

***COMPREHENSIVE TECHNICAL EXHIBIT***  
***APPLICATION FOR***  
***MODIFICATION OF CONSTRUCTION PERMIT***

---

FM TRANSLATOR STATION K269FB  
SAN FRANCISCO, CALIFORNIA  
101.7 MHz / 0.250 kW DA

IHR EDUCATIONAL BROADCASTING

DECEMBER, 2015

## **APPLICATION FOR MODIFICATION OF CONSTRUCTION PERMIT**

The following engineering statement and attached exhibits have been prepared for **IHR Educational Broadcasting** ("IHR"), licensee of FM translator station K269FB at Sausalito, California, and are in support of their application for modification of construction permit.<sup>1</sup> This application seeks to modify the current construction permit for the facility, which is under FCC File No. BPFT-20131217DGV. This application seeks to relocate the facility, and to change the community of license from Sausalito, California to San Francisco, California.

The proposed facility would operate with a maximum effective radiated power of 240 Watts at a center of radiation of 194.3 meters AMSL from the site that has been assigned antenna structure registration number 1023253. Since the elevation at the site is 105.3 meters AMSL, the proposed center of radiation would be 89.0 meters AGL.

In order to provide required contour protection to other facilities in the region, IHR will continue to utilize a directional antenna for the proposed facility. The antenna to be utilized is a single Kathrein-Scala CA5-FM/CP/RM yagi style antenna. This antenna is circularly polarized, and is to be oriented at an azimuth of 242 degrees true.

The proposed facility would continue to serve as a fill-in translator for AM station KSFB at San Francisco, California.<sup>2</sup> Exhibit E-1 illustrates the proposed 60 dBu service contour for KSFB along with the 2.0 mV/m daytime service contour for KSFB, and a forty-kilometer (twenty-five mile)

---

<sup>1</sup> The Facility ID for K269FB at Sausalito, California is 147348.

<sup>2</sup> The Facility ID for KSFB at San Francisco, California is 6369. The licensee of KSFB is IHR.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

radius centered on its transmitter site. As this exhibit demonstrates, the predicted 60 dBu service contour would be wholly contained within both of these constructs.

The proposed modification to the construction permit would be a minor change to the existing construction permit, and also to the license.<sup>3</sup> Exhibit E-2 provides a comparison between the proposed, authorized, and licensed 60 dBu service contours. As this map demonstrates, the proposed 60 dBu contour would overlap with both the licensed and construction permit contours.

The proposed facility complies with the provisions of Section 74.1204 of the Commission's Rules to relevant facilities in the region. Section 74.1205 is not applicable to the facility due to the channel of operation. The provisions of Section 74.1204(d) will be utilized relative to some of the facilities under consideration.

Exhibit E-3 is a tabular interference study for the proposed K269FB facility. This study demonstrates that the proposed facility would comply with the contour overlap provisions of Section 74.1204 to all facilities within the exception of KIOI(FM), KRBQ(FM), and KRBQ-FM2, which are all located at San Francisco, California. A graphical overview of this tabular study is contained in Exhibit E-4, with additional detail in the vicinity of the KKIQ 60 dBu service contour in Exhibit E-5.

Three facilities require additional consideration pursuant to Section 74.1204(d) of the Commission's Rules. These three facilities, which are KIOI, KRBQ, and KRBQ-FM2, operate on channels second adjacent to the channel of operation for K269FB. Exhibit E-6 illustrates the

---

<sup>3</sup> The File No. for the current K269FB license is BLFT-20120410AEF.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

location of the proposed K269FB site along with various FCC service contours of those three facilities. Specifically the three service contours illustrated are 98.5 dBu F(50,50) for KIOI, 97.5 dBu F(50,50) for KRBQ, and 63.3 dBu for KRBQ-FM2. As is indicated each of these service contours intersects the proposed transmitter site.

KIOI and KRBQ will be considered initially. Since both of these facilities are second adjacent to K269FB, as was previously stated, interference to either is predicted to occur when the field strength of K269FB is at least 40 dBu above the field strength of either facility. Specifically interference to KIOI may occur when the translator field strength is at least 138.5 dBu, and to KRBQ when at least 137.5 dBu.

The limit to KRBQ is more restrictive than the limit to KIOI. Thus, if the facility complies with the requirements of Section 74.1204(d) to the former, it can logically be inferred that it will comply with those requirements to the latter. Thus, when analyzing these two facilities, the limit to KRBQ will be considered for both.

