

**DIRECTIONAL ANTENNA
PARTIAL PROOF-OF-PERFORMANCE
KCTE 1510 kHz 10 kW DA-D
INDEPENDENCE, MISSOURI**

**OCTOBER 2002
DIRECTIONAL ANTENNA**

COMMUNICATIONS TECHNOLOGIES, INC. - BROADCAST ENGINEERING CONSULTANTS

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KCTE 1510 kHz 10 kW DA-D
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SUMMARY

The following engineering statement has been prepared on behalf of **American Tower Corporation ("ATC")**, Dedham, Massachusetts, in reference to an **American Tower** structure on East Truman Road in Independence, Missouri, having an overall height AGL of 356 meters and carrying FCC Tower Registration Number 1211744. The ATC tower is located 2.9 km from the licensed site of KCTE-AM, Independence, Missouri at a bearing of 319 degrees from the KCTE array. This statement presents the results of field strength readings taken before and after the ATC tower was constructed and populated with antennas and feedlines.

NEC ANALYSIS

Prior to construction of the ATC tower, an analysis of the likely impact to the KCTE directional pattern was conducted by Professor Al Christman at the request of the affiant. The NEC analysis showed little, if any, impact on the KCTE antenna pattern null structure. Some standing wave northwest of the KCTE array, in the major lobe of radiation, was detected due to proximity of the tower. The NEC analysis suggested that the proposed ATC tower would not have a detrimental impact on the KCTE pattern.

PARTIAL PROOF-OF-PERFORMANCE

Field intensity measurements, both before and after the ATC tower was constructed, were made by Ron Krob of Fort Collins, Colorado under the direction of this office. Mr. Krob used a Potomac Instruments field intensity meter, Serial No. 495. The meter calibration is regularly checked against other meters and was last calibrated by the manufacturer on November 8, 1988 and again on August 30, 2000. A two year passage of time between the before and after measurements is clearly not desirable. However, the length of time required to construct the tower and mount associated antenna and feedlines, followed by delays associated with a malfunctioning transmitter at KCTE, conspired to yield the time difference seen here.

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KCTE before and after array parameters are as follows:

		<u>June 2000</u>	<u>October 2002</u>
BE10A transmitter power		10.7 kW	10.7 kW
Delta CP Ammeter		14.6 Amps	14.6 Amps
Phasor setting	Input X	090	090
	Input R	039	039
	Phase 1	047	047
	Power 2	122	122
	Phase 2	080	080

AM-19 (204) phase monitor

Tower # 1	100 0°	100 0°
Tower # 2	75.6 - 35°	74 -26°

Before and after tower construction, partial proof-of-performance measurements were made on the ten radials found in the May, 1983 last full proof-of-performance, BL-19830405AB. Table I includes the measurement data and is summarized below:

<u>Azimuth Bearing</u>	<u>October 2002 Ratio To June 2000</u>	<u>October 2002 to 1983</u>	<u>Inverse Field</u>	<u>mV/m Standard Pattern Maximum</u>
5°	1.1361	0.7619	1,108	1,463
45°	1.4810	0.8202	726	909
83.5°	1.7353	0.7208	151	212
108°	0.9416	0.5872	163	284
132.5°	1.7206	0.3993	84	212
165°	1.4378	0.7775	568	757
205°	1.3564	0.6716	970	1,461
243°	1.3936	0.6746	706	1,076
288°	1.0210	0.9070	531	594
323°	1.1094	0.6103	529	907

Increasing the phase of Tower #2 by plus 9 degrees modifies the standard pattern field intensity. The changes in pattern magnitude at the eight measured radials track the ratio of before to after partial proof values.

