	0.943	12.5	0.136	33.0	0.213	53.5	0.259	74.0	0.067
-7.0	0.463	3.6	0.933	13.0	0.091	33.5	0.217	54.0	0.262	74.5	0.062
-6.5	0.518	3.8	0.923	13.5	0.049	34.0	0.219	54.5	0.264	75.0	0.058
-6.0	0.571	4.0	0.912	14.0	0.010	34.5	0.219	55.0	0.266	75.5	0.054
-5.5	0.623	4.2	0.901	14.5	0.026	35.0	0.217	55.5	0.266	76.0	0.049
-5.0	0.674	4.4	0.888	15.0	0.059	35.5	0.213	56.0	0.266	76.5	0.046
-4.5	0.721	4.6	0.875	15.5	0.089	36.0	0.208	56.5	0.265	77.0	0.042
-4.0	0.766	4.8	0.862	16.0	0.116	36.5	0.201	57.0	0.264	77.5	0.038
-3.5	0.808	5.0	0.848	16.5	0.138	37.0	0.192	57.5	0.262	78.0	0.035
-3.0	0.847	5.2	0.833	17.0	0.158	37.5	0.182	58.0	0.259	78.5	0.032
-2.8	0.861	5.4	0.818	17.5	0.173	38.0	0.171	58.5	0.256	79.0	0.029
-2.6	0.875	5.6	0.802	18.0	0.185	38.5	0.158	59.0	0.252	79.5	0.026
-2.4	0.888	5.8	0.786	18.5	0.194	39.0	0.144	59.5	0.247	80.0	0.024
-2.2	0.901	6.0	0.769	19.0	0.199	39.5	0.129	60.0	0.243	80.5	0.021
-2.0	0.913	6.2	0.752	19.5	0.201	40.0	0.113	60.5	0.237	81.0	0.019
-1.8	0.924	6.4	0.734	20.0	0.199	40.5	0.096	61.0	0.232	81.5	0.017
-1.6	0.934	6.6	0.716	20.5	0.195	41.0	0.079	61.5	0.226	82.0	0.015
-1.4	0.944	6.8	0.698	21.0	0.187	41.5	0.061	62.0	0.220	82.5	0.013
-1.2	0.953	7.0	0.679	21.5	0.177	42.0	0.043	62.5	0.214	83.0	0.011
-1.0	0.961	7.2	0.660	22.0	0.165	42.5	0.025	63.0	0.207	83.5	0.009
-0.8	0.968	7.4	0.641	22.5	0.151	43.0	0.007	63.5	0.200	84.0	0.008
-0.6	0.975	7.6	0.621	23.0	0.134	43.5	0.012	64.0	0.194	84.5	0.007
-0.4	0.981	7.8	0.601	23.5	0.116	44.0	0.030	64.5	0.185	85.0	0.006
-0.2	0.986	8.0	0.581	24.0	0.097	44.5	0.049	65.0	0.178	85.5	0.004
0.0	0.990	8.2	0.561	24.5	0.076	45.0	0.066	65.5	0.171	86.0	0.003
0.2	0.994	8.4	0.540	25.0	0.055	45.5	0.084	66.0	0.164	86.5	0.003
0.4	0.997	8.6	0.520	25.5	0.033	46.0	0.101	66.5	0.157	87.0	0.002
0.6	0.998	8.8	0.499	26.0	0.011	46.5	0.117	67.0	0.150	87.5	0.001
0.8	1.000	9.0	0.478	26.5	0.012	47.0	0.133	67.5	0.144	88.0	0.001
1.0	1.000	9.2	0.457	27.0	0.034	47.5	0.148	68.0	0.137	88.5	0.000
1.2	1.000	9.4	0.436	27.5	0.055	48.0	0.162	68.5	0.130	89.0	0.000
1.4	0.998	9.6	0.415	28.0	0.076	48.5	0.175	69.0	0.124	89.5	0.000
1.6	0.996	9.8	0.405	28.5	0.097	49.0	0.188	69.5	0.117	90.0	0.000
1.8	0.993	10.0	0.384	29.0	0.116	49.5	0.199	70.0	0.111		
2.0	0.990	10.2	0.363	29.5	0.133	50.0	0.210	70.5	0.105		
2.2	0.985	10.4	0.342	30.0	0.150	50.5	0.220	71.0	0.099		