The power density for the proposed facility at the interfering field strength is given by the following equation:

$$S = \frac{E^2}{Z_0}$$

In this equation, S represents the calculated power density in Watts per square meter, E is the electric field intensity, and  $Z_0$  is the characteristic impedance of free space of 377 ohms.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

The power density is also given by:

$$S = \frac{P}{4\pi R^2}$$

Where S is the same units, P is the power in Watts, and R is the distance. Rearranging the terms in the equation, it can be solved for the distance to the desired power density as follows:

$$R^2 = \frac{P}{4\pi S}$$

The results of these calculations for depression angles of 0 degrees to 90 degrees are tabulated in Exhibit E-7. In addition to the tabular data in that exhibit, Exhibit E-7 also provides several graphs illustrating the calculated interference information. The calculations in this exhibit assume the maximum ERP occurs at all azimuths.

As the form pages indicate, the center of radiation is located at 89.0 meters above ground level. Additionally, the site to be utilized consists of a tower on top of a building. The center of radiation is to be 58 feet or 17.7 meters above the roofline. The roofline is located at 71.3 meters above ground level based on the ASR data. Exhibit E-7 indicates that the lowest elevation of the potential interference region occurs at a depression angles of 32 and 33 degrees where it is 5.2 meters below the center of radiation. Thus, interference is confined to regions 12.5 meters above the roof top of the building. The following image illustrates the tower from street level.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com



From this image, it can be logically inferred that the interference region would not reach the rooftop of the building, and would affect zero population. Additionally, Exhibit E-7 indicates that the maximum horizontal distance to the interference region is approximately 14.5 meters, or 47.6 feet, from the antenna. The photo also implies that zero population would be in this region. It is therefore respectfully submitted that any potential interference would not involve any resident population due to its potential location relative to the proposed antenna location.

The final facility requiring additional consideration is on-channel booster KRBQ-FM2, which is licensed to San Francisco. This booster operates on the same frequency as KRBQ. Interference to the booster would be predicted to occur in regions where the field strength of K269FB is at least 40 dB above the field strength of the booster. Exhibit E-6 demonstrates that by the FCC contour methodology, the KRBQ-FM2 field strength in the vicinity of K269FB is 63.3 dBu.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

12.8.2015

Thus, interference to the booster is predicted to occur in regions where the K269FB field strength is at least 103.3 dBu.

The booster, as stated, operates co-channel to KRBQ. Exhibit E-6 demonstrated that the field strength of KRBQ in the vicinity of the booster is 97.5 dBu. Since co-channel interference is defined by a -20 dB U/D ratio, it can be reasonably inferred that in the immediate vicinity of the K269FB site, the effect of the co-channel interference from KRBQ to its booster will significantly outweigh any potential interference that may occur from the proposed K269FB facility.

The proposed facility is exempt from environmental processing, as it would not constitute a substantial environmental impact. The proposed facility would utilize a tower on the rooftop of an existing building that is registered as an antenna structure with the Commission. The addition of the K269FB antenna to this building would not increase the existing environmental impact from its presence.

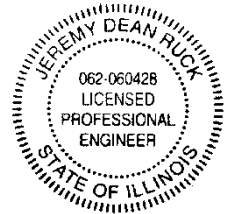
In addition, the proposed facility would not constitute an RF exposure hazard to persons in the vicinity. Under a worst-case scenario, the predicted power density at 2 meters above the rooftop level is  $65.0 \mu\text{W}/\text{cm}^2$ , and at 2 meters above ground is  $2.11 \mu\text{W}/\text{cm}^2$ . Both of these values are less than the upper limit permissible under the uncontrolled environment condition of the Commission's safety standard. IHR certifies that it will coordinate with other users of the site, including building personnel, and reduce power or cease operation as necessary to protect workers in the vicinity of the antenna.

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

The preceding statement and attached exhibits have been prepared by me, or under my direction, and are true and accurate to the best of my belief and knowledge.



Above signature is digitized copy of actual signature  
License Expires November 30, 2015

Jeremy D. Ruck, PE  
December 8, 2015

JEREMY RUCK & ASSOCIATES, INC.