Azimuth Bearing	mV/m Field @ 1 km		Ratio of 2002 to 2000	Partial Normalized to RMS	Ratio of Standard to #2 + 9°
	KCTE Standard Pattern	# 2 + 9° Phase			
5°	1,463	1,456	1.1361	.852	0.995
45°	909	997	1.4810	1.110	1.097
83.5°	212	240	1.7353	1.30	1.132
108°	284	226	0.9416	.706	0.796
132.5°	212	240	1.7206	1.291	1.132
165°	757	852	1.4378	1.078	1.126
205°	1,461	1,470	1.3564	1.017	1.006
243°	1,076	999	1.3936	1.045	0.928
288°	594	497	1.0210	0.766	0.837
323°	907	818	1.1094	0.832	0.902

CONCLUSION

Taking the after measurements in October rather than June would be expected to result in ratios greater than 1.0 due to higher fall soil conductivity with associated greater field strengths. The 2002 to 2000 ratios were added, averaged, and found to equal 1.333. Correcting the 2002 to 2000 ratios by a factor of times 0.75 shows a realistic ratio of 2002 to 2000 values adjusted for seasonal changes. Comparing the corrected before and after ratios, to the ratios associated with the standard pattern as adjusted to licensed standard pattern, yields reasonable correlation of before and after measurement data.

Based on the data submitted herein, it is concluded that, 1) the current array adjustment does not exceed standard pattern limits and, 2) the ATC tower has had no detrimental impact on the KCTE pattern shape.

TABLE I
BEFORE AND AFTER
PARTIAL PROOF-OF-PERFORMANCE
KCTE 1510 kHz 10 kW DA-D
INDEPENDENCE, MISSOURI

OCTOBER 2002

KCTE Radial 005.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
11	1.82	27 Jun	1302	242.0	15 Oct	1545	250.0	390	0.6205	0.6410	1.0331
13	2.18	27 Jun	1309	168.0	15 Oct	1543	260.0	270	0.6222	0.9630	1.5476
15	2.68	27 Jun	1313	111.0	15 Oct	1529	142.0	180	0.6167	0.7889	1.2793
16	2.84	27 Jun	1315	95.0	15 Oct	1532	68.0	67	1.4179	1.0149	0.7158
17	3.17	27 Jun	1318	95.0	15 Oct	1534	105.0	142	0.6690	0.7394	1.1053
18	3.39	27 Jun	1320	90.0	15 Oct	1536	95.0	108	0.8333	0.8796	1.0556
20	5.00	27 Jun	1033	58.2	15 Oct	1359	60.0	74.4	0.7823	0.8065	1.0309
21	5.80	27 Jun	1044	52.0	15 Oct	1406	49.0	81.7	0.6365	0.5998	0.9423
22	6.55	27 Jun	1051	29.0	15 Oct	1409	51.0	67.0	0.4328	0.7612	1.7586
25	11.48	27 Jun	1110	10.2	15 Oct	1421	12.8	24.5	0.4163	0.5224	1.2549
26	13.05	27 Jun	1121	11.5	15 Oct	1431	8.9	13.4	0.8582	0.6642	0.7739

Arithmetic averages: 0.7187 0.7619 1.1361

KCTE Radial 045.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
14	1.85	27 Jun	1254	144.0	14 Oct	1137	252.00	195	0.7385	1.2923	1.7500
15	2.30	27 Jun	1252	119.0	14 Oct	1142	141.00	190	0.6263	0.7421	1.1849
16	2.58	27 Jun	1247	59.0	14 Oct	1145	120.00	128	0.4609	0.9375	2.0339
17	2.92	27 Jun	1243	56.0	14 Oct	1150	106.00	98	0.5714	1.0816	1.8929
18	3.52	27 Jun	1237	57.0	14 Oct	1155	57.00	71	0.8028	0.8028	1.0000
19	4.08	27 Jun	1234	41.0	14 Oct	1159	65.00	44	0.9318	1.4773	1.5854
20	4.50	27 Jun	1142	40.0	14 Oct	1203	54.00	180	0.2222	0.3000	1.3500
23	6.30	27 Jun	1540	18.1	14 Oct	1213	26.00	42	0.4310	0.6190	1.4365
24	7.65	27 Jun	1554	9.9	14 Oct	1222	16.20	30.2	0.3278	0.5364	1.6364
25	9.08	27 Jun	1601	7.3	14 Oct	1228	9.20	15.5	0.4710	0.5935	1.2603
26	11.22	27 Jun	1606	8.1	14 Oct	1232	9.40	14.7	0.5510	0.6395	1.1605