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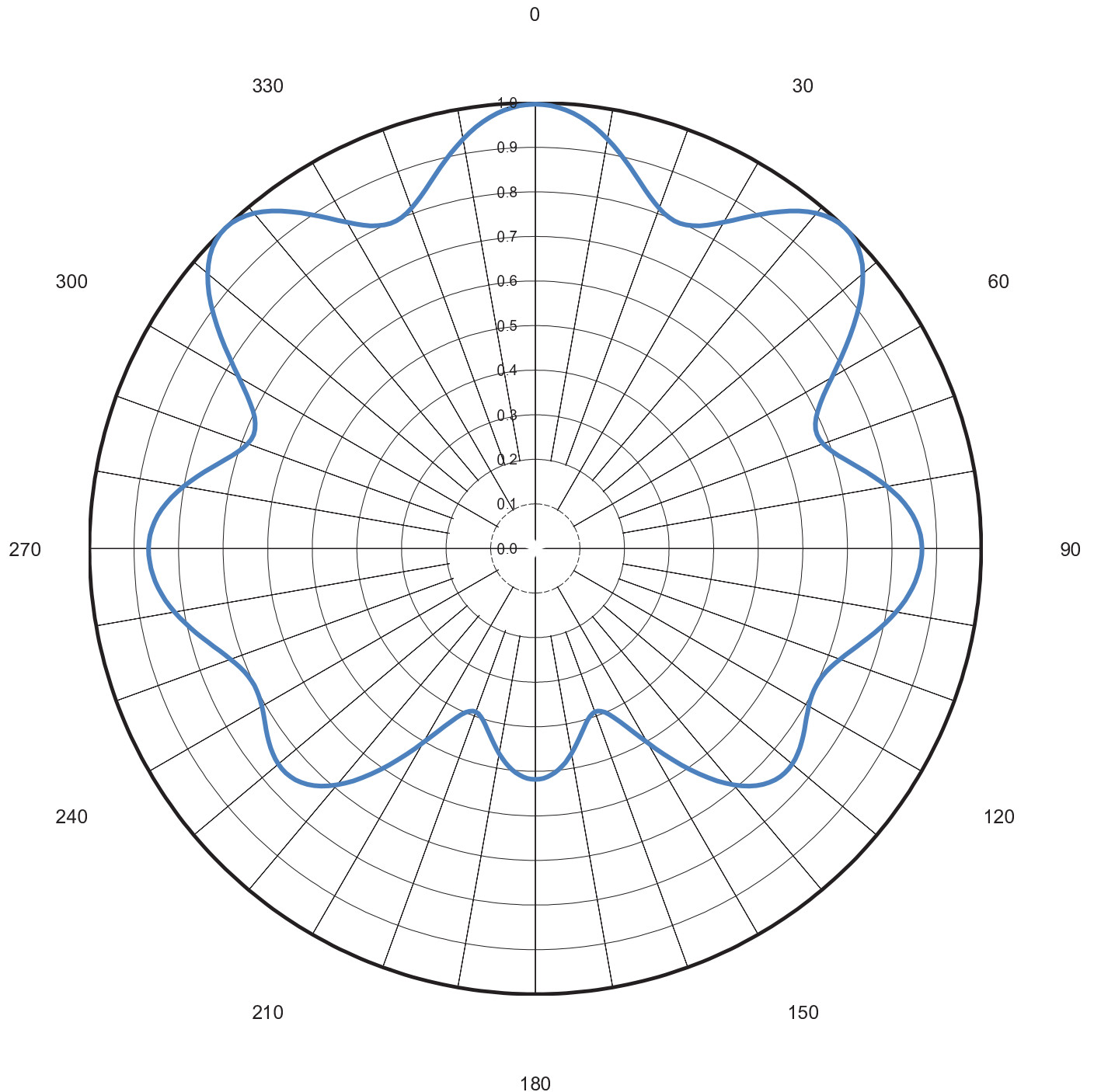
AZIMUTH PATTERN

