Environmental Considerations
KMEX License Partnership G.P.
KMEX-DT Los Angeles, CA
Ch 34 255 kW-DA (Aux) 956 m

KMEX-DT operates from the Mt. Wilson antenna farm above Pasadena, also used by most FM and television stations serving the Los Angeles basin. The station's antenna support tower also hosts the antenna "sister" station KFTR-DT. Appropriate radiofrequency radiation (RFR) advisory and/or warning signs are posted. Access to the site and tower is restricted to authorized personnel by fencing. The station will reduce power or cease operation as may be necessary to ensure the safety of personnel working on its tower and/or the several adjacent towers.

"As-built" antenna elevation radiation data were provided by the manufacturer to a depression angle of 10 degrees and are not readily available for greater angles. The theoretical downward radiation, from 60 to 90 downward degrees, of the Andrew ATW22HS8-ETC2L-34H antenna, proposed for auxiliary service, does not exceed that of the Andrew ATW22HS6-ETC2L-34H main antenna (pattern data attached). Their radiation center elevations above ground are identical. In 2011, Hatfield & Dawson prepared a comprehensive study of RFR levels at areas accessible to the general public on Mt. Wilson, attached hereto. Given that the theoretical downward radiation of the main and auxiliary antennas is similar, the result of the Hatfield & Dawson survey is valid for use of the proposed auxiliary antenna.

The theoretical maximum elevation radiation values for the proposed antenna, at depression angles from 60 to 90 degrees, are 0.064 for horizontal polarization and 0.081 for vertical polarization. The vertically-polarized ERP is 20% of the horizontally-polarized ERP. The antenna radiation center is 98 m above ground level. Therefore, the worst-case predicted radiofrequency energy level at 2 m above ground is 5 $\mu W/cm^2$, 1.3% of the relevant protection guideline value for uncontrolled areas. The elevation radiation values would need to double for the 5% "responsibility" threshold to be exceeded, which is highly unlikely.

RF energy levels were surveyed within the KFTR-DT and KMEX-DT leasehold in July 2014 and reported in the station's license renewal application (BRCDT-20140801AIT). At no location regularly accessed by station and contractor personnel did the measured RF energy level exceed the guideline value for uncontrolled environments, when spatially averaged. At the bottom of the tower climbing ladder, the measured energy level exceeded the guideline value for uncontrolled environments but was below that specified for controlled environments.

19 September 2016

Karl D. Lahm, P.E.
California Registration #E10307
Director, RF Systems Engineering
Univision Management Co.

TABULATED DATA FOR ELEVATION PATTERN

Type: ATW25H6H
PolarizationHorizontal

ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB
5.00	0.052	-25.68	-6.75	0.194	-14.24	-27.00	0.042	-27.43	-50.50	0.014	-36.77	-74.00	0.009	-40.92
4.75	0.068	-23.35	-7.00	0.179	-14.94	-27.50	0.040	-27.96	-51.00	0.016	-35.92	-74.50	0.017	-35.39
4.50	0.098	-20.18	-7.25	0.155	-16.19	-28.00	0.028	-30.90	-51.50	0.026	-31.70	-75.00	0.025	-32.22
4.25	0.127	-17.92	-7.50	0.128	-17.86	-28.50	0.024	-32.58	-52.00	0.034	-29.50	-75.50	0.030	-30.31
4.00	0.144	-16.80	-7.75	0.108	-19.33	-29.00	0.034	-29.50	-52.50	0.036	-28.87	-76.00	0.036	-29.00
3.75	0.148	-16.59	-8.00	0.105	-19.58	-29.50	0.041	-27.85	-53.00	0.032	-29.90	-76.50	0.039	-28.18
3.50	0.135	-17.39	-8.25	0.116	-18.71	-30.00	0.036	-28.75	-53.50	0.023	-32.77	-77.00	0.041	-27.74
3.25	0.108	-19.33	-8.50	0.130	-17.75	-30.50	0.025	-32.04	-54.00	0.014	-37.08	-77.50	0.042	-27.54
3.00	0.076	-22.38	-8.75	0.139	-17.14	-31.00	0.022	-33.15	-54.50	0.015	-36.48	-78.00	0.042	-27.54
2.75	0.071	-22.97	-9.00	0.138	-17.23	-31.50	0.032	-29.90	-55.00	0.025	-32.04	-78.50	0.041	-27.85
2.50	0.112	-19.05	-9.25	0.127	-17.92	-32.00	0.039	-28.18	-55.50	0.033	-29.76	-79.00	0.038	-28.29
2.25	0.165	-15.65	-9.50	0.109	-19.25	-32.50	0.035	-29.12	-56.00	0.036	-28.75	-79.50	0.036	-29.00
2.00	0.213	-13.43	-9.75	0.090	-20.92	-33.00	0.024	-32.40	-56.50	0.035	-29.24	-80.00	0.033	-29.76
1.75	0.244	-12.25	-10.00	0.078	-22.16	-33.50	0.021	-33.76	-57.00	0.028	-31.06	-80.50	0.029	-30.90
1.50	0.251	-12.02	-10.50	0.089	-20.96	-34.00	0.030	-30.46	-57.50	0.018	-34.89	-81.00	0.025	-32.22
1.25	0.230	-12.77	-11.00	0.107	-19.37	-34.50	0.037	-28.64	-58.00	0.011	-39.17	-81.50	0.021	-33.76
1.00	0.184	-14.68	-11.50	0.097	-20.26	-35.00	0.035	-29.24	-58.50	0.016	-35.92	-82.00	0.017	-35.65
0.75	0.136	-17.33	-12.00	0.069	-23.29	-35.50	0.025	-32.04	-59.00	0.026	-31.70	-82.50	0.013	-38.06
0.50	0.154	-16.28	-12.50	0.064	-23.94	-36.00	0.018	-34.89	-59.50	0.034	-29.50	-83.00	0.009	-40.45
0.25	0.257	-11.80	-13.00	0.083	-21.67	-36.50	0.026	-31.70	-60.00	0.037	-28.64	-83.50	0.006	-44.44
0.00	0.399	-7.98	-13.50	0.086	-21.31	-37.00	0.035	-29.24	-60.50	0.036	-29.00	-84.00	0.004	-49.12
-0.25	0.550	-5.19	-14.00	0.067	-23.54	-37.50	0.036	-29.00	-61.00	0.030	-30.46	-84.50	0.002	-53.98
-0.50	0.695	-3.17	-14.50	0.049	-26.20	-38.00	0.027	-31.37	-61.50	0.021	-33.56	-85.00	0.003	-52.04
-0.75	0.821	-1.71	-15.00	0.061	-24.29	-38.50	0.018	-35.14	-62.00	0.011	-39.17	-85.50	0.004	-47.96
-1.00	0.918	-0.74	-15.50	0.073	-22.67	-39.00	0.020	-33.98	-62.50	0.009	-40.45	-86.00	0.005	-46.02
-1.25	0.980	-0.18	-16.00	0.066	-23.68	-39.50	0.030	-30.31	-63.00	0.019	-34.42	-86.50	0.005	-46.02
-1.50	1.000	0.00	-16.50	0.045	-26.84	-40.00	0.035	-29.12	-63.50	0.028	-31.06	-87.00	0.006	-44.44
-1.75	0.981	-0.17	-17.00	0.044	-27.13	-40.50	0.032	-30.03	-64.00	0.035	-29.24	-87.50	0.006	-44.44
-2.00	0.923	-0.70	-17.50	0.059	-24.58	-41.00	0.021	-33.35	-64.50	0.038	-28.40	-88.00	0.005	-46.02
-2.25	0.835	-1.57	-18.00	0.061	-24.29	-41.50	0.015	-36.19	-65.00	0.037	-28.52	-88.50	0.005	-46.02
-2.50	0.726	-2.78	-18.50	0.047	-26.56	-42.00	0.024	-32.40	-65.50	0.034	-29.50	-89.00	0.004	-47.96
-2.75	0.610	-4.29	-19.00	0.034	-29.37	-42.50	0.033	-29.76	-66.00	0.026	-31.70	-89.50	0.003	-50.46
-3.00	0.504	-5.96	-19.50	0.044	-27.03	-43.00	0.035	-29.12	-66.50	0.017	-35.39	-90.00	0.002	-53.98
-3.25	0.420	-7.54	-20.00	0.056	-25.11	-43.50	0.029	-30.75	-67.00	0.007	-42.50			
-3.50	0.375	-8.53	-20.50	0.051	-25.93	-44.00	0.019	-34.42	-67.50	0.007	-42.50			
-3.75	0.359	-8.90	-21.00	0.035	-29.24	-44.50	0.015	-36.19	-68.00	0.017	-35.39			
-4.00	0.358	-8.92	-21.50	0.032	-29.90	-45.00	0.024	-32.40	-68.50	0.026	-31.70			
-4.25	0.354	-9.02	-22.00	0.045	-26.94	-45.50	0.033	-29.76	-69.00	0.034	-29.50			
-4.50	0.336	-9.47	-22.50	0.050	-26.11	-46.00	0.035	-29.24	-69.50	0.038	-28.40			
-4.75	0.303	-10.37	-23.00	0.041	-27.85	-46.50	0.029	-30.60	-70.00	0.040	-27.96			
-5.00	0.259	-11.75	-23.50	0.028	-31.21	-47.00	0.020	-33.98	-70.50	0.040	-27.96			
-5.25	0.212	-13.47	-24.00	0.033	-29.76	-47.50	0.014	-36.77	-71.00	0.037	-28.64			
-5.50	0.176	-15.07	-24.50	0.044	-27.13	-48.00	0.022	-33.15	-71.50	0.032	-29.90			
-5.75	0.163	-15.76	-25.00	0.044	-27.03	-48.50	0.032	-30.03	-72.00	0.026	-31.87			
-6.00	0.171	-15.34	-25.50	0.033	-29.76	-49.00	0.036	-29.00	-72.50	0.018	-35.14			
-6.25	0.186	-14.61	-26.00	0.025	-32.22	-49.50	0.033	-29.76	-73.00	0.009	-40.92			
-6.50	0.196	-14.15	-26.50	0.034	-29.37	-50.00	0.024	-32.40	-73.50	0.001	-60.00			

Preliminary, subject to final design and review.

