

**Sutro Tower, Inc. • San Francisco, California**  
**– Auxiliary Operation –**

**Statement of Hammett & Edison, Inc., Consulting Engineers**

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by Sutro Tower, Inc. to evaluate RF exposure levels near the Sutro Tower broadcast site, One La Avanzada Street, San Francisco, California, for compliance with appropriate guidelines limiting human exposure to radio frequency electromagnetic fields.

**Background Information**

Sutro Tower is located near Mt. Sutro in San Francisco, California, and currently supports the auxiliary transmitting facilities for ten full-service TV stations, one low power TV station, and four FM stations. As part of the final DTV antenna installation project, Sutro Tower agreed to provide the neighborhood associations with measurement data of existing RF exposure levels at 200 locations within a 1,000-foot radius of the Tower within two weeks of the activation of any new DTV antenna, or within two weeks of any DTV antenna power increase, or every three years, whichever is earliest.\* There have been a number of changes since our last measurements in 2018, as summarized in the table below:

<u>TV Station</u>	<u>2018 Channel</u>	<u>Existing Channel</u>
KRCB(TV)	Not at site	D05
KRON-TV	D38	D07
KGO-TV	D07	D12
KQTA-LD	Not at site	D14
KPJK(TV)	D43	D27
KTVU(TV)	D44	D31
KBCW(TV)	D45	D28
KCNS(TV)	D39	D32

**Prevailing Exposure Standards**

The U.S. Congress requires that the Federal Communications Commission (“FCC”) evaluate its actions for possible significant impact on the environment. In Docket 93-62, effective October 15, 1997, the FCC adopted the human exposure limits for field strength and power density recommended in Report No. 86, “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements (“NCRP”). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers IEEE C95.1-2019, “IEEE Standard for Safety Levels

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\* Due to the coronavirus pandemic, social distancing requirements, and shelter-in-place limitations associated therewith, Sutro Tower, Inc. was unable to meet this deadline. Accordingly, with the concurrence of the City of San Francisco Planning and Public Health Departments, as well as the neighborhood associations, the measurements were delayed.



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with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz,” includes similar exposure limits. A summary of the FCC’s exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

**Measurement Procedure**

The site was visited by the undersigned engineer and by Mr. Scott Walthard, a qualified field technician, both employed by Hammett & Edison, Inc., during regular business hours on April 8, 2021, a non-holiday weekday, when all stations were operating from their auxiliary antennas. As required by the City and County of San Francisco, the measurements were overseen by a qualified California Professional Engineer, Dr. Andrew Afflerbach from CTC Technology & Energy.

Measurements were made at 208 locations within a 1,000-foot radius of Sutro Tower, as shown in Figure 2A, including all residential streets, and at four locations near the Twin Peaks observation area, as shown in Figure 2B. Measurements were taken at a typical spacing of about 60–75 feet along the streets, although variations occurred due to topography and street layout. Measurements were made using a Narda Type NBM-520 Broadband Field Meter with Type EF-0391 and Type EA-5091 Isotropic Broadband Electric Field Probes (Serial Nos. D-0454 and 01035, respectively). The meter and probes were under current calibration by the manufacturer.

The Type EF-0391 probe provides results in volts/meter (V/m) and is calibrated for exposure of levels down to 0.2 V/m (0.005% of the most restrictive public limit); measurement results using that instrument are expressed as a percentage of the most restrictive FCC limit (0.2 mW/cm<sup>2</sup>). The Type EA-5091 probe is capable of providing results directly as a percent of the applicable FCC exposure limit and is calibrated for exposure of levels down to 2.5% of the limit. Because this probe provides results directly as a percent of the applicable FCC limit, its results are more precise than those provided by the Type EF-0391 probe. Both probes are broadband devices, which means that they measure all radio frequency sources, not just the broadcast operations at Sutro Tower.