Gain **1.70**
Calculated / Measured

(2.30 dB)
Calculated

Frequency
Drawing #

605.00 MHz
TUMLP-SP4-6050





Proposal Number

Date

20-May-14

Call Letters

Channel

36

Location

Customer

Antenna Type

TUM-LP-SP4-4/14M-1

TABULATION OF AZIMUTH PATTERNAzimuth Pattern Drawing #: **TUMLP-SP4-6050**

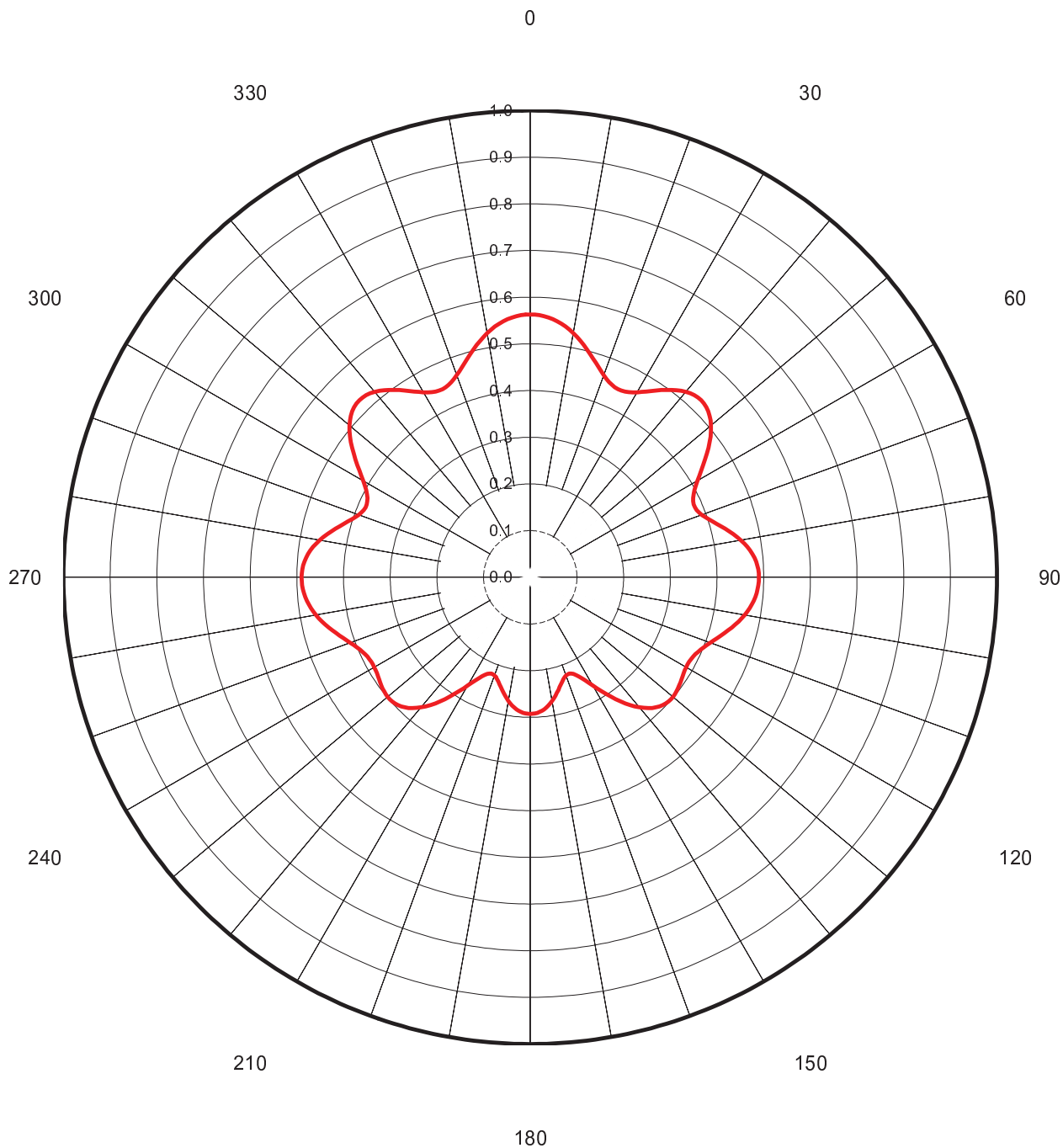
Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.997	45	0.999	90	0.867	135	0.743	180	0.518	225	0.743	270	0.867	315	0.999
1	0.996	46	0.996	91	0.867	136	0.736	181	0.518	226	0.748	271	0.867	316	1.000
2	0.994	47	0.990	92	0.865	137	0.727	182	0.516	227	0.751	272	0.864	317	0.999
3	0.991	48	0.982	93	0.863	138	0.717	183	0.513	228	0.753	273	0.861	318	0.995
4	0.986	49	0.972	94	0.860	139	0.706	184	0.510	229	0.753	274	0.856	319	0.989
5	0.980	50	0.959	95	0.855	140	0.692	185	0.505	230	0.752	275	0.850	320	0.982
6	0.973	51	0.945	96	0.850	141	0.678	186	0.499	231	0.750	276	0.842	321	0.972
7	0.964	52	0.929	97	0.844	142	0.661	187	0.492	232	0.747	277	0.834	322	0.961
8	0.955	53	0.911	98	0.837	143	0.644	188	0.485	233	0.743	278	0.824	323	0.948
9	0.944	54	0.892	99	0.830	144	0.626	189	0.476	234	0.738	279	0.813	324	0.934
10	0.933	55	0.872	100	0.822	145	0.606	190	0.467	235	0.733	280	0.801	325	0.919
11	0.920	56	0.851	101	0.813	146	0.586	191	0.458	236	0.728	281	0.788	326	0.904
12	0.907	57	0.830	102	0.803	147	0.565	192	0.448	237	0.722	282	0.775	327	0.889
13	0.894	58	0.809	103	0.793	148	0.544	193	0.438	238	0.717	283	0.762	328	0.874
14	0.881	59	0.788	104	0.783	149	0.524	194	0.428	239	0.712	284	0.749	329	0.859
15	0.867	60	0.768	105	0.773	150	0.503	195	0.418	240	0.708	285	0.735	330	0.845
16	0.854	61	0.750	106	0.763	151	0.484	196	0.410	241	0.705	286	0.723	331	0.833
17	0.842	62	0.733	107	0.753	152	0.465	197	0.402	242	0.702	287	0.711	332	0.822
18	0.831	63	0.717	108	0.744	153	0.448	198	0.396	243	0.701	288	0.701	333	0.813
19	0.821	64	0.705	109	0.735	154	0.432	199	0.392	244	0.701	289	0.693	334	0.806