TABULATED DATA FOR ELEVATION PATTERN

Type: ATW22H6V
Polarization: Vertical

ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB
5.00	0.134	-17.49	-6.75	0.261	-11.67	-27.00	0.045	-26.84	-50.50	0.024	-32.40	-74.00	0.026	-31.54
4.75	0.174	-15.19	-7.00	0.265	-11.55	-27.50	0.076	-22.38	-51.00	0.026	-31.70	-74.50	0.032	-30.03
4.50	0.207	-13.70	-7.25	0.255	-11.87	-28.00	0.097	-20.26	-51.50	0.025	-32.04	-75.00	0.036	-28.75
4.25	0.228	-12.84	-7.50	0.233	-12.63	-28.50	0.103	-19.70	-52.00	0.020	-34.20	-75.50	0.042	-27.64
4.00	0.234	-12.63	-7.75	0.205	-13.76	-29.00	0.097	-20.31	-52.50	0.010	-39.58	-76.00	0.045	-26.84
3.75	0.223	-13.03	-8.00	0.175	-15.14	-29.50	0.082	-21.78	-53.00	0.012	-38.42	-76.50	0.049	-26.20
3.50	0.198	-14.09	-8.25	0.149	-16.54	-30.00	0.066	-23.68	-53.50	0.027	-31.54	-77.00	0.051	-25.85
3.25	0.165	-15.65	-8.50	0.130	-17.72	-30.50	0.054	-25.35	-54.00	0.042	-27.43	-77.50	0.052	-25.68
3.00	0.141	-17.05	-8.75	0.119	-18.49	-31.00	0.044	-27.03	-54.50	0.055	-25.19	-78.00	0.051	-25.76
2.75	0.145	-16.77	-9.00	0.112	-19.05	-31.50	0.033	-29.76	-55.00	0.064	-23.94	-78.50	0.050	-26.02
2.50	0.182	-14.80	-9.25	0.103	-19.74	-32.00	0.019	-34.42	-55.50	0.067	-23.48	-79.00	0.048	-26.38
2.25	0.231	-12.73	-9.50	0.089	-20.96	-32.50	0.013	-37.72	-56.00	0.065	-23.81	-79.50	0.044	-27.03
2.00	0.274	-11.26	-9.75	0.072	-22.85	-33.00	0.016	-35.92	-56.50	0.058	-24.73	-80.00	0.042	-27.64
1.75	0.301	-10.43	-10.00	0.054	-25.35	-33.50	0.013	-37.72	-57.00	0.051	-25.93	-80.50	0.037	-28.52
1.50	0.304	-10.34	-10.50	0.052	-25.76	-34.00	0.004	-47.96	-57.50	0.044	-27.03	-81.00	0.034	-29.50
1.25	0.285	-10.90	-11.00	0.082	-21.78	-34.50	0.025	-32.22	-58.00	0.043	-27.33	-81.50	0.029	-30.75
1.00	0.247	-12.15	-11.50	0.089	-20.96	-35.00	0.050	-26.11	-58.50	0.045	-26.94	-82.00	0.025	-32.22
0.75	0.214	-13.39	-12.00	0.069	-23.22	-35.50	0.072	-22.85	-59.00	0.048	-26.38	-82.50	0.021	-33.76
0.50	0.231	-12.73	-12.50	0.058	-24.66	-36.00	0.086	-21.26	-59.50	0.049	-26.20	-83.00	0.018	-35.14
0.25	0.312	-10.12	-13.00	0.098	-20.22	-36.50	0.090	-20.92	-60.00	0.047	-26.56	-83.50	0.014	-37.08
0.00	0.437	-7.19	-13.50	0.138	-17.20	-37.00	0.083	-21.62	-60.50	0.042	-27.54	-84.00	0.011	-39.17
-0.25	0.575	-4.81	-14.00	0.153	-16.31	-37.50	0.072	-22.91	-61.00	0.035	-29.12	-84.50	0.009	-40.92
-0.50	0.710	-2.97	-14.50	0.141	-17.05	-38.00	0.060	-24.44	-61.50	0.029	-30.90	-85.00	0.007	-43.10
-0.75	0.829	-1.63	-15.00	0.111	-19.09	-38.50	0.051	-25.76	-62.00	0.025	-32.04	-85.50	0.006	-44.44
-1.00	0.920	-0.72	-15.50	0.083	-21.57	-39.00	0.045	-26.84	-62.50	0.026	-31.54	-86.00	0.005	-46.02
-1.25	0.979	-0.18	-16.00	0.065	-23.81	-39.50	0.037	-28.52	-63.00	0.030	-30.31	-86.50	0.005	-46.02
-1.50	1.000	0.00	-16.50	0.045	-26.94	-40.00	0.028	-31.06	-63.50	0.033	-29.63	-87.00	0.005	-46.02
-1.75	0.983	-0.15	-17.00	0.020	-33.76	-40.50	0.020	-34.20	-64.00	0.034	-29.50	-87.50	0.005	-46.02
-2.00	0.930	-0.63	-17.50	0.020	-33.76	-41.00	0.019	-34.42	-64.50	0.030	-30.31	-88.00	0.004	-47.96
-2.25	0.848	-1.43	-18.00	0.038	-28.29	-41.50	0.020	-34.20	-65.00	0.025	-32.22	-88.50	0.004	-47.96
-2.50	0.746	-2.55	-18.50	0.040	-27.96	-42.00	0.015	-36.19	-65.50	0.016	-35.92	-89.00	0.003	-50.46
-2.75	0.636	-3.93	-19.00	0.026	-31.87	-42.50	0.009	-40.92	-66.00	0.005	-46.02	-89.50	0.002	-53.98
-3.00	0.533	-5.47	-19.50	0.037	-28.75	-43.00	0.019	-34.42	-66.50	0.008	-41.94	-90.00	0.002	-56.48
-3.25	0.451	-6.92	-20.00	0.075	-22.50	-43.50	0.039	-28.18	-67.00	0.020	-33.98			
-3.50	0.402	-7.90	-20.50	0.107	-19.37	-44.00	0.058	-24.73	-67.50	0.032	-29.90			
-3.75	0.384	-8.31	-21.00	0.122	-18.24	-44.50	0.072	-22.85	-68.00	0.042	-27.43			
-4.00	0.384	-8.32	-21.50	0.117	-18.60	-45.00	0.079	-22.10	-68.50	0.051	-25.93			
-4.25	0.383	-8.34	-22.00	0.099	-20.09	-45.50	0.076	-22.33	-69.00	0.057	-24.96			
-4.50	0.370	-8.64	-22.50	0.077	-22.27	-46.00	0.069	-23.22	-69.50	0.059	-24.51			
-4.75	0.342	-9.32	-23.00	0.060	-24.36	-46.50	0.059	-24.58	-70.00	0.060	-24.44			
-5.00	0.300	-10.44	-23.50	0.045	-26.84	-47.00	0.051	-25.76	-70.50	0.058	-24.81			
-5.25	0.252	-11.97	-24.00	0.028	-31.06	-47.50	0.048	-26.38	-71.00	0.052	-25.60			
-5.50	0.210	-13.56	-24.50	0.012	-38.42	-48.00	0.046	-26.65	-71.50	0.046	-26.65			
-5.75	0.188	-14.52	-25.00	0.016	-35.92	-48.50	0.043	-27.23	-72.00	0.040	-28.07			
-6.00	0.195	-14.22	-25.50	0.021	-33.76	-49.00	0.037	-28.52	-72.50	0.033	-29.76			
-6.25	0.218	-13.23	-26.00	0.011	-38.79	-49.50	0.030	-30.46	-73.00	0.027	-31.37			
-6.50	0.243	-12.27	-26.50	0.015	-36.77	-50.00	0.025	-32.22	-73.50	0.025	-32.04			

Preliminary, subject to final design and review.