P.O. Box 415  
221 S. 1st Avenue  
Canton, IL 61520

Tel: 309.647.1200  
Fax: 855.332.9537  
jeremyruck.com

12.8.2015



**K269FB.X**

BPFT20131217DGV

Latitude: 37-47-36.30 N

Longitude: 122-24-47.10 W

ERP: 0.24 kW

Channel: 269

Frequency: 101.7 MHz

AMSL Height: 194.3 m

Horiz. Pattern: Directional

Vert. Pattern: No

Prop Model: None

K269FB Proposed 60 dBu  
Service Contour

Jeremy Ruck &amp; Associates, Inc.

KSFB 2 mV/m  
Daytime ContourKSFB 25 mile  
Site Radius

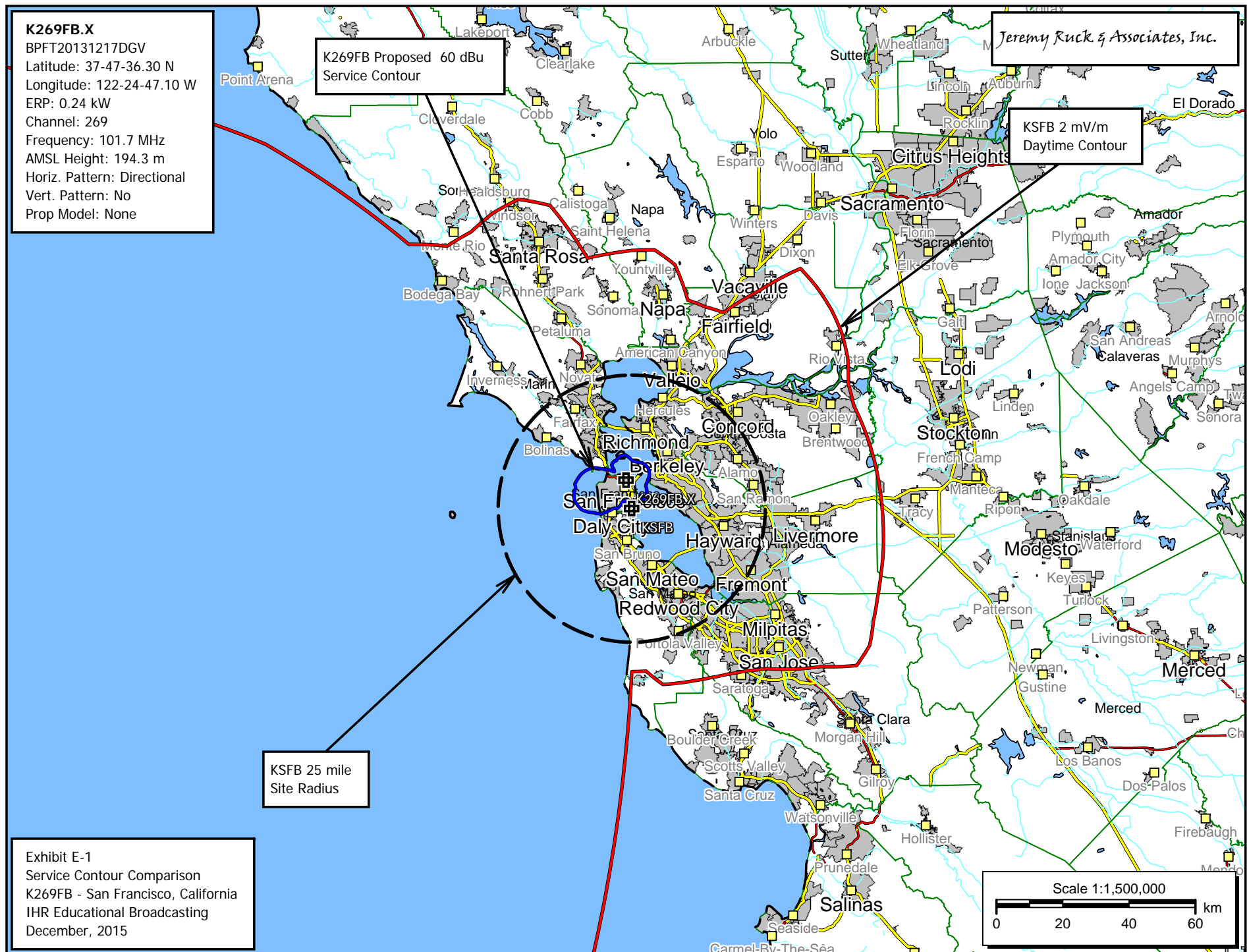
## Exhibit E-1

Service Contour Comparison

K269FB - San Francisco, California

IHR Educational Broadcasting

December, 2015



**K269FB**

BLFT20120410AEF  
Latitude: 37-51-04 N  
Longitude: 122-29-50 W  
ERP: 0.025 kW  
Channel: 269  
Frequency: 101.7 MHz  
AMSL Height: 351.0 m  
Horiz. Pattern: Directional  
Vert. Pattern: No  
Prop Model: None