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The specifications of the auxiliary DTV and FM antennas, as operating during the measurements, are as follows:

Station	Channel	Effective Radiated Power	Antenna Make & Model	Center Height Above Sea Level
KRCB(TV)	D05	27.5 kW	Jampro JHD-LV2-2/2	414.5 m
KRON-TV	D07	65	Dielectric TLS-V8/VP-R C160	472.1
KGO-TV	D12	70	Dielectric TLS-V8/VP-R C160	472.4
KQTA-LD	D14	15	} Dielectric TUA-C4SP-12/40U-1-S	402.3
KPJK(TV)	D27	500		
KPIX-TV	D29	500		
KTVU(TV)	D31	427.9	} Dielectric TUA-C4SP-12/40U-1-S	387.8
KBCW(TV)	D28	500		
KQED(TV)	D30	500		
KCNS(TV)	D32	500		
KFSF-DT	D34	250		
KQED-FM	203	58	Dielectric DCRS8D50PF	495.0
KOIT(FM)	243	36	ERI SHP-6AC-HW	443.0
KSOL(FM)	255	6.1	Shively 6813-NP	302.1
KNBR-FM	283	8.9	ERI MPX-4C-W	451.0

**Measurement Results**

The maximum RF exposure level measured at any of the 212 locations surrounding Sutro Tower, when all auxiliary antennas are operating, was 29% of the applicable FCC public exposure limit. A tabulation of measurement results at each of those locations is provided in Figure 3.

**Conclusion**

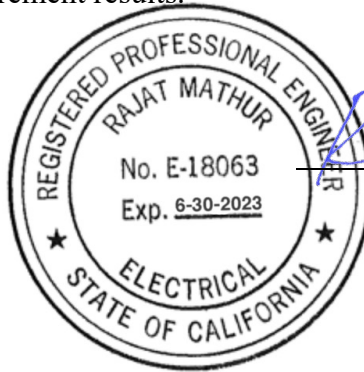
It is my professional opinion that the TV and FM broadcast stations at Sutro Tower continue to comply with prevailing standards for limiting public exposure to radio frequency energy.

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**Figures**

In carrying out these engineering studies, the following attached figures were prepared under my direct supervision:

1. Summary of FCC RF exposure guidelines (FCC Radio Frequency Protection Guide),
2. Map showing measurement locations,
3. Table showing measurement results.



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Rajat Mathur, P.E.  
707/996-5200

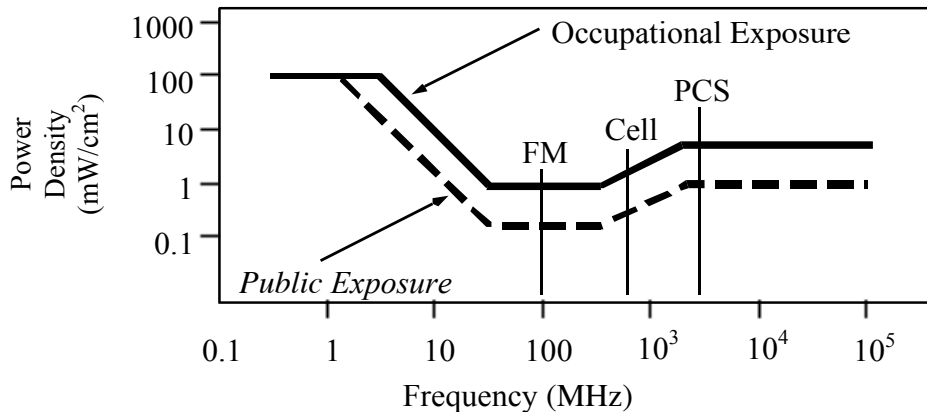
July 26, 2021

## FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission (“FCC”) to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements (“NCRP”). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, “Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” includes similar limits. These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:

Frequency Applicable Range (MHz)	Electromagnetic Fields (f is frequency of emission in MHz)					
	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm <sup>2</sup> )	
0.3 – 1.34	614	<i>614</i>	1.63	<i>1.63</i>	100	<i>100</i>
1.34 – 3.0	614	<i>823.8/f</i>	1.63	<i>2.19/f</i>	100	<i>180/f<sup>2</sup></i>
3.0 – 30	1842/f	<i>823.8/f</i>	4.89/f	<i>2.19/f</i>	900/f <sup>2</sup>	<i>180/f<sup>2</sup></i>
30 – 300	61.4	<i>27.5</i>	0.163	<i>0.0729</i>	1.0	<i>0.2</i>
300 – 1,500	3.54√f	<i>1.59√f</i>	√f/106	<i>√f/238</i>	f/300	<i>f/1500</i>
1,500 – 100,000	137	<i>61.4</i>	0.364	<i>0.163</i>	5.0	<i>1.0</i>