TABULATED DATA FOR ELEVATION PATTERN

Type: ATW25H8H
PolarizationHorizontal

ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB
5.00	0.085	-21.36	-6.75	0.186	-14.61	-27.00	0.034	-29.37	-50.50	0.024	-32.40	-74.00	0.001	-60.00
4.75	0.063	-24.01	-7.00	0.196	-14.15	-27.50	0.042	-27.43	-51.00	0.014	-36.77	-74.50	0.009	-40.92
4.50	0.052	-25.68	-7.25	0.194	-14.24	-28.00	0.040	-27.96	-51.50	0.016	-35.92	-75.00	0.017	-35.39
4.25	0.068	-23.35	-7.50	0.179	-14.94	-28.50	0.028	-30.90	-52.00	0.026	-31.70	-75.50	0.025	-32.22
4.00	0.098	-20.18	-7.75	0.155	-16.19	-29.00	0.024	-32.58	-52.50	0.034	-29.50	-76.00	0.030	-30.31
3.75	0.127	-17.92	-8.00	0.128	-17.86	-29.50	0.034	-29.50	-53.00	0.036	-28.87	-76.50	0.036	-29.00
3.50	0.144	-16.80	-8.25	0.108	-19.33	-30.00	0.041	-27.85	-53.50	0.032	-29.90	-77.00	0.039	-28.18
3.25	0.148	-16.59	-8.50	0.105	-19.58	-30.50	0.036	-28.75	-54.00	0.023	-32.77	-77.50	0.041	-27.74
3.00	0.135	-17.39	-8.75	0.116	-18.71	-31.00	0.025	-32.04	-54.50	0.014	-37.08	-78.00	0.042	-27.54
2.75	0.108	-19.33	-9.00	0.130	-17.75	-31.50	0.022	-33.15	-55.00	0.015	-36.48	-78.50	0.042	-27.54
2.50	0.076	-22.38	-9.25	0.139	-17.14	-32.00	0.032	-29.90	-55.50	0.025	-32.04	-79.00	0.041	-27.85
2.25	0.071	-22.97	-9.50	0.138	-17.23	-32.50	0.039	-28.18	-56.00	0.033	-29.76	-79.50	0.038	-28.29
2.00	0.112	-19.05	-9.75	0.127	-17.92	-33.00	0.035	-29.12	-56.50	0.036	-28.75	-80.00	0.036	-29.00
1.75	0.165	-15.65	-10.00	0.109	-19.25	-33.50	0.024	-32.40	-57.00	0.035	-29.24	-80.50	0.033	-29.76
1.50	0.213	-13.43	-10.50	0.078	-22.16	-34.00	0.021	-33.76	-57.50	0.028	-31.06	-81.00	0.029	-30.90
1.25	0.244	-12.25	-11.00	0.089	-20.96	-34.50	0.030	-30.46	-58.00	0.018	-34.89	-81.50	0.025	-32.22
1.00	0.251	-12.02	-11.50	0.107	-19.37	-35.00	0.037	-28.64	-58.50	0.011	-39.17	-82.00	0.021	-33.76
0.75	0.230	-12.77	-12.00	0.097	-20.26	-35.50	0.035	-29.24	-59.00	0.016	-35.92	-82.50	0.017	-35.65
0.50	0.184	-14.68	-12.50	0.069	-23.29	-36.00	0.025	-32.04	-59.50	0.026	-31.70	-83.00	0.013	-38.06
0.25	0.136	-17.33	-13.00	0.064	-23.94	-36.50	0.018	-34.89	-60.00	0.034	-29.50	-83.50	0.009	-40.45
0.00	0.154	-16.28	-13.50	0.083	-21.67	-37.00	0.026	-31.70	-60.50	0.037	-28.64	-84.00	0.006	-44.44
-0.25	0.257	-11.80	-14.00	0.086	-21.31	-37.50	0.035	-29.24	-61.00	0.036	-29.00	-84.50	0.004	-49.12
-0.50	0.399	-7.98	-14.50	0.067	-23.54	-38.00	0.036	-29.00	-61.50	0.030	-30.46	-85.00	0.002	-53.98
-0.75	0.550	-5.19	-15.00	0.049	-26.20	-38.50	0.027	-31.37	-62.00	0.021	-33.56	-85.50	0.003	-52.04
-1.00	0.695	-3.17	-15.50	0.061	-24.29	-39.00	0.018	-35.14	-62.50	0.011	-39.17	-86.00	0.004	-47.96
-1.25	0.821	-1.71	-16.00	0.073	-22.67	-39.50	0.020	-33.98	-63.00	0.009	-40.45	-86.50	0.005	-46.02
-1.50	0.918	-0.74	-16.50	0.066	-23.68	-40.00	0.030	-30.31	-63.50	0.019	-34.42	-87.00	0.005	-46.02
-1.75	0.980	-0.18	-17.00	0.045	-26.84	-40.50	0.035	-29.12	-64.00	0.028	-31.06	-87.50	0.006	-44.44
-2.00	1.000	0.00	-17.50	0.044	-27.13	-41.00	0.032	-30.03	-64.50	0.035	-29.24	-88.00	0.006	-44.44
-2.25	0.981	-0.17	-18.00	0.059	-24.58	-41.50	0.021	-33.35	-65.00	0.038	-28.40	-88.50	0.005	-46.02
-2.50	0.923	-0.70	-18.50	0.061	-24.29	-42.00	0.015	-36.19	-65.50	0.037	-28.52	-89.00	0.005	-46.02
-2.75	0.835	-1.57	-19.00	0.047	-26.56	-42.50	0.024	-32.40	-66.00	0.034	-29.50	-89.50	0.004	-47.96
-3.00	0.726	-2.78	-19.50	0.034	-29.37	-43.00	0.033	-29.76	-66.50	0.026	-31.70	-90.00	0.003	-50.46
-3.25	0.610	-4.29	-20.00	0.044	-27.03	-43.50	0.035	-29.12	-67.00	0.017	-35.39			
-3.50	0.504	-5.96	-20.50	0.056	-25.11	-44.00	0.029	-30.75	-67.50	0.007	-42.50			
-3.75	0.420	-7.54	-21.00	0.051	-25.93	-44.50	0.019	-34.42	-68.00	0.007	-42.50			
-4.00	0.375	-8.53	-21.50	0.035	-29.24	-45.00	0.015	-36.19	-68.50	0.017	-35.39			
-4.25	0.359	-8.90	-22.00	0.032	-29.90	-45.50	0.024	-32.40	-69.00	0.026	-31.70			
-4.50	0.358	-8.92	-22.50	0.045	-26.94	-46.00	0.033	-29.76	-69.50	0.034	-29.50			
-4.75	0.354	-9.02	-23.00	0.050	-26.11	-46.50	0.035	-29.24	-70.00	0.038	-28.40			
-5.00	0.336	-9.47	-23.50	0.041	-27.85	-47.00	0.029	-30.60	-70.50	0.040	-27.96			
-5.25	0.303	-10.37	-24.00	0.028	-31.21	-47.50	0.020	-33.98	-71.00	0.040	-27.96			
-5.50	0.259	-11.75	-24.50	0.033	-29.76	-48.00	0.014	-36.77	-71.50	0.037	-28.64			
-5.75	0.212	-13.47	-25.00	0.044	-27.13	-48.50	0.022	-33.15	-72.00	0.032	-29.90			
-6.00	0.176	-15.07	-25.50	0.044	-27.03	-49.00	0.032	-30.03	-72.50	0.026	-31.87			
-6.25	0.163	-15.76	-26.00	0.033	-29.76	-49.50	0.036	-29.00	-73.00	0.018	-35.14			
-6.50	0.171	-15.34	-26.50	0.025	-32.22	-50.00	0.033	-29.76	-73.50	0.009	-40.92			

Preliminary, subject to final design and review.

TABULATED DATA FOR ELEVATION PATTERN

Type: ATW22H8V
Polarization: Vertical

ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB	ANGLE	FIELD	dB
5.00	0.056	-24.96	-6.75	0.218	-13.23	-27.00	0.015	-36.77	-50.50	0.025	-32.22	-74.00	0.025	-32.04
4.75	0.091	-20.82	-7.00	0.243	-12.27	-27.50	0.045	-26.84	-51.00	0.024	-32.40	-74.50	0.026	-31.54
4.50	0.134	-17.49	-7.25	0.261	-11.67	-28.00	0.076	-22.38	-51.50	0.026	-31.70	-75.00	0.032	-30.03
4.25	0.174	-15.19	-7.50	0.265	-11.55	-28.50	0.097	-20.26	-52.00	0.025	-32.04	-75.50	0.036	-28.75
4.00	0.207	-13.70	-7.75	0.255	-11.87	-29.00	0.103	-19.70	-52.50	0.020	-34.20	-76.00	0.042	-27.64
3.75	0.228	-12.84	-8.00	0.233	-12.63	-29.50	0.097	-20.31	-53.00	0.010	-39.58	-76.50	0.045	-26.84
3.50	0.234	-12.63	-8.25	0.205	-13.76	-30.00	0.082	-21.78	-53.50	0.012	-38.42	-77.00	0.049	-26.20
3.25	0.223	-13.03	-8.50	0.175	-15.14	-30.50	0.066	-23.68	-54.00	0.027	-31.54	-77.50	0.051	-25.85
3.00	0.198	-14.09	-8.75	0.149	-16.54	-31.00	0.054	-25.35	-54.50	0.042	-27.43	-78.00	0.052	-25.68
2.75	0.165	-15.65	-9.00	0.130	-17.72	-31.50	0.044	-27.03	-55.00	0.055	-25.19	-78.50	0.051	-25.76
2.50	0.141	-17.05	-9.25	0.119	-18.49	-32.00	0.033	-29.76	-55.50	0.064	-23.94	-79.00	0.050	-26.02
2.25	0.145	-16.77	-9.50	0.112	-19.05	-32.50	0.019	-34.42	-56.00	0.067	-23.48	-79.50	0.048	-26.38
2.00	0.182	-14.80	-9.75	0.103	-19.74	-33.00	0.013	-37.72	-56.50	0.065	-23.81	-80.00	0.044	-27.03
1.75	0.231	-12.73	-10.00	0.089	-20.96	-33.50	0.016	-35.92	-57.00	0.058	-24.73	-80.50	0.042	-27.64
1.50	0.274	-11.26	-10.50	0.054	-25.35	-34.00	0.013	-37.72	-57.50	0.051	-25.93	-81.00	0.037	-28.52
1.25	0.301	-10.43	-11.00	0.052	-25.76	-34.50	0.004	-47.96	-58.00	0.044	-27.03	-81.50	0.034	-29.50
1.00	0.304	-10.34	-11.50	0.082	-21.78	-35.00	0.025	-32.22	-58.50	0.043	-27.33	-82.00	0.029	-30.75
0.75	0.285	-10.90	-12.00	0.089	-20.96	-35.50	0.050	-26.11	-59.00	0.045	-26.94	-82.50	0.025	-32.22
0.50	0.247	-12.15	-12.50	0.069	-23.22	-36.00	0.072	-22.85	-59.50	0.048	-26.38	-83.00	0.021	-33.76
0.25	0.214	-13.39	-13.00	0.058	-24.66	-36.50	0.086	-21.26	-60.00	0.049	-26.20	-83.50	0.018	-35.14
0.00	0.231	-12.73	-13.50	0.098	-20.22	-37.00	0.090	-20.92	-60.50	0.047	-26.56	-84.00	0.014	-37.08
-0.25	0.312	-10.12	-14.00	0.138	-17.20	-37.50	0.083	-21.62	-61.00	0.042	-27.54	-84.50	0.011	-39.17
-0.50	0.437	-7.19	-14.50	0.153	-16.31	-38.00	0.072	-22.91	-61.50	0.035	-29.12	-85.00	0.009	-40.92
-0.75	0.575	-4.81	-15.00	0.141	-17.05	-38.50	0.060	-24.44	-62.00	0.029	-30.90	-85.50	0.007	-43.10
-1.00	0.710	-2.97	-15.50	0.111	-19.09	-39.00	0.051	-25.76	-62.50	0.025	-32.04	-86.00	0.006	-44.44
-1.25	0.829	-1.63	-16.00	0.083	-21.57	-39.50	0.045	-26.84	-63.00	0.026	-31.54	-86.50	0.005	-46.02
-1.50	0.920	-0.72	-16.50	0.065	-23.81	-40.00	0.037	-28.52	-63.50	0.030	-30.31	-87.00	0.005	-46.02
-1.75	0.979	-0.18	-17.00	0.045	-26.94	-40.50	0.028	-31.06	-64.00	0.033	-29.63	-87.50	0.005	-46.02
-2.00	1.000	0.00	-17.50	0.020	-33.76	-41.00	0.020	-34.20	-64.50	0.034	-29.50	-88.00	0.005	-46.02
-2.25	0.983	-0.15	-18.00	0.020	-33.76	-41.50	0.019	-34.42	-65.00	0.030	-30.31	-88.50	0.004	-47.96
-2.50	0.930	-0.63	-18.50	0.038	-28.29	-42.00	0.020	-34.20	-65.50	0.025	-32.22	-89.00	0.004	-47.96
-2.75	0.848	-1.43	-19.00	0.040	-27.96	-42.50	0.015	-36.19	-66.00	0.016	-35.92	-89.50	0.003	-50.46
-3.00	0.746	-2.55	-19.50	0.026	-31.87	-43.00	0.009	-40.92	-66.50	0.005	-46.02	-90.00	0.002	-53.98
-3.25	0.636	-3.93	-20.00	0.037	-28.75	-43.50	0.019	-34.42	-67.00	0.008	-41.94			
-3.50	0.533	-5.47	-20.50	0.075	-22.50	-44.00	0.039	-28.18	-67.50	0.020	-33.98			
-3.75	0.451	-6.92	-21.00	0.107	-19.37	-44.50	0.058	-24.73	-68.00	0.032	-29.90			
-4.00	0.402	-7.90	-21.50	0.122	-18.24	-45.00	0.072	-22.85	-68.50	0.042	-27.43			
-4.25	0.384	-8.31	-22.00	0.117	-18.60	-45.50	0.079	-22.10	-69.00	0.051	-25.93			
-4.50	0.384	-8.32	-22.50	0.099	-20.09	-46.00	0.076	-22.33	-69.50	0.057	-24.96			
-4.75	0.383	-8.34	-23.00	0.077	-22.27	-46.50	0.069	-23.22	-70.00	0.059	-24.51			
-5.00	0.370	-8.64	-23.50	0.060	-24.36	-47.00	0.059	-24.58	-70.50	0.060	-24.44			
-5.25	0.342	-9.32	-24.00	0.045	-26.84	-47.50	0.051	-25.76	-71.00	0.058	-24.81			
-5.50	0.300	-10.44	-24.50	0.028	-31.06	-48.00	0.048	-26.38	-71.50	0.052	-25.60			
-5.75	0.252	-11.97	-25.00	0.012	-38.42	-48.50	0.046	-26.65	-72.00	0.046	-26.65			
-6.00	0.210	-13.56	-25.50	0.016	-35.92	-49.00	0.043	-27.23	-72.50	0.040	-28.07			
-6.25	0.188	-14.52	-26.00	0.021	-33.76	-49.50	0.037	-28.52	-73.00	0.033	-29.76			
-6.50	0.195	-14.22	-26.50	0.011	-38.79	-50.00	0.030	-30.46	-73.50	0.027	-31.37			