**K269FB.C**

BPFT20131217DGV  
Latitude: 37-47-54 N  
Longitude: 122-24-59 W  
ERP: 0.25 kW  
Channel: 269  
Frequency: 101.7 MHz  
AMSL Height: 147.0 m  
Horiz. Pattern: Directional  
Vert. Pattern: No  
Prop Model: None

**K269FB.X**

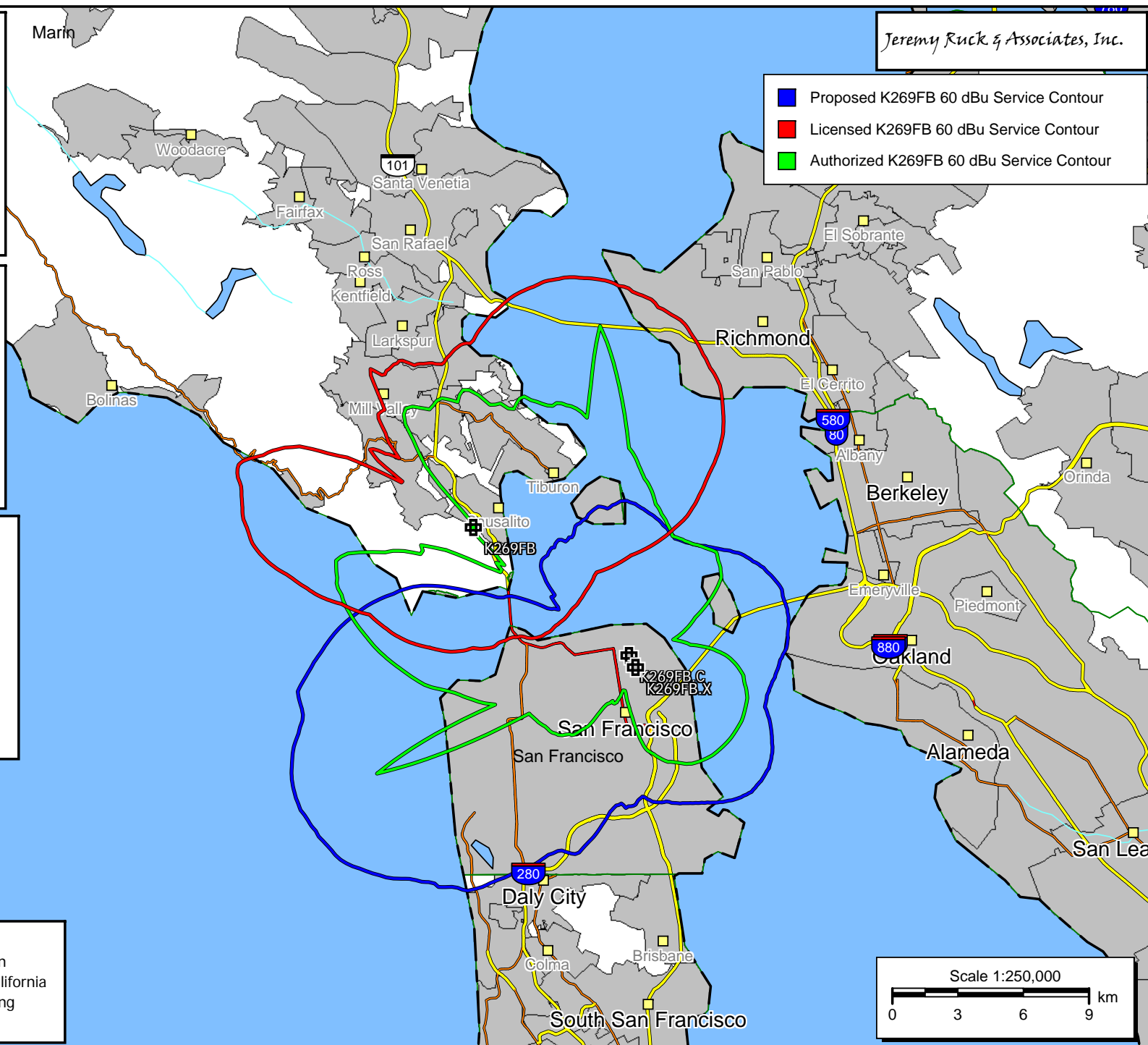
BPFT20131217DGV  
Latitude: 37-47-36.30 N  
Longitude: 122-24-47.10 W  
ERP: 0.24 kW  
Channel: 269  
Frequency: 101.7 MHz  
AMSL Height: 194.3 m  
Horiz. Pattern: Directional  
Vert. Pattern: No  
Prop Model: None