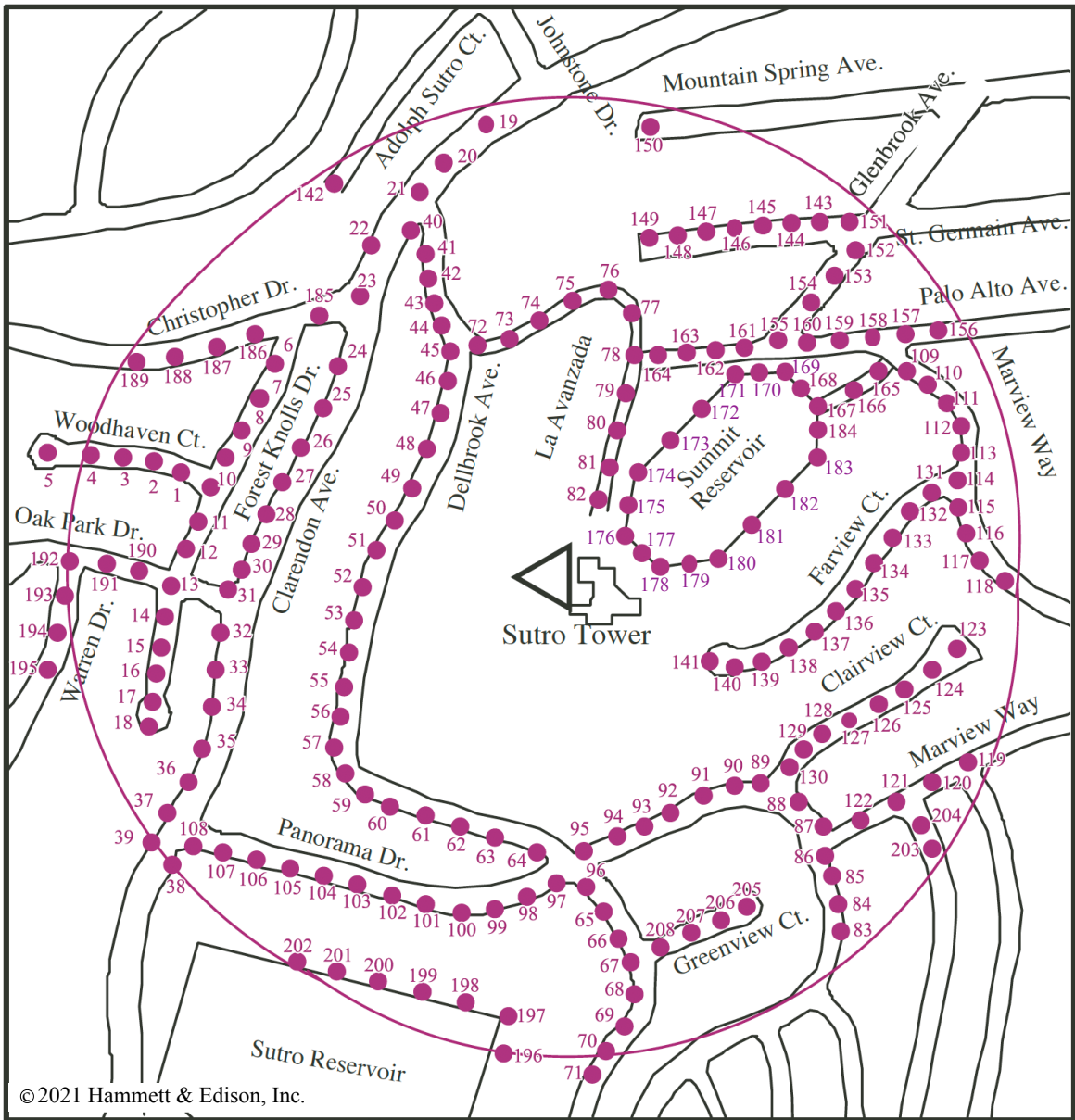


Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits.



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**Measurement Locations**



**Purple circle** represents 1,000-foot radius from Sutro Tower.  
**Purple dots** denote locations for measurement results in Figure 3.

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Measurement Locations



Purple dots denote locations for measurement results in Figure 3.