Preliminary, subject to final design and review.

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RF Safety Report

An Analysis of RF Field Levels and RF Safety Concerns on the Roads of the Mt. Wilson Antenna Farm

Prepared for

KABC-TV and the Mt. Wilson Stakeholders Group

August 25, 2011

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Hatfield & Dawson Consulting Engineers (H & D) has been retained by KABC-TV, in a consortium with KCBS/KCAL-TV, NBC Universal (KNBC), Univision, and Tribune, to evaluate the radio frequency (RF) human exposure conditions along specific roadways at Mt. Wilson, California, for compliance with current Federal Communications Commission (FCC) rules and guidelines regarding public exposure to RF electromagnetic fields. David Pinion, PE, of H & D made the on-site measurements and wrote this report.

RF Safety Solutions LLC (RFSS) was a subcontractor to H & D on this project. Richard R. Strickland of RFSS made on-site measurements with David Pinion and shared in writing this report.

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Executive Summary

Overview

KABC-TV, in a consortium with KCBS/KCAL-TV, NBC Universal (KNBC), Univision, and Tribune, collectively referred to as the Mt. Wilson Stakeholders Group, commissioned this RF safety report. The primary objective of the survey and report is to determine whether the roads in the central area of Mt. Wilson are in compliance with Federal Communications Commission (FCC) and Occupational Safety and Health (OSHA) Regulations regarding RF radiation safety and to determine which measures, if any, may be necessary to achieve compliance and/or improve the level of RF safety.

Measurements

Measurements were made over all portions (i.e., across the full width of the road) of Video Road, Weathervane Drive, and the southwest section of Mt. Wilson Circle Road. All recorded values are spatially averaged measurements—measured by instruments capable of making such measurements—representative of the average exposure of an adult male standing on the ground. Spatially averaged measurements are specified in the Federal Communications Commission (FCC) Regulations and used in all the major RF exposure standards worldwide. Two sets of survey instruments were used, each of which includes the same probe (sensor). This probe—Narda Safety Test Solutions Model B8742D—is by far the best probe available for accurately assessing RF fields at complex, multi-signal broadcast sites such as Mt. Wilson. The shaped frequency response design of the probe automatically compensates for the differences in the FCC's Maximum Permissible Exposure (MPE) limits at different frequencies and yields results in terms of the percentage of the MPE limit for General Population/ Uncontrolled exposure. All the major standards vary the exposure limit with frequency.

An enhanced spatial averaging technique was used in the small area where the highest RF field levels were found to improve accuracy beyond standard methodology. The spatially averaged RF field level in this very small area—the highest level found on any of the three roads surveyed—was 85.1 percent of the FCC's MPE limit for General Population/Uncontrolled exposure.

Compliance and Safety

The three subject roads—Video Road, Weathervane Drive, and the southwest section of Mt. Wilson Circle Road—are fully compliant with the FCC's RF safety regulations.

These roadways are fully compliant with the regulatory requirements of the Federal Communications Commission (FCC) regarding RF radiation, and there are no RF health hazards for anyone traveling or working on the three subject roads.

This conclusion is based on the following criteria:

1. **Compliance:** The FCC's MPE limit for General Population/Uncontrolled (public) exposure is the criteria used to determine compliance. The maximum spatially averaged RF field level found anywhere on Video Road, Weathervane Drive, and the southwest section of Mt. Wilson Circle Road is less than the FCC's MPE limit for General Population/Uncontrolled exposure. Therefore, these roadways, as measured on the two days of the survey, are in compliance with the FCC Regulations

2. **RF Safety:** The MPE limits for General Population/Uncontrolled exposure are only one-fifth of the biologically based upper-tier MPE limits for Occupational/ Controlled (occupational) exposure above 3 MHz, which includes all significant sources at Mt. Wilson. The vast majority of experts in the field of RF safety use the upper-tier MPE limits as the reference point for biological concerns. The highest spatially averaged RF field level found during the two days of the survey was 85.1 percent of the MPE limit for General Population/ Uncontrolled exposure, which is equal to approximately 17 percent of the MPE limit for the biologically based MPE limit for Occupational/ Controlled exposure. Therefore, the highest RF field level found on the subject roadways is far below the generally accepted criteria—the FCC's MPE limit for Occupational/Controlled exposure—referenced for RF safety concerns.

Comparison to Previous Surveys

The results of this survey are reasonably similar to the measurements made by Alfred Resnick of Carl T. Jones Corporation on behalf of Richard Tell Associates as documented in a report dated July 31, 2006.

There have been three reports by Aurora Industrial Hygiene, the most recent dated October 28, 2009. This report indicates that a few discrete locations on Video Road and one location on the southwest section of Mt. Wilson Circle Road had RF field levels in excess of the stated MPE public limit of 200 μW/cm². There are several flaws with this report and the previous reports:

- The MPE limit varies with frequency. It is 200 μW/cm² for FM radio stations and television Channels 2 through 13. But the MPE limit increases linearly above 300 MHz to 1,500 MHz. The MPE limit is 313 μW/cm² for Channel 14, 400 μW/cm² for Channel 35, and even higher for Channels 36 and above.

- Spatial averaging techniques were not used. The use of this technique is not mentioned in the report, and the meter used does not have this capability. The typical spatially averaged RF field at any location on the roads is roughly 60 percent of the peak field level at that point on the road.

- Typical industrial hygiene sampling techniques were used to assess the magnitude of the RF fields. While this may be fine for evaluating indoor air quality, it is inappropriate for areas with complex RF fields.

In summary, the reports generated by Aurora Industrial Hygiene were based on evaluations of measurements made with less than ideal test equipment—equipment incapable of making neither spatially averaged measurements nor compensating for the variance in MPE limit—and were conducted by personnel who have no apparent background in or understanding of RF fields.

Statement of David J. Pinion, PE

I am an experienced RF engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield & Dawson Consulting Engineers. I am registered as a Professional Engineer in the States of California, Washington, Oregon. and Hawaii.

All representations contained herein are true to the best of my knowledge.

25 August 2011

David J. Pinion, PE. My CA PE Expires 12/31/2011.

Statement of Richard R. Strickland, RF Safety Consultant

Richard R. Strickland of RF Safety Solutions LLC certifies that the statements in this report accurately describe, to the best of his knowledge, the conditions on the three subject roads at the Mt. Wilson Antenna Farm when surveyed July 28–29, 2011. The findings within this report are based on the observations from that survey and sound engineering practice. Changes in operating practices and/or hardware or property reconfigurations should be followed by another survey and report modification as appropriate.