## Exhibit E-2

Service Contour Comparison  
K269FB - San Francisco, California  
IHR Educational Broadcasting  
December, 2015

Jeremy Ruck & Associates, Inc.

- Proposed K269FB 60 dBu Service Contour
- Licensed K269FB 60 dBu Service Contour
- Authorized K269FB 60 dBu Service Contour



Jeremy Ruck & Associates, Inc.  
Consulting Engineers - Canton, Illinois

Exhibit E-3 - Tabular Interference Study  
K269FB - San Francisco, CA  
CH# 269D - 101.7 MHz, Pwr= 0.24 kW DA, HAAT= 168.9 M, COR= 194.3 M  
Average Protected F(50-50)= 16.86 km  
Standard Directional

REFERENCE  
37 47 36.3 N.  
122 24 47.1 W.

DISPLAY DATES  
DATA 12-07-15  
SEARCH 12-07-15

CH CITY	CALL	TYPE STATE	ANT --	AZI <--	DIST FILE #	LAT LNG	PWR(kW) HAAT(M)	INT(km) COR(M)	PRO(km) LICENSEE	*IN* (Overlap in km)	*OUT*
267B San Francisco	KIOI	LIC DCN CA		190.3 10.3	11.68 BLH6225	37 41 24.0 122 26 13.0	125.000 354	10.8 418	90.3 Amfm Broadcasting Licenses	-5.9	-79.2*
271B San Francisco	KRBQ	LIC _CX CA		310.8 130.7	9.78 BMLH20120530ALA	37 51 03.0 122 29 51.0	33.000 319	8.1 386	80.5 Entercom License, Lic	-3.5	-71.1*
269A Livermore	KKIQ	LIC _C_ CA		108.2 288.7	69.66 BLH20150406ACG	37 35 42.0 121 39 43.0	4.100 123	118.5 639	47.7 Alpha Media Licensee Lic	-55.3*	0.0
269D Sausalito	<del>K269FB</del>	CP DC_ CA		332.0 152.0	0.61 BPFT20131217DGV	37 47 54.0 122 24 59.0	0.250	18.6 147	5.6 Ihr Educational Broadcasti	-24.6*	-27.4*
269D Sausalito	<del>K269FB</del>	LIC DC_ CA		311.0 130.9	9.78 BLFT20120410AEF	37 51 04.0 122 29 50.0	0.025 306	21.9 351	5.9 Ihr Educational Broadcasti	-17.2*	-12.2*
269B1 Santa Rosa	KHTH	LIC ZCN CA		344.8 164.7	82.42 BLH19920818KG	38 30 31.0 122 39 41.0	2.200 332	88.2 546	37.8 Amaturo Sonoma Media Group	-13.1*	15.1
271D San Francisco	KRBQ-FM2	LIC DV_ CA		77.1 257.4	44.55 BLFTB20060209AAG	37 52 54.0 121 55 05.0	1.000	2.0 1122	52.1 Entercom License, Lic	35.4	-7.8*
269D Hayward	KKIQ-FM1	LIC DV_ CA		113.5 293.7	31.77 BLFTB20150410ABK	37 40 44.0 122 04 55.0	0.460	22.1 74	6.6 Alpha Media Licensee Lic	2.9	2.2
269D Petaluma	KHTH-FM1	LIC DCN CA		345.2 165.1	61.98 BLFTB19930712TD	38 19 56.0 122 35 42.0	0.045 400	47.8 579	13.5 Amaturo Sonoma Media Group	6.8	23.4
216B1 San Mateo	KCSM	LIC _CX CA		166.2 346.3	29.51 BLED20100921ACN	37 32 08.1 122 20 00.0	11.000 113	25.1 225	7.5 San Mateo County Community	11.5R	18.0M
267D Walnut Creek	KIOI-FM1	LIC DVN CA		58.7 238.9	29.84 BLFTB19990225UC	37 55 57.0 122 07 20.0	0.150 300	0.0 427	3.5 Amfm Broadcasting Licenses	22.3	26.2
267D Pleasanton	KIOI-FM2	LIC DVN CA		109.2 289.5	44.87 BLFTB19990225UB	37 39 34.0 121 55 54.0	0.900	0.1 543	8.8 Amfm Broadcasting Licenses	38.3	35.9
269D Tracy	KKIQ-FM2	LIC DC_ CA		90.7 271.3	92.49 BLFTB20150410ABH	37 46 43.0 121 21 38.0	0.845	49.0 102	14.3 Alpha Media Licensee Lic	37.0	56.0
269A Carmel	KCDU	LIC _CN CA		157.9 338.3	148.66 BLH19941228KG	36 33 09.0 121 47 17.0	2.350 161	101.1 387	39.6 Mapleton License Of Monter	40.9	86.3