20	0.812	65	0.695	110	0.727	155	0.419	200	0.390	245	0.702	290	0.687	335	0.801
21	0.805	66	0.687	111	0.720	156	0.408	201	0.391	246	0.705	291	0.683	336	0.798
22	0.801	67	0.683	112	0.714	157	0.400	202	0.394	247	0.709	292	0.681	337	0.798
23	0.798	68	0.681	113	0.709	158	0.394	203	0.400	248	0.714	293	0.683	338	0.801
24	0.798	69	0.683	114	0.705	159	0.391	204	0.408	249	0.720	294	0.687	339	0.805
25	0.801	70	0.687	115	0.702	160	0.390	205	0.419	250	0.727	295	0.695	340	0.812
26	0.806	71	0.693	116	0.701	161	0.392	206	0.432	251	0.735	296	0.705	341	0.821
27	0.813	72	0.701	117	0.701	162	0.396	207	0.448	252	0.744	297	0.717	342	0.831
28	0.822	73	0.711	118	0.702	163	0.402	208	0.465	253	0.753	298	0.733	343	0.842
29	0.833	74	0.723	119	0.705	164	0.410	209	0.484	254	0.763	299	0.750	344	0.854
30	0.845	75	0.735	120	0.708	165	0.418	210	0.503	255	0.773	300	0.768	345	0.867
31	0.859	76	0.749	121	0.712	166	0.428	211	0.524	256	0.783	301	0.788	346	0.881
32	0.874	77	0.762	122	0.717	167	0.438	212	0.544	257	0.793	302	0.809	347	0.894
33	0.889	78	0.775	123	0.722	168	0.448	213	0.565	258	0.803	303	0.830	348	0.907
34	0.904	79	0.788	124	0.728	169	0.458	214	0.586	259	0.813	304	0.851	349	0.920
35	0.919	80	0.801	125	0.733	170	0.467	215	0.606	260	0.822	305	0.872	350	0.933
36	0.934	81	0.813	126	0.738	171	0.476	216	0.626	261	0.830	306	0.892	351	0.944
37	0.948	82	0.824	127	0.743	172	0.485	217	0.644	262	0.837	307	0.911	352	0.955
38	0.961	83	0.834	128	0.747	173	0.492	218	0.661	263	0.844	308	0.929	353	0.964
39	0.972	84	0.842	129	0.750	174	0.499	219	0.678	264	0.850	309	0.945	354	0.973
40	0.982	85	0.850	130	0.752	175	0.505	220	0.692	265	0.855	310	0.959	355	0.980
41	0.989	86	0.856	131	0.753	176	0.510	221	0.706	266	0.860	311	0.972	356	0.986
42	0.995	87	0.861	132	0.753	177	0.513	222	0.717	267	0.863	312	0.982	357	0.991
43	0.999	88	0.864	133	0.751	178	0.516	223	0.727	268	0.865	313	0.990	358	0.994
44	1.000	89	0.867	134	0.748	179	0.518	224	0.736	269	0.867	314	0.996	359	0.996