25 August 2011

Table of Contents

Executive Summary

OVERVIEW **3**

MEASUREMENTS **3**

COMPLIANCE AND SAFETY **4**

COMPARISON TO PREVIOUS SURVEYS **4**

STATEMENT OF DAVID J. PINION, PE 5
STATEMENT OF RICHARD R. STRICKLAND, RF SAFETY CONSULTANT 5

Section 1: RF Survey Details

Results of Site Measurements

OVERVIEW **8**

AREAS SURVEYED **9**

RF FIELD LEVEL MEASUREMENTS **10**

MEASUREMENT PROCEDURES 10
THE SURVEY MEASUREMENTS WERE PERFORMED IN ACCORDANCE WITH METHODS DESCRIBED IN: 10
- FEDERAL COMMUNICATIONS COMMISSION (FCC) OET BULLETIN 65, EDITION 97-01, AUGUST 1997, *EVALUATING COMPLIANCE WITH FCC GUIDELINES FOR HUMAN EXPOSURE TO RADIOFREQUENCY ELECTROMAGNETIC FIELDS* AND 10
- IEEE STANDARD C95.3-2002 *IEEE RECOMMENDED PRACTICE FOR THE MEASUREMENT OF POTENTIALLY HAZARDOUS ELECTROMAGNETIC FIELDS, RF AND MICROWAVE.* 10

Peak Field Measurements *10*
Spatially Averaged Measurements *11*
Enhanced Spatially Averaged Measurements *11*
RF FIELD LEVELS ON ROADS 13
Weathervane Drive *13*
Mt. Wilson Circle Road *13*
Video Road *13*
CONTRIBUTIONS OF FM RADIO AND TELEVISION 14
CONTRIBUTIONS OF FM RADIO AND TELEVISION 15

Section 2: Standards and Measurements

Measurements Compared to FCC Regulations

FEDERAL COMMUNICATIONS COMMISSION (FCC) **17**

MPE LIMITS FOR THE PUBLIC ROADS AT MT. WILSON 18

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS **19**

RF SURVEY EQUIPMENT AND MEASUREMENT TECHNIQUES **20**

RF SURVEY EQUIPMENT 20
MEASUREMENTS 21
Measurement Range of B8742D Probe *21*
Calibration *21*
Measurement Techniques *22*
Comparison of Peak versus Spatially Averaged Measurements *23*
Comparison of Measurements: Shaped versus Flat Response Probes *23*
Comparison of Measurements: Shaped versus Flat Response Probes *24*

Section 3: Risks and Recommendations

There Are No RF Safety Concerns on the Roads

RISKS **25**

RECOMMENDATIONS **25**

RECOMMENDATIONS FOR ROADS AND GROUND AREAS 25
RECOMMENDATIONS FOR TOWER CLIMBING 25

Appendix

OSHA/PCIA CORRESPONDENCE **26**

Figures

Figure 1: Roads Surveyed 10

Figure 2: Maximum Spatially Averaged RF Field Levels on Roads 16

Tables

Table 1: Enhanced Spatial Averaging Details 14

Table 2: FCC Maximum Permissible Exposure Limits 18

Section
1

RF Survey Details

Results of Site Measurements

Overview

Mt. Wilson is located approximately 15 miles northeast of downtown Los Angeles. Mt. Wilson is referred to as an “antenna farm” because it and nearby Mt. Harvard are where virtually all of the television and FM radio broadcast facilities that serve the Los Angeles area are located. The Mt. Wilson antenna farm is located on United States Forest Service Land in Los Angeles County. There are approximately 36 towers, 29 of which contain broadcast antennas, on Mt. Wilson. The towers are located in four distinct areas. This report and the cited survey focus on the central area near the post office, which has the greatest concentration of towers and antennas. All of the FM and television transmission facilities are within the fenced compounds and inaccessible to the general public. The focus of the survey and this report is on the RF environment on the county-maintained roads on Mt. Wilson.

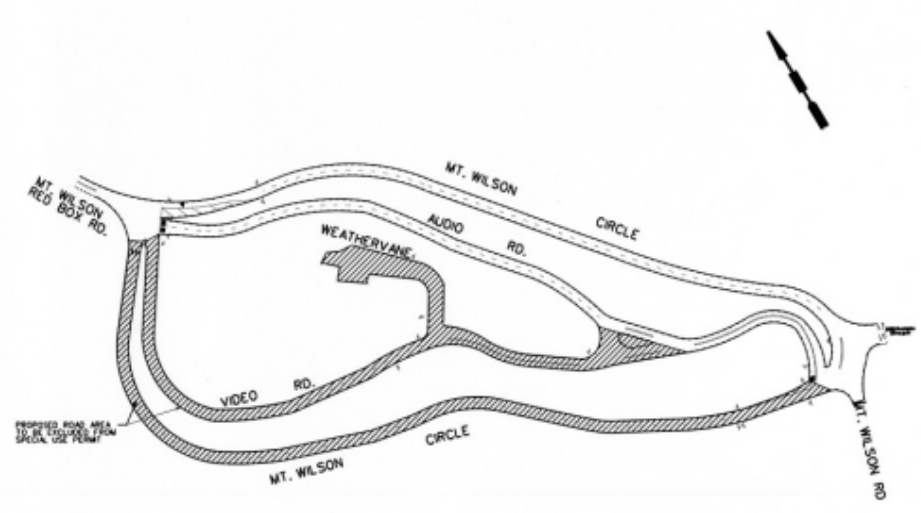
Areas Surveyed

Spatially averaged RF field level measurements were made in the following locations:

- Video Road
- Weathervane Drive
- Mt. Wilson Circle Road (southwest section)

The entire width of each road was surveyed in an attempt to find any areas with significant RF field levels. These three roads are shaded in Figure 1 below.

Figure 1: Roads Surveyed



RF Field Level Measurements

Measurement Procedures

The survey measurements were performed in accordance with methods described in:

- Federal Communications Commission (FCC) OET[1] Bulletin 65, Edition 97-01, August 1997, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields* and
- IEEE Standard C95.3-2002 *IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields, RF and Microwave.*

The survey included both peak and spatial averaging of the RF exposure environment. During the initial survey, the exposure measurements included sweeping the three subject roads—Weathervane Drive, Video Road, and the southwest portion of Mt. Wilson Circle Road—using both sets of the B8742D shaped frequency response probe and survey meter, exploring the roads, sidewalks, and shoulders to find the locations of the highest spatially averaged and peak exposure conditions.

Peak Field Measurements

Peak field measurements are quicker and easier to obtain than spatially averaged measurements, but they overstate exposure conditions, especially in areas such as central Mt. Wilson where non-uniform RF fields exist. Spatially averaged measurements are more time-consuming, but they yield a more accurate representation of human exposure conditions, and they are in accordance with

[1] The OET is the FCC's Office of Engineering and Technology.

FCC recommendations and IEEE methodology cited above. Therefore, an efficient measurement procedure calls for the use of spatial averaging only at those locations where peak measurements indicate the possibility of excessive exposure conditions, or to obtain a more precise indication of the field level in an area.

The two surveyors walked the areas of interest while moving the probes in an oscillatory up-and-down fashion over an area equivalent to that of the human body (1 meter by 2 meters) to cover as large an area as possible while watching for elevated peak meter readings that approached or exceeded 50 percent of the MPE limit for the general public. The "Max Hold" feature of the survey meters was activated to capture the peak RF exposure level between the ground and the average head height of an adult male. The Max Hold feature captures the highest transient exposure conditions.

Spatially Averaged Measurements

If the transient readings approached or exceeded 50 percent of the MPE limit, then a series of three spatially averaged exposure readings were made at the location of the highest peak transient exposure level. Spatially averaged measurements were also made in areas with lower peak RF field levels in order to determine the maximum spatially averaged field level in certain sections of the roads. For example, Figure 2 shows that the spatially averaged RF field levels on Weathervane Drive measured no higher than 50 percent of the MPE limit for General Population/Uncontrolled (public) exposure. This assessment is based on walking over all surfaces of the road at least twice with the probes in constant motion to find the highest peak field levels. Three small areas were found where the magnitude of the RF fields was somewhat higher than anywhere else on Weathervane Drive. A minimum of three spatially averaged measurements were made at each of these three locations. The results of these spatially averaged measurements indicate that the maximum RF field levels on Weathervane Road are less than 50 percent of the public MPE limit.

The results of all of these measurements are shown in Figure 2.

Enhanced Spatially Averaged Measurements

Peak and linear spatially averaged exposure measurements are quicker and easier to obtain, but they overstate exposure conditions, especially in areas such as central Mt. Wilson where non-uniform RF fields exist. Multipath reflections may create highly non-uniform RF field distributions, or "standing waves." These standing waves are due to the multipath interactions among the transmitting antennas, towers, buildings, ground, measuring instruments, surveyors holding the instruments, and other field generating objects.

Spatially averaged measurements of standing waves mitigate the effects of the localized field variations, and provide a more accurate survey of the RF exposure environment.

Performing enhanced spatial averaging measurements can further mitigate surveyor-induced field perturbations. This technique involves multiple scans in multiple directions around the location of the highest peak exposure condition. It serves to eliminate the effects of the standing waves caused by the field reflections due to the surveyor and his instruments.

The FCC MPE limits for General Population/ Uncontrolled exposure are derived from a presumption of a uniform, plane wave exposure over the adult human body. Most RF exposure conditions do not result from perfectly uniform plane waves, thus spatial averaging measurement techniques are normally used to obtain estimates of the plane wave equivalent power density of a non-uniform, spatially distributed field.

RF fields interact with the human body through scattering and reflection of the fields. Therefore, the surveyor performing the RF measurements distorts and perturbs the ambient fields to be measured. To minimize the influence of these surveyor-induced field perturbations, enhanced spatially averaged measurements were accomplished through a series of vertical sweeps of the probe around a critical measurement point, with measurements being made from four different directions, each facing the measurement point in question and spaced 90 degrees apart.

A total of four repeated spatially averaged measurements were made for each of the four directions for a total of 16 spatially averaged vertical scans taken at the point of interest. The overall average of the 16 spatially averaged scans was deemed to be the best estimate of what the unperturbed field would be at the critical measurement point.

Enhanced spatially averaged measurements are more time consuming than either peak or simple linear spatial averaging, but they yield a more accurate representation of human exposure conditions, and they are in accordance with IEEE Standard C95.3-2002. Thus, an efficient measurement procedure calls for the use of enhanced spatial averaging only at those locations where initial measurements indicate excessive exposure conditions.

ABOVE:
Dave Pinion making a spatially averaged measurement.

The time averaging feature of the survey meters was used to facilitate the spatially averaged exposure readings. For each spatial average scan, the probe was lowered to ground level and slowly raised to a point approximately 6 feet above ground. Each scan period was approximately 10 to 13 seconds in duration. During the scan, the probe was moved at an approximately constant speed making use of the built-in time averaging feature of the Model 8718B and Model 8715 survey meters. At the termination of each vertical scan, the spatially averaged value of the exposure condition was read from the meter as a percentage of the MPE limit.

RF Field Levels on Roads

The most important areas are described in detail below. Refer to Figure 2.