Terrain database is NED 03 SEC , R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM  
Contour distances are on direct line to and from reference station. Reference zone= East Zone 2A, Co to 3rd adjacent.  
All separation margins (if shown) include rounding.  
Ant Column: (D= DA Standard, Z= DA 73.215, N= Not DA 73.215, \_= Omni), Polarization (C,H,V,E), Beamtilt(Y,N,X)  
\*\*\*affixed to 'IN' or 'OUT' values = site inside restricted contour.

**K269FB.X**

BPFT20131217DGV  
Latitude: 37-47-36.30 N  
Longitude: 122-24-47.10 W  
ERP: 0.24 kW  
Channel: 269  
Frequency: 101.7 MHz  
AMSL Height: 194.3 m  
Elevation: 90.913 m  
Horiz. Pattern: Directional  
Vert. Pattern: No  
Prop Model: None

Jeremy Ruck & Associates, Inc.

- 60 dBu F(50,50) Service Contour
- 57 dBu F(50,50) Service Contour
- 54 dBu F(50,50) Service Contour
- 94 dBu F(50,10) Interference Contour
- 40 dBu F(50,10) Interference Contour
- 37 dBu F(50,10) Interference Contour

**Exhibit E-4**

Interference Study Overview  
K269FB - San Francisco, California  
IHR Educational Broadcasting  
December, 2015