Arithmetic averages: 0.5577 0.8202 1.4810

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KCTE Radial 083.5 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
10	1.08 MP	27 Jun	1725	94.0	14 Oct	1337	104.0	105.0	0.8952	0.9905	1.1064
18	2.00	27 Jun	1715	22.7	14 Oct	1327	46.0	46.0	0.4935	1.0000	2.0264
19	2.26	27 Jun	1713	8.9	14 Oct	1323	21.0	39.0	0.2282	0.5385	2.3596
20	2.50	27 Jun	1710	12.0	14 Oct	1320	25.0	36.0	0.3333	0.6944	2.0833
21	2.79	27 Jun	1705	12.1	14 Oct	1317	26.5	31.0	0.3903	0.8548	2.1901
22	3.18	27 Jun	1700	13.8	14 Oct	1314	18.0	24.0	0.5750	0.7500	1.3043
23	3.48	27 Jun	1652	9.7	14 Oct	1312	10.3	21.0	0.4619	0.4905	1.0619
24	3.81	27 Jun	1641	10.0	14 Oct	1305	16.8	26.0	0.3846	0.6462	1.6800
26	4.34	27 Jun	1634	5.1	14 Oct	1259	12.0	16.7	0.3054	0.7186	2.3529
27	4.70	27 Jun	1632	5.55	14 Oct	1256	10.6	16.1	0.3447	0.6584	1.9099
29	5.75	27 Jun	1626	7.3	14 Oct	1251	7.4	12.6	0.5794	0.5873	1.0137

Arithmetic averages: 0.4538 0.7208 1.7353

KCTE Radial 108.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
18	1.97	26 Jun	1416	50.00	14 Oct	1347	31.0	64.00	0.7813	0.4844	0.6200
19	2.25	26 Jun	1426	37.00	14 Oct	1350	35.0	56.00	0.6607	0.6250	0.9459
20	2.45	26 Jun	1429	26.50	14 Oct	1354	31.5	51.50	0.5146	0.6117	1.1887
23	3.60	26 Jun	1504	23.00	14 Oct	1358	15.3	31.50	0.7302	0.4857	0.6652
24	3.85	26 Jun	1502	18.30	14 Oct	1403	14.0	33.50	0.5463	0.4179	0.7650
25	4.34	26 Jun	1511	16.20	14 Oct	1407	15.0	27.10	0.5978	0.5535	0.9259
27	4.92	26 Jun	1520	13.90	14 Oct	1414	12.0	14.90	0.9329	0.8054	0.8633
28	5.28	26 Jun	1528	10.00	14 Oct	1417	12.2	15.80	0.6329	0.7722	1.2200
30	6.13	26 Jun	1532	9.50	14 Oct	1421	7.4	14.00	0.6786	0.5286	0.7789
32	9.28	26 Jun	1551	3.05	14 Oct	1431	4.4	7.48	0.4078	0.5882	1.4426

Arithmetic averages: 0.6483 0.5872 0.9416

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KCTE Radial 132.5 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
15	1.67 MP	26 Jun	830	29.00	14 Oct	1449	34.00	58.0	0.5000	0.5862	1.1724
19	2.06	26 Jun	836	12.40	14 Oct	1453	18.20	51.0	0.2431	0.3569	1.4677
20	2.29	26 Jun	840	6.20	14 Oct	1457	8.90	42.0	0.1476	0.2119	1.4355
21	2.96	26 Jun	845	7.70	14 Oct	1503	16.00	28.0	0.2750	0.5714	2.0779
22	3.40	26 Jun	849	8.00	14 Oct	1507	10.60	28.0	0.2857	0.3786	1.3250
23	3.70	26 Jun	851	7.20	14 Oct	1509	9.80	18.8	0.3830	0.5213	1.3611
25	4.48	26 Jun	855	1.30	14 Oct	1514	3.40	10.5	0.1238	0.3238	2.6154
27	5.70	26 Jun	909	6.30	14 Oct	1519	5.80	9.6	0.6563	0.6042	0.9206
29	6.83	26 Jun	915	1.20	14 Oct	1524	2.65	8.5	0.1412	0.3118	2.2083
30	8.50	26 Jun	921	0.29	14 Oct	1532	0.74	5.3	0.0547	0.1396	2.5517
31	9.83	26 Jun	945	0.67	14 Oct	1552	1.20	3.1	0.2161	0.3871	1.7910