Weathervane Drive

The RF field levels on Weathervane Drive are less than 50 percent of the FCC's MPE limit for General Population/Uncontrolled exposure. This zone extends from the dead end of the drive to the intersection with Video Road. The coordinates of this intersection, defined by the plane of the west-facing side of the pink KTLA building (Building 5), is approximately N 34° 13' 35", W 118° 4' 0" (NAD83 datum geographic coordinates, rounded to the nearest second).

Mt. Wilson Circle Road

The RF field levels on the southwest section of Mt. Wilson Circle Road are less than 50 percent of the FCC's MPE limit for General Population/Uncontrolled exposure. Most areas of this road are well below 50 percent of the MPE limit.

Video Road

The highest spatially averaged RF field levels found during the survey are in a short section of Video Road near the post office (Building 13). The maximum spatially averaged RF field levels are found in the area that extends northwest from the blue front door of the Post Office to the gate of the John Poole Building (Building #12).

The boundaries of this area are as follows:

- Southeast boundary is approximately N 34° 13' 35", W 118° 4' 1"
- Northwest boundary is approximately N 34° 13' 35", W 118° 4' 2"

This section of Video Road, which is shown in grey in Figure 2, was surveyed a minimum of three times. With the exception of a very small area that is less than 5 feet in diameter, the maximum spatially averaged RF field levels are less than 80 percent of the FCC's MPE limit for General Population/Uncontrolled exposure.

The location of the highest exposure condition—the small area that is less than 5 feet in diameter and is shown in red in Figure 2—was on Video Road, across from the two short telephone poles near the post office (Building 13). The NAD83 datum geographic coordinates of this location is N 34° 13' 34.8". W 118° 4' 1.2".

The result of enhanced spatially averaged measurements indicate that the highest RF field level in this small area is 85.1 percent of the FCC's MPE limit for General Population/Uncontrolled exposure. All other areas of the three subject roads have RF field levels that are below this level. Table 1 shows the details of the 16 measurements used to arrive at this value.

Table 1: Enhanced Spatial Averaging Details

	Spatially Averaged RF Field Level			
	Direction 1	Direction 2	Direction 3	Direction 4
Scan 1	81.0	73.7	89.4	96.4
Scan 2	87.5	76.4	88.2	96.3
Scan 3	73.7	76.1	83.6	103.6
Scan 4	76.2	75.8	86.4	97.4
Average	79.6	75.5	86.9	98.4
	Average of all four directions is 85.1 percent.			

The results of this survey indicate that there are no areas on the subject roads where the RF field levels exceed the Federal Communications Commission's Maximum Permissible Exposure limits for General Population/Uncontrolled exposure.

ABOVE: This is the door to the post office, which is opposite the east end of the gray area shown in Figure 2 on Video Road that represents the section of the road with the highest spatially averaged RF field levels. The maximum spatially averaged RF field levels in this area are less than 80 percent of the FCC's MPE limit for General Population/Uncontrolled exposure except for a very small area that is across the street and slightly west of this door.

TOP RIGHT: This is the gate to the Poole Building (Building 12) that is opposite the west end of the section of Video Road with the highest spatially averaged RF field levels.

RIGHT: This is the Poole Building. The location of the gate is indicated by arrows.

Contributions of FM Radio and Television

A Narda Safety Test Solutions Frequency Selective Radiation Meter, Model SRM-3000, was used to determine the dominant contributors to the RF exposure environment along Video Road near the post office. Ralph Ortiz, transmission systems manager for Univision, supplied this meter. Although this instrument had not been calibrated recently and cannot be used to make spatially averaged measurements, it is very useful for determining the relative distribution of RF energy in a complex RF environment such as the Mt. Wilson antenna farm.

The SRM-3000 has a built-in spectrum analyzer that can display the magnitudes of the RF fields from each broadcast station or broadcast service. It was found that nearby stations in the FM radio broadcast service contributed approximately 80 percent to the exposure near the post office. The nearby TV broadcast stations contributed the remaining 20 percent. These percentages are weighted—they are in terms of the MPE limit.

The Model B8742D probe used for the critical exposure measurements along Video Road was calibrated with a correction factor of 1.00 at 100 MHz, which is roughly the middle of the FM broadcast band. Therefore, the exposure measurements of RF fields with dominant contributions in the FM band do not require interpretation or multiplication by an additional correction factor in order to maximize the accuracy of the readings.

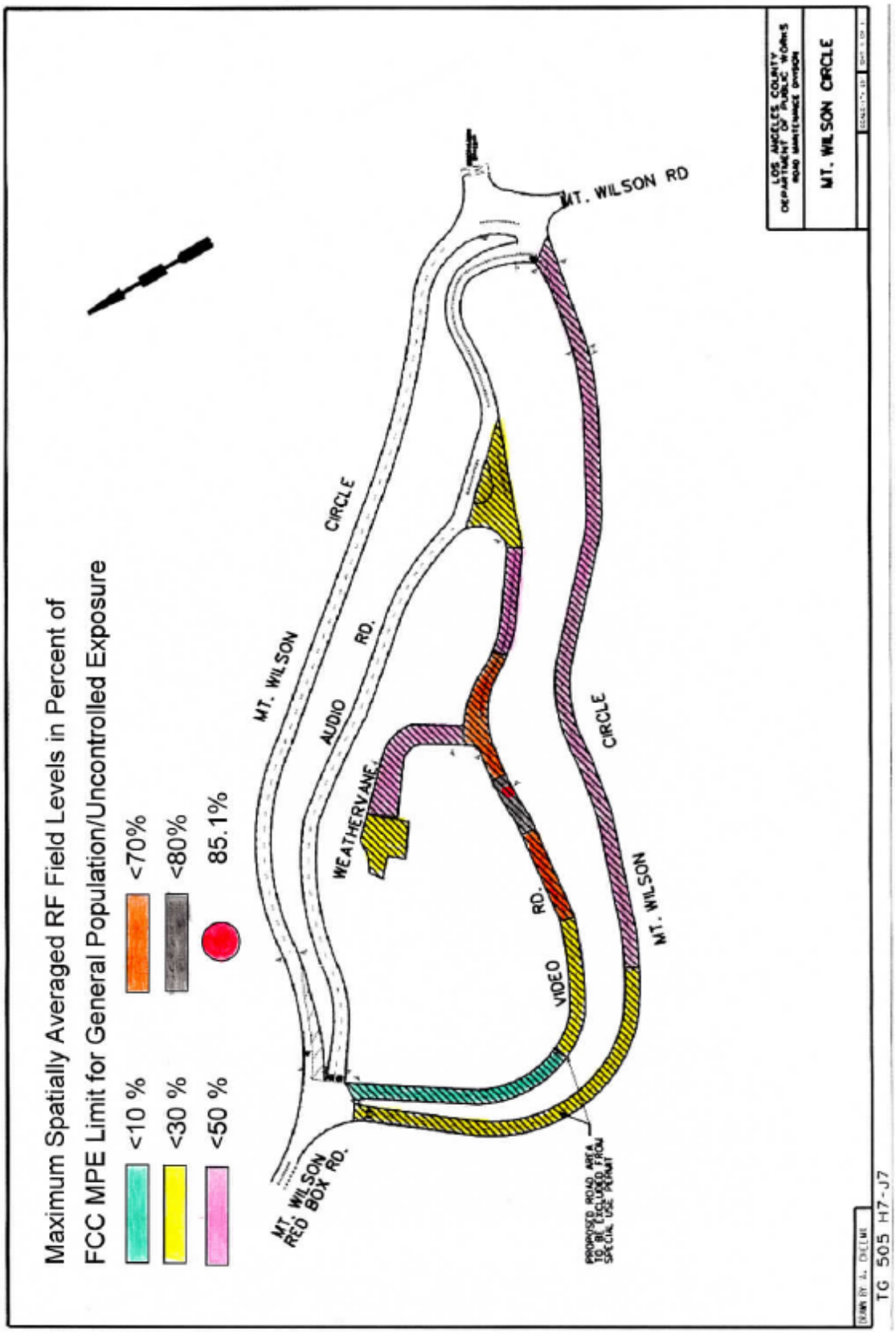


Figure 2: Maximum Spatially Averaged RF Field Levels on Roads

Section
2

Standards and Measurements

Measurements Compared to FCC Regulations

Federal Communications Commission (FCC)

The FCC updated its RF safety regulations in 1997. The regulations require that all transmitting sites in the United States must meet all aspects of these regulations as of September 1, 2000.

The FCC Regulations are based on setting limits for human exposure. The FCC limits are similar to, but not identical, to the limits of several other major standards. There are two sets of exposure limits.

- Occupational/Controlled
- General Population/Uncontrolled

These are Maximum Permissible Exposure (MPE) limits averaged over the body and averaged over time. The Occupational/Controlled limits are five times higher than the General Population/Uncontrolled limits at all frequencies above 3 MHz. The averaging period for Occupational/Controlled exposure is six minutes for exposure to frequencies below 15 GHz. The averaging time decreases as the frequency increases from 15 to 300 GHz. The FCC does not allow time averaging for General Population/Uncontrolled exposure. The MPE limits are the same for both the electric field and the magnetic field.

The FCC provides definitions for the two types of exposure and attempts to define when they apply. A simplified view, endorsed by the Occupational Safety and Health Administration (OSHA), is that the more restrictive General Population/ Uncontrolled limits apply unless

- the organization is operating under a written RF safety program, and
- the individuals who may be exposed to levels above the General Population/Uncontrolled limits have received RF safety training.

A planned Notice of Proposed Rulemaking is aimed at further defining when an organization is allowed to use the higher MPE limits for Occupational/Controlled exposure. The terms *fully aware* and *exercise control* are referred to in the current FCC Regulations when defining the requirements for establishing an

Occupational/Controlled exposure situation. The Notice further defines these two important terms.

The phrase *fully aware* refers to workers who

- have received both written and verbal information regarding RF radiation.
- have received training that includes how to control or mitigate RF radiation exposure.

The phrase *exercise control* refers to workers who

- understand how to use administrative controls to reduce their exposure level. Administrative controls include time averaging.
- understand how to use engineering controls to reduce their exposure level. Engineering controls include Personal Protective Equipment (PPE), specifically RF personal monitors and RF protective clothing.