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**Measured Peak RF Exposure Levels**  
**April 8, 2021**

Location	Percent FCC Limit*	Location	Percent FCC Limit*	Location	Percent FCC Limit*
1	1.4	41	0.58	81	4.6†
2	1.6	42	0.58	82	11.0†
3	1.6	43	0.53	83	1.7
4	1.9	44	0.76	84	1.5
5	1.4	45	1.5	85	1.4
6	0.70	46	1.6	86	2.1
7	0.53	47	2.8	87	2.7
8	0.90	48	2.7	88	2.6
9	1.4	49	3.3	89	1.3
10	1.4	50	1.4	90	1.4
11	2.5	51	1.9	91	1.3
12	1.9	52	1.4	92	1.4
13	2.3	53	2.7	93	1.4
14	1.6	54	2.6	94	1.1
15	1.4	55	1.2	95	0.97
16	1.6	56	1.0	96	1.3
17	0.97	57	1.2	97	1.0
18	0.83	58	0.90	98	0.43
19	0.30	59	1.4	99	0.64
20	0.34	60	1.4	100	0.70
21	0.38	61	0.97	101	0.90
22	0.48	62	1.1	102	1.1
23	0.58	63	1.1	103	1.2
24	0.64	64	1.1	104	0.76
25	1.1	65	1.7	105	0.26
26	0.83	66	1.2	106	0.34
27	0.58	67	1.3	107	0.38
28	0.97	68	1.6	108	0.34
29	0.70	69	0.90	109	3.9
30	0.58	70	0.34	110	1.8
31	0.83	71	0.22	111	1.9
32	1.1	72	0.70	112	2.5
33	0.53	73	0.76	113	0.43
34	0.38	74	0.43	114	2.1
35	0.43	75	0.90	115	0.76
36	0.48	76	0.43	116	0.83
37	0.90	77	1.0	117	1.4
38	0.38	78	2.1	118	0.97
39	1.0	79	2.9	119	1.2
40	0.30	80	3.7	120	0.90

\* Expressed as percent of most restrictive FCC limit of 0.2 mW/cm<sup>2</sup>, except as noted.

† Expressed as percent of applicable public limit for frequencies involved; Type EA-5091 probe used.





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**Measured Peak RF Exposure Levels**  
**April 8, 2021**

Location	Percent FCC Limit*	Location	Percent FCC Limit*	Location	Percent FCC Limit*
121	1.2	159	4.2	197	0.22
122	0.76	160	1.4	198	0.19
123	1.7	161	0.97	199	0.22
124	2.7	162	0.58	200	0.26
125	1.6	163	2.7	201	0.34
126	1.8	164	1.6	202	0.19
127	1.5	165	5.0†	203	2.2
128	1.7	166	3.5†	204	2.2
129	1.5	167	2.6	205	1.7
130	2.0	168	2.3	206	1.2
131	2.2	169	2.9	207	1.4
132	2.8	170	4.9	208	1.1
133	2.7	171	8.5†	209	2.5
134	1.7	172	4.1†	210	5.5†
135	2.8	173	4.0†	211	2.5
136	0.97	174	3.8†	212	3.1†
137	2.1	175	29†‡		
138	2.2	176	15†		
139	1.6	177	18†‡		
140	2.8	178	17†		
141	2.9	179	8.0†		
142	0.64	180	9.5†		
143	3.6	181	5.0†		
144	2.1	182	7.0†		
145	0.58	183	5.0†		
146	0.38	184	<2.5†		
147	0.53	185	1.4		
148	0.90	186	2.1		
149	0.97	187	0.90		
150	0.53	188	0.64		
151	3.3	189	0.90		
152	3.5†	190	1.4		
153	<2.5†	191	1.9		
154	3.2	192	1.7		
155	1.1	193	0.38		
156	3.9	194	0.22		
157	<2.5†	195	0.26		
158	6.0†	196	0.34		

\* Expressed as percent of most restrictive FCC limit of 0.2 mW/cm<sup>2</sup>, except as noted.

† Expressed as percent of applicable public limit for frequencies involved; Type EA-5091 probe used.

‡ The spatially averaged levels at Locations 175 and 177 were 17% and 12%, respectively, of the FCC public limit. As allowed by the FCC, measurements may be averaged over the human body. The meter and probe used conveniently provide spatially averaged results when moved across heights, typically from about 1 foot to 6½ feet above ground.