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AZIMUTH PATTERN/VERTICAL POLARIZATION

Gain **1.77** **(2.48 dB)**
 Calculated / Measured **Calculated**

Frequency **605.00 MHz**
 Drawing # **TUMLP-SP4V-6050**



TABULATION OF AZIMUTH PATTERN/VERTICAL POLARIZATION

Azimuth Pattern Drawing #: **TUMLP-SP4V-6050**

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.563	45	0.526	90	0.490	135	0.391	180	0.293	225	0.391	270	0.490	315	0.526
1	0.563	46	0.525	91	0.490	136	0.387	181	0.293	226	0.394	271	0.490	316	0.527
2	0.562	47	0.521	92	0.489	137	0.383	182	0.292	227	0.397	272	0.489	317	0.527
3	0.560	48	0.517	93	0.488	138	0.377	183	0.291	228	0.398	273	0.487	318	0.525
4	0.558	49	0.512	94	0.486	139	0.371	184	0.289	229	0.399	274	0.485	319	0.522
5	0.555	50	0.506	95	0.484	140	0.364	185	0.287	230	0.399	275	0.482	320	0.519
6	0.552	51	0.498	96	0.481	141	0.356	186	0.284	231	0.398	276	0.479	321	0.514
7	0.548	52	0.490	97	0.478	142	0.347	187	0.281	232	0.397	277	0.474	322	0.509
8	0.543	53	0.481	98	0.475	143	0.338	188	0.278	233	0.396	278	0.470	323	0.503
9	0.537	54	0.472	99	0.471	144	0.329	189	0.274	234	0.394	279	0.464	324	0.496
10	0.531	55	0.462	100	0.466	145	0.319	190	0.269	235	0.393	280	0.458	325	0.490
11	0.525	56	0.452	101	0.461	146	0.308	191	0.264	236	0.391	281	0.452	326	0.483
12	0.518	57	0.442	102	0.456	147	0.298	192	0.259	237	0.389	282	0.445	327	0.476
13	0.511	58	0.432	103	0.451	148	0.288	193	0.254	238	0.388	283	0.437	328	0.469
14	0.503	59	0.422	104	0.445	149	0.277	194	0.249	239	0.386	284	0.430	329	0.463
15	0.495	60	0.413	105	0.439	150	0.268	195	0.243	240	0.386	285	0.423	330	0.458
16	0.488	61	0.405	106	0.433	151	0.258	196	0.238	241	0.385	286	0.415	331	0.453
17	0.480	62	0.398	107	0.427	152	0.250	197	0.234	242	0.386	287	0.408	332	0.449
18	0.473	63	0.393	108	0.421	153	0.242	198	0.230	243	0.386	288	0.402	333	0.447
19	0.467	64	0.388	109	0.416	154	0.236	199	0.226	244	0.388	289	0.396	334	0.445