The FCC's MPE limits for the two classes of exposure are shown in the tables below. Limits are spatially averaged over the whole body. The Occupational/ Controlled limits are time averaged.

Table 2: FCC Maximum Permissible Exposure Limits

Table 1A: Occupational/Controlled Exposure

Frequency (MHz)	Power Density (S) (mW/cm^2)
0.03–3	100
3–30	$900/f^2$
30–300	1.0
300–1,500	f/300
1,500–100,000	5.0

Table 1B: General Population/Uncontrolled Exposure

Frequency (MHz)	Power Density (S) (mW/cm^2)
0.03–1.34	100
1.34–30	$180/f^2$
30–300	0.2
300–1,500	f/1,500
1,500–100,000	1.0

MPE Limits for the Public Roads at Mt. Wilson

The FCC's MPE limits for General Population/Uncontrolled exposure apply for the roads on Mt. Wilson. These limits are one-fifth of the biologically-based MPE limits for Occupational/Controlled exposure above 3 MHz. All of the broadcast

systems operate well above 3 MHz as there are no AM radio stations on the mountain.

It is important to understand that MPE limits for General Population/Uncontrolled exposure are *regulatory* limits, *not* safety limits. The primary reason for having two sets, or tiers, of exposure limits is to provide a buffer to ensure that untrained personnel are not exposed to RF fields above the biologically-based MPE limits for Occupational/Controlled exposure. The major RF safety concern with RF energy is that the exposure to high levels of RF energy can cause heating over a short period of time. This can occur, for example, if a person were to climb a tower and get directly in front of an FM radio or television antenna. Even at very high energy levels, both biology and the regulations allow for time averaging. All the major worldwide standards and regulations, including those of the FCC, evaluate a person's exposure based on the average exposure over any six-minute interval of time. This is because it takes some time to heat a human body.

In contrast, regulatory limits that are not biologically-based, such as the FCC's MPE limit for General Population/Uncontrolled exposure, are usually not time averaged in practice since the personnel involved have little or no knowledge of RF safety issues and can not be expected to understand how to make use of time averaging as a mitigation procedure. The FCC requires personnel to be properly trained in RF safety and meet the FCC's criteria for ***fully aware*** personnel who are able to ***exercise control*** over their exposure in order to qualify for the use of the MPE limit for Occupational/Controlled exposure and its six-minute time averaging.

The previous reports by Aurora Industrial Hygiene, the most recent dated October 28, 2009, state that a time averaging interval of six minutes is applicable for the roads on Mt. Wilson.

This is incorrect!

Occupational Safety and Health Administration (OSHA) Regulations

OSHA still has an outdated standard on its books that is based on the first American National Standards Institute (ANSI) standard developed in the 1960s. This is a single-tier standard that suggests limiting exposure to 10.0 mW/cm² at all frequencies. The FCC limits are far more restrictive. Under the "General Duty" clause of its regulations, OSHA has been using modern, "consensus" standards, such as the FCC's, as a model for enforcement. OSHA defined its position relative to the FCC Regulations in a reply to an official request from the Personal Communications Industry Association (PCIA) in October 1998. In essence, OSHA went on record stating that, while it was not relinquishing its role as the agency responsible for worker health, organizations that satisfy FCC requirements would also satisfy OSHA requirements. Refer to *Appendix: OSHA/PCIA Correspondence.*

This may be the official position of OSHA, but the evaluator could not identify the corresponding compliance directive. Therefore, local OSHA offices may not be aware of it. For this reason, only FCC MPE limits are considered in this RF Safety Report.

RF Survey Equipment and Measurement Techniques

RF Survey Equipment

The RF survey equipment used to make the measurements cited in this report was manufactured by Narda Safety Test Solutions, an L-3 Communications Corporation company located in Hauppauge, New York. The equipment was in excellent operating condition. The consultants are both very familiar with this equipment and its operation. A survey instrument is comprised of a probe (the sensor), a meter, a cable, and a shielded bag used as a "zero field" reference.

DESCRIPTION	MODEL	SER. NO.
Electric Field Probe, 300 kHz to 3 GHz, 600% full scale	B8742D	05003
RF Survey Meter	8718B	D0001
Electric Field Probe, 300 kHz to 3 GHz, 600% full scale	B8742D	08004
RF Survey Meter	8715	12009

ABOVE: The Narda Safety Test Solutions Model 8715 Survey Meter is used with all 8700 series probes. It has spatial-averaging capability. This is the meter used by Richard Strickland of RF Safety Solutions.

LEFT: The Narda Safety Test Solutions Model 8718B meter is used with all 8700 series probes. It has time-averaging capability to facilitate spatially averaged measurements. This is the meter used by David Pinion of Hatfield & Dawson Consulting

These are two Narda Safety Test Solutions 8700 series probes. The larger probe is the Model B8742D that was used by both consultants to survey the roads at the Mt. Wilson Broadcast Transmission Facility described in this report. This probe operates over a frequency range of 300 kHz to 3 GHz. The full-scale rating is 600 percent of the FCC's MPE limits for General Population/ Uncontrolled exposure.

Model B8742D Probe

Measurements

Measurement Range of B8742D Probe

The shaped-frequency response Model B8742D probe has frequency-dependent sensitivity that closely conforms to the FCC's MPE limits for General Population/ Uncontrolled exposure. Thus, it is not important to know the operating frequencies of the equipment being measured providing that they operate within the broad frequency limits of the probe—300 kHz to 3 GHz. All the significant emitters at the Mt. Wilson Antenna Farm operate within this frequency range.

The measurement range is approximately 30 dB, or 1,000:1. Therefore, the smallest RF field level that can be measured accurately is about 0.6 percent of the MPE limits for General Population/Uncontrolled exposure.

Calibration

The accuracy of any survey system comprised of a meter and probe in the Narda Safety Test Solutions 8700 Series is entirely dependent on the probe, or sensor. The meter uses a low DC voltage from the amplifier in the handle of the probe to determine what is displayed on the meter. The only important thing to do is to select the correct probe or full-scale measurement range so that the meter correctly interprets the output of the probe. There are no calibration adjustments inside any of the meters because they use an extremely accurate internal voltage reference device.

All calibration and adjustments are made with the probe. Any 8700 series probe can be used with any 8700 series meter with no impact on calibration accuracy. The United States Armed Forces and most of the armed forces around the world

use the Narda 8700 series system. Accuracy and interchangeability are two of the main factors in the system's popularity.

The model B8742D probe is the probe of choice by professionals in the United States when there is a need to make measurements in multi-signal environments such as broadcast antenna farms.

This probe is initially calibrated at 100 MHz and then checked at 13 other frequencies. If needed, an adjustment is made to the amplifier gain so that the probe reads within its specified tolerance at all test frequencies.

The Hatfield & Dawson probe used by Dave Pinion was set so that there is no correction factor at 100 MHz and very little variance across the broadcast band. It was last calibrated in December 2010.

The RF Safety Solutions probe used by Richard Strickland has a correction factor of 1.08 at 100 MHz. This means that if one knows that the majority of the energy is from FM radio stations, then it is appropriate to add 8 percent to any readings. This probe was last calibrated in February 2010.

Numerous checks were made side-by-side with the two probes. Once the correction factor was applied to the RF Safety Solutions probe, it was difficult to see a difference in the readings between the two survey sets. Nonetheless, all readings in areas where the RF fields exceeded 70 percent of the MPE limit were made with the Hatfield & Dawson probe since it had been calibrated most recently.

Measurement Techniques

Three different techniques were used to make measurements:

- **Search for Peak Field Levels:** Both surveyors moved their probes in an oscillatory manner to cover the largest volume of space possible. In areas of significant fields, defined as areas where any peak levels of 50 percent of the MPE limit were detected, the entire area, including the entire width of the road, was covered twice. In the areas with the highest RF field levels, which were found on Video Road between the Post Office and the Poole Building, the surface of the road was covered three times.

- **Standard Spatial Averaging:** A minimum of three spatially averaged measurements were made at each point where significant peak field levels were found. Additional measurements were made when the results of the first three measurements were not within a range of 10 percent.

- **Enhanced Spatial Averaging:** This technique was used in the small area near the Post Office where the highest RF field levels were found. The concept of this technique was to average out the influence of the surveyor's body, reflections off the body and other objects, and any subtle variations in the probe's sensitivity that is related to position. In this technique, a spot on the road below the point where the highest peak RF field level was detected was marked. Four spatially averaged measurements were then made while the surveyor moved only his arm and the probe. Then, the surveyor moved 90 degrees while holding the

probe over the same spot on the road and made four more measurements. The process was then repeated two more times so that a total of 16 spatially averaged measurements were made. The result is the average of those 16 measurements.

Comparison of Peak versus Spatially Averaged Measurements

A leading measurement expert at the Federal Communications Commission has stated that, in his experience, the value of a spatially averaged RF field at a multi-signal broadcast antenna site is typically about 60 percent of the peak field. Dave Pinion believes that it is closer to 50 percent, and Richard Strickland uses a range of 50 to 70 percent. Using these ratios, a survey that reports a peak field strength of 280 μW/cm² most likely has a spatially averaged field less than the MPE limit of 200 μW/cm².

The comments filed with the FCC regarding the reasons for using spatial averaging at complex broadcast transmission sites and a detailed description of the technique are shown in the note below.

Comments on ET Docket No. 03-137, NPRM on RF Exposure
Topic: Spatial Averaging

The RF field levels from a TV or FM broadcast antenna are normally quite low at ground level and increase as a function of elevation above the ground with a maximum occurring at an elevation of λ/4 above the ground. For FM stations, this means that the peak fields occur at roughly 2½ feet above the ground. The field intensity then drops off as the elevation is increased. The ratio of field strength from peak to null is typically 8:1 or greater.

Multi-signal environments, typical of the many broadcast antenna farms, are far more complicated because of the various wavelengths and the interactions that take place between fields near ground level. ***Field levels in these environments vary dramatically in all three dimensions and as a function of time.*** Even spatially averaged measurements will not be totally repeatable. Field levels also vary due to the interaction of the surveyor's body with the field.

Even with all these variables to be considered, spatially-averaged measurements will be far less variable and more meaningful than making measurements based on looking for spatial peaks.