Arithmetic averages: 0.2751 0.3993 1.7206

KCTE Radial 165.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
18	2.68	26 Jun	1128	70.0	15 Oct	930	99.0	115	0.6087	0.8609	1.4143
19	3.00	26 Jun	1124	44.0	15 Oct	924	88.0	65	0.6769	1.3538	2.0000
20	3.27	26 Jun	1120	38.5	15 Oct	920	56.0	88	0.4375	0.6364	1.4545
21	3.50	26 Jun	1117	38.0	15 Oct	916	52.0	75	0.5067	0.6933	1.3684
22	3.92	26 Jun	1114	33.0	15 Oct	914	48.0	57	0.5789	0.8421	1.4545
23	4.34	26 Jun	1110	25.8	15 Oct	908	42.5	60	0.4300	0.7083	1.6473
24	4.77	26 Jun	1108	26.0	14 Oct	1646	39.0	54	0.4815	0.7222	1.5000
25	5.18	26 Jun	1051	12.6	14 Oct	1643	19.5	29	0.4345	0.6724	1.5476
26	5.40	26 Jun	1058	16.5	14 Oct	1637	21.0	38	0.4342	0.5526	1.2727
27	5.90	26 Jun	1046	17.0	14 Oct	1631	15.4	14	1.2143	1.1000	0.9059
29	7.76	26 Jun	1018	9.2	14 Oct	1622	11.5	28	0.3286	0.4107	1.2500

Arithmetic averages: 0.5574 0.7775 1.4378

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KCTE Radial 205.0 Degrees

<u>1983</u> <u>point</u>	<u>distance</u> <u>miles</u>	<u>Before - 2000</u>			<u>After - 2002</u>			<u>mv/m</u> <u>1983</u>	<u>ratio</u> <u>6/00</u>	<u>ratio</u> <u>after</u>	<u>after/</u> <u>before</u>
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
16	1.84	26 Jun	1139	142.0	15 Oct	942	240	245	0.5796	0.9796	1.6901
19	2.68	26 Jun	1144	94.0	15 Oct	947	85	165	0.5697	0.5152	0.9043
21	3.32	26 Jun	1148	100.0	15 Oct	951	72	160	0.6250	0.4500	0.7200
22	3.73	26 Jun	1153	77.0	15 Oct	956	112	110	0.7000	1.0182	1.4545
24	4.37	26 Jun	1158	36.0	15 Oct	1001	73	99	0.3636	0.7374	2.0278
25	4.68	26 Jun	1201	42.0	15 Oct	1004	51	83	0.5060	0.6145	1.2143
26	5.08	26 Jun	1207	32.5	15 Oct	1009	44	88	0.3693	0.5000	1.3538
27	5.42	26 Jun	1210	30.8	15 Oct	1011	35	47	0.6553	0.7447	1.1364
28	5.77	26 Jun	1215	23.8	15 Oct	1014	41	47	0.5064	0.8723	1.7227
29	6.10	26 Jun	1218	20.1	15 Oct	1017	31	54	0.3722	0.5741	1.5423
31	6.92	26 Jun	1226	18.2	15 Oct	1023	21	55	0.3309	0.3818	1.1538