20	0.461	65	0.385	110	0.410	155	0.231	200	0.224	245	0.390	290	0.391	335	0.445
21	0.455	66	0.383	111	0.405	156	0.227	201	0.223	246	0.393	291	0.387	336	0.446
22	0.451	67	0.383	112	0.401	157	0.224	202	0.223	247	0.397	292	0.385	337	0.448
23	0.448	68	0.385	113	0.397	158	0.223	203	0.224	248	0.401	293	0.383	338	0.451
24	0.446	69	0.387	114	0.393	159	0.223	204	0.227	249	0.405	294	0.383	339	0.455
25	0.445	70	0.391	115	0.390	160	0.224	205	0.231	250	0.410	295	0.385	340	0.461
26	0.445	71	0.396	116	0.388	161	0.226	206	0.236	251	0.416	296	0.388	341	0.467
27	0.447	72	0.402	117	0.386	162	0.230	207	0.242	252	0.421	297	0.393	342	0.473
28	0.449	73	0.408	118	0.386	163	0.234	208	0.250	253	0.427	298	0.398	343	0.480
29	0.453	74	0.415	119	0.385	164	0.238	209	0.258	254	0.433	299	0.405	344	0.488
30	0.458	75	0.423	120	0.386	165	0.243	210	0.268	255	0.439	300	0.413	345	0.495
31	0.463	76	0.430	121	0.386	166	0.249	211	0.277	256	0.445	301	0.422	346	0.503
32	0.469	77	0.437	122	0.388	167	0.254	212	0.288	257	0.451	302	0.432	347	0.511
33	0.476	78	0.445	123	0.389	168	0.259	213	0.298	258	0.456	303	0.442	348	0.518
34	0.483	79	0.452	124	0.391	169	0.264	214	0.308	259	0.461	304	0.452	349	0.525
35	0.490	80	0.458	125	0.393	170	0.269	215	0.319	260	0.466	305	0.462	350	0.531
36	0.496	81	0.464	126	0.394	171	0.274	216	0.329	261	0.471	306	0.472	351	0.537
37	0.503	82	0.470	127	0.396	172	0.278	217	0.338	262	0.475	307	0.481	352	0.543
38	0.509	83	0.474	128	0.397	173	0.281	218	0.347	263	0.478	308	0.490	353	0.548
39	0.514	84	0.479	129	0.398	174	0.284	219	0.356	264	0.481	309	0.498	354	0.552
40	0.519	85	0.482	130	0.399	175	0.287	220	0.364	265	0.484	310	0.506	355	0.555
41	0.522	86	0.485	131	0.399	176	0.289	221	0.371	266	0.486	311	0.512	356	0.558
42	0.525	87	0.487	132	0.398	177	0.291	222	0.377	267	0.488	312	0.517	357	0.560
43	0.527	88	0.489	133	0.397	178	0.292	223	0.383	268	0.489	313	0.521	358	0.562
44	0.527	89	0.490	134	0.394	179	0.293	224	0.387	269	0.490	314	0.525	359	0.563