Modern survey instruments are designed to make literally hundreds of measurements during a single spatial average. The technique employed is simple. Pressing a key on the instrument begins data acquisition at a fixed rate that continues until another (often the same) key is pushed. A typical logging rate is 32 data points per second. Thus, if a surveyor moves the probe in a vertical line over about 10 seconds, the resultant spatial average will be based on more than 300 measurements. If the movement of the probe is at a reasonably constant speed, then the spacing between measurements will be similar.

Comparison of Measurements: Shaped versus Flat Response Probes

The FCC's MPE limit varies with frequency as is the case for all the major RF safety standards worldwide. For example, the MPE limit for General Population/ Uncontrolled exposure is 200 μW/cm² from 30 MHz to 300 MHz, which includes the FM radio band and VHF television channels 2 through 13.

Since the conversion to digital television, there are far fewer VHF television stations than prior to the conversion and many more UHF stations. The MPE limit increases linearly above 300 MHz to 1,500 MHz, which includes all the UHF television channels. For example, the MPE limit is 313 μW/cm² for Channel 14, 400 μW/cm² for Channel 35, and even higher for Channels 36 and above.

The impact of using a flat frequency response probe rather than a shaped frequency response probe can be very significant. For example, assume that one of the measurements made by Aurora Industrial Hygiene was made in an area where there were only two significant sources of RF energy—an FM radio station and a television station broadcasting on Channel 35 (596 to 602 MHz). Assume that an accurate spatially averaged measurement was made (*which is not the case, since the peak values were documented*), and that the total field strength is 240 μW/cm². The flat probe does not differentiate between the signals even though the operating frequency of the TV station is roughly six times higher than the FM station and the MPE limit is double. Therefore, this finding is reported as 220 percent of the MPE limit for General Population/Uncontrolled exposure.

However, assuming that a significant portion of the energy is from each of the two stations stations, these results are incorrect. Assuming that half the energy is from each station, the *correct result* is 90 percent[2] of the MPE limit for General Population/Uncontrolled exposure.

If one were to then factor in that the spatially averaged measurement is typically about 60 percent of the peak value, then the spatially averaged field strength would be about 54 percent of the MPE limit. Obviously, this value is fully compliant with the FCC Regulations while the results based on peak values measured with a flat probe would indicate an out-of-compliance situation.

[2] The calculation in this example is: 120 μW/cm² versus the MPE limit of 200 μW/cm² for the FM station equals 60 percent of the MPE limit. The same value of 120 μW/cm² for a Channel 35 television is compared to an MPE limit of 400 μW/cm² and is therefore equal to 30 percent of the limit. The total for the area measured is therefore 90 percent of the MPE limit, *not 120 percent* as would be reported by someone using a flat frequency response probe.

Section
3

Risks and Recommendations

There Are No RF Safety Concerns on the Roads

Risks

There are neither RF safety nor regulatory compliance risks for anyone who remains at ground level.

There is a risk of exposure to significant, and potentially hazardous, levels of RF energy for anyone who ascends any of the towers in the central area of the Mt. Wilson antenna farm. Tower climbers may be exposed to significant levels of RF energy from antennas on the tower that they are climbing and/or antennas on nearby towers.

Recommendations

Recommendations for Roads and Ground Areas

There are no recommendations for any of the roads or the ground areas of the Mt. Wilson antenna farm. This is because, based on the criteria for determining safety and compliance defined in the *Compliance and Safety* section of the *Executive Summary,* there are neither safety nor regulatory compliance concerns in these areas.

Recommendations for Tower Climbing

It is recommended that Mt. Wilson Stakeholders Group and other licensees operating at the Mt. Wilson antenna farm:

- **Update the analysis of on-tower RF field levels and mitigation requirements that can be used to ensure that tower climbers are not exposed to excessive levels of RF energy.**

- **Develop a unified RF safety program that includes coordination procedures for notifying other licensees when the need for work on any of the towers is anticipated.**

Appendix: OSHA/PCIA Correspondence

Letter from Personal Communications Industry Association (PCIA) to Department of Labor Occupational Safety and Health Administration (OSHA), September 3, 1998:

The Personal Communications Industry Association (PCIA) wrote this letter to obtain written confirmation from OSHA concerning that organization's position relative to the FCC's 1997 RF Safety Regulations. The FCC, OSHA, and PCIA met a few days prior to the writing of this letter to try to get a definitive position statement from OSHA. Up until this point, OSHA had been giving out often confusing and conflicting information on what it required for compliance with RF safety regulations, especially within the communications industry.

Letter from Occupational Safety and Health Administration (OSHA) to Personal Communications Industry Association, October 5, 1998:

This is OSHA's official response to the PCIA letter dated September 3, 1998. While maintaining its legal rights, the letter in essence clearly states that it will accept full compliance with the FCC's 1997 RF Safety Regulations as fully satisfying OSHA in this area. The letter states "For purposes of construction or maintenance activities, OSHA will consider employers who are in compliance with the FCC standards as they relate to employee RF exposure to be in compliance with OSHA requirements."

Personal Communications Industry Association

September 3, 1998

Mr. Charles N. Jeffress
Assistant Secretary of Labor
Occupational Safety and Health Administration
Room S2315
200 Constitution Avenue
Washington, D.C. 20210

Dear Mr. Jeffress:

I write on behalf of the Personal Communications Industry Association ("PCIA") to request confirmation of the position recently conveyed verbally to certain PCIA members in a recent meeting with staff of the Occupational Safety and Health Administration ("OSHA") regarding compliance with radiofrequency ("RF") radiation criteria.

As you know, each of OSHA and the Federal Communications Commission ("FCC") has certain responsibility for assuring compliance with federal RF regulations. The FCC has already promulgated regulations pursuant to ET Docket 93-62. Recently, certain of our members were advised that, while OSHA has not yet developed regulations of its own regarding RF criteria, and while it may promulgate regulations in the future, it has no current criteria to apply. In view of this vacuum, query was made as to whether OSHA would view compliance with FCC regulations as being sufficient to constitute effective compliance with OSHA requirements.

As I understand it, non-binding response was provided by OSHA staff to the effect that, at least in so far as compliance with OSHA regulations governing RF exposure involving construction of telecommunications facilities is concerned, compliance with FCC RF regulations would currently be viewed as constituting compliance with OSHA requirements. The staff was careful to make clears that OSHA still may promulgate alternative criteria in the future, that this position involves only construction (i.e., construction of new sites and modifications including painting of existing sites) and that compliance with RF criteria would not in of itself obviate the need for compliance with non-RF regulations governing other matters. Needless to say, the staff's informal comment was very useful and very well received by PCIA members.

● 500 Montgomery Street ● Suite 700 Alexandria, VA 22314-1561 ●
● Tel: 703-739-0300 ● Fax: 703-836-1608 ● Web Address: http//www.pcia.com ●

PCIA will be hosting its annual convention during the week of September 21, 1998. At that time, we will have the attention of a considerable portion of the wireless telecommunication industry. We very much want to be able to advise them of OSHA's position as discussed above, but believe that it would be much more meaningful if conveyed via letter to me under your signature. We also believe that, by setting forth your views on compliance in this matter, you would further compliance by the telecommunications industry with both FCC established criteria and with the requirements that are effectively being applied by OSHA. Accordingly, we respectively ask that you write to confirm our understanding as set forth above.

In the event that should have any questions with respect to this matter, please feel free to contact me directly. Permit me to also thank you in advance for your efforts on this very important matter.

Very truly yours,

Jay Kitchen
Executive Director
Personal Communications Industry Association

cc: D. Morgan

U.S. Department of Labor

Occupational Safety and Health Administration
Washington, D.C. 20210

October 5, 1998

Mr. Jay Kitchen
Executive Director
Personal Communications Industry Association
500 Montgomery Street
Suite 700
Alexandria, VA 22314-1561

Dear Mr. Kitchen:

This is in response to your letter of September 13, 1998, from Personal Industry Association (PCIA) members regarding compliance with radiofrequency ("RF") radiation criteria. I understand that your representatives, as well as a representative from the Federal Communications Commission (FCC) recently met to discuss the subject with staff members from OSHA's Directorate of Compliance and Construction and were telephonically connected with Bob Curtis of our Technical Support Directorate in Salt Lake City. You ask in your letter for written verification that compliance with FCC Regulations regarding RF be viewed as constituting compliance with OSHA requirements.

OSHA understands that the FCC does not dispute OSHA's exercise of jurisdiction over employers with employees who may be exposed to RF. OSHA does have limited standards which apply both to general industry and to construction, covering employee exposure to non-ionizing radiation (see 29 CFR 1910 97 and 1910.268(p) for general industry and 29 CFR 1926.54 for construction). However, these standards are over 30 years old and neither reflect current technology in the communications industry nor provide the level of employee protection from exposure to RF currently promulgated by the FCC. It has been and continues to be OSHA's policy to recognize state and federal standards which are more protective than current OSHA Regulations as constituting compliance with our requirements. For purposes of construction or maintenance activities, OSHA will consider employers who are in compliance with the FCC standards as they relate to employee RF exposure to be in compliance with OSHA requirements. If an employer is not in compliance with the FCC's standards, OSHA will enforce current OSHA standards but may also enforce Section 5 (a)(I) of the OSH Act to the extent that the FCC standards address serious, recognized hazards not covered under OSHA's requirements.

As discussed in the meeting with PCIA representatives and reiterated in your letter, although not on our current regulatory agenda, OSHA may promulgate alternative criteria in the future. In the meantime, the enforcement stated in the preceding paragraph covers construction activities (i.e., tower/site construction, major equipment installation and/or replacement, painting operations, and other such construction activities) as well as routine tower maintenance activities. Finally, employers will continue to be responsible for complying with all other OSHA standards on their worksites.

We have accepted the invitation from your representative to participate in a panel discussing RF compliance at your annual convention during the week of September 21, 1998. Bob Curtis from our Salt Lake City Technical Laboratory represented OSHA on that panel and was available for questions from the attendees. We trust that this letter of confirmation of our position on RF compliance and Bob's expertise on the subject addressed your concerns and those of your constituents and members. If you have questions regarding this letter, please contact Berrien Zettler of the Directorate of Construction on 202-219-8644.

Sincerely,

Russell B. Swanson, Director
Directorate of Construction