Arithmetic averages: 0.5071 0.6716 1.3564

KCTE Radial 243.0 Degrees

<u>1983</u> <u>point</u>	<u>distance</u> <u>miles</u>	<u>Before - 2002</u>			<u>After - 2002</u>			<u>mv/m</u> <u>1983</u>	<u>ratio</u> <u>6/00</u>	<u>ratio</u> <u>after</u>	<u>after/</u> <u>before</u>
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
15	1.80	26 Jun	1359	159.00	15 Oct	1144	150.0	265	0.6000	0.5660	0.9434
17	2.42	26 Jun	1355	107.00	15 Oct	1141	145.0	195	0.5487	0.7436	1.3551
18	2.90	26 Jun	1350	50.00	15 Oct	1137	69.0	155	0.3226	0.4452	1.3800
23	4.74	26 Jun	1332	39.50	15 Oct	1124	53.0	85	0.4647	0.6235	1.3418
24	5.12	26 Jun	1326	40.50	15 Oct	1119	52.0	56	0.7232	0.9286	1.2840
25	5.40	26 Jun	1322	36.50	15 Oct	1116	48.0	95	0.3842	0.5053	1.3151
26	5.68	26 Jun	1319	35.00	15 Oct	1113	49.0	50	0.7000	0.9800	1.4000
27	6.00	26 Jun	1315	23.00	15 Oct	1110	34.0	40	0.5750	0.8500	1.4783
28	7.18	26 Jun	1306	15.10	15 Oct	1105	29.0	35	0.4314	0.8286	1.9205
29	8.42	26 Jun	1258	8.90	15 Oct	1056	12.1	22	0.4045	0.5500	1.3596
30	10.10	26 Jun	1247	3.35	15 Oct	1049	5.2	13	0.2577	0.4000	1.5522

Arithmetic averages: 0.4920 0.6746 1.3936

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KCTE Radial 288.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
10	1.22 MP	27 Jun	808	238.00	15 Oct	1153	211.0	275.0	0.8655	0.7673	0.8866
18	2.38	27 Jun	819	100.00	15 Oct	1210	88.0	98.0	1.0204	0.8980	0.8800
19	3.06	27 Jun	827	67.00	15 Oct	1215	67.0	80.0	0.8375	0.8375	1.0000
20	3.70	27 Jun	831	77.00	15 Oct	1220	45.0	59.0	1.3051	0.7627	0.5844
21	3.98	27 Jun	837	41.50	15 Oct	1224	45.0	41.0	1.0122	1.0976	1.0843
22	4.37	27 Jun	841	19.30	15 Oct	1227	21.0	32.0	0.6031	0.6563	1.0881
23	4.74	27 Jun	845	28.50	15 Oct	1230	13.5	39.0	0.7308	0.3462	0.4737
24	5.13	27 Jun	849	25.10	15 Oct	1234	34.0	17.0	1.4765	2.0000	1.3546
25	5.53	27 Jun	853	25.80	15 Oct	1238	28.0	21.0	1.2286		
26	5.90	27 Jun	859	12.40	15 Oct	1240	15.0	24.0	0.5167	0.6250	1.2097
28	7.16	27 Jun	907	10.10	15 Oct	1249	16.0	24.5	0.4122	0.6531	1.5842

Arithmetic averages: 0.9099 0.9070 1.0210

KCTE Radial 323.0 Degrees

1983 point	distance miles	<u>Before - 2000</u>			<u>After - 2002</u>			mv/m 1983	ratio 6/00	ratio after	after/ before
		<u>date</u>	<u>time</u>	<u>mv/m</u>	<u>date</u>	<u>time</u>	<u>mv/m</u>				
20	2.01	27 Jun	1330	81.00	15 Oct	1504	140.0	143.0	0.5664	0.9790	1.7284
21	2.49	27 Jun	1459	77.00	15 Oct	1512	68.0	110.0	0.7000	0.6182	0.8831
22	2.90	27 Jun	1455	41.50	15 Oct	1515	42.0	92.0	0.4511	0.4565	1.0120
23	3.31	27 Jun	1451	29.50	15 Oct	1519	17.0	80.0	0.3688	0.2125	0.5763
27	5.70	27 Jun	1440	19.00	15 Oct	1447	16.2	30.0	0.6333	0.5400	0.8526
28	6.20	27 Jun	1436	16.50	15 Oct	1451	23.0	19.0	0.8684	1.2105	1.3939
29	7.88	27 Jun	1006	10.60	15 Oct	1344	8.0	17.0	0.6235	0.4706	0.7547
30	9.52	27 Jun	958	6.30	15 Oct	1336	6.4	14.0	0.4500	0.4571	1.0159
31	11.37	27 Jun	949	4.60	15 Oct	1325	4.1	4.8	0.9583	0.8542	0.8913
32	12.60	27 Jun	938	3.64	15 Oct	1319	3.7	7.1	0.5127	0.5211	1.0165
33	13.84	27 Jun	925	0.89	15 Oct	1313	1.85	4.7	0.1894	0.3936	2.0787

Arithmetic averages: 0.5747 0.6103 1.1094

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