Scale 1:1,000,000  
0 10 20 30 km



**K269FB.X**

BPFT20131217DGV

Latitude: 37-47-36.30 N

Longitude: 122-24-47.10 W

ERP: 0.24 kW

Channel: 269

Frequency: 101.7 MHz

AMSL Height: 194.3 m

Elevation: 90.913 m

Horiz. Pattern: Directional

Vert. Pattern: No

Prop Model: None

Proposed K269FB  
40 dBu F(50,10) Contour*Jeremy Ruck & Associates, Inc.*

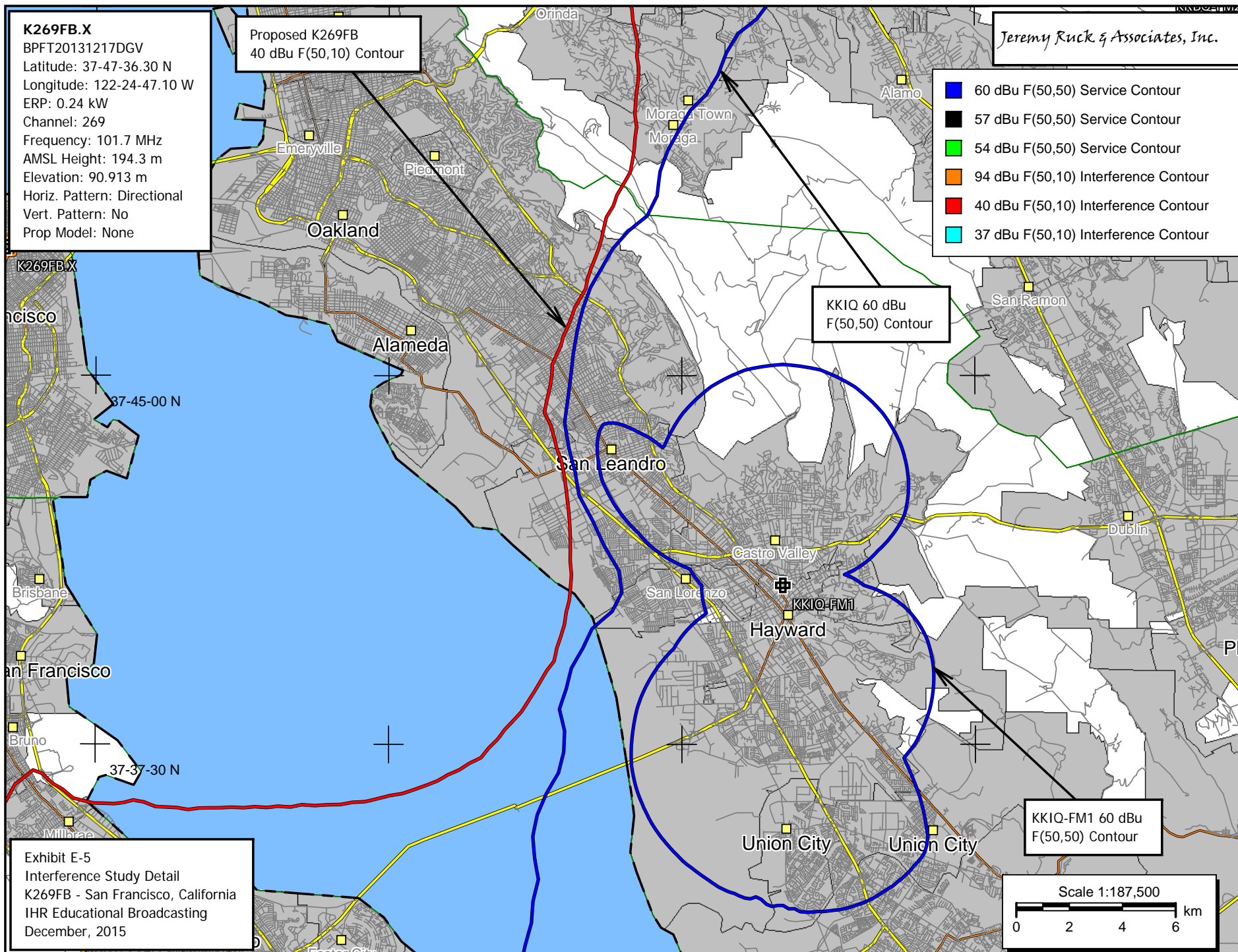
- 60 dBu F(50,50) Service Contour
- 57 dBu F(50,50) Service Contour
- 54 dBu F(50,50) Service Contour
- 94 dBu F(50,10) Interference Contour
- 40 dBu F(50,10) Interference Contour
- 37 dBu F(50,10) Interference Contour

KKIQ 60 dBu  
F(50,50) ContourKKIQ-FM1 60 dBu  
F(50,50) Contour

Exhibit E-5  
Interference Study Detail  
K269FB - San Francisco, California  
IHR Educational Broadcasting  
December, 2015

Scale 1:187,500

0 2 4 6 km



**K269FB.X**

BPFT20131217DGV

Latitude: 37-47-36.30 N

Longitude: 122-24-47.10 W

ERP: 0.24 kW

Channel: 269

Frequency: 101.7 MHz

AMSL Height: 194.3 m

Elevation: 90.913 m

Horiz. Pattern: Directional

Vert. Pattern: No

Prop Model: None

*Jeremy Ruck & Associates, Inc.*

■ KIOI 98.5 dBu F(50,50) Service Contour

■ KRBQ 97.5 dBu F(50,50) Service Contour

■ KRBQ-FM2 63.3 dBu F(50,50) Service Contour

FCC F(50-50) 63.30 dBu (FCC HAAT)

FCC F(50-50) 97.50 dBu (FCC HAAT)

FCC F(50-50) 98.50 dBu (FCC HAAT)

Exhibit E-6

Interference Study

K269FB - San Francisco, California

IHR Educational Broadcasting

December, 2015

Scale 1:250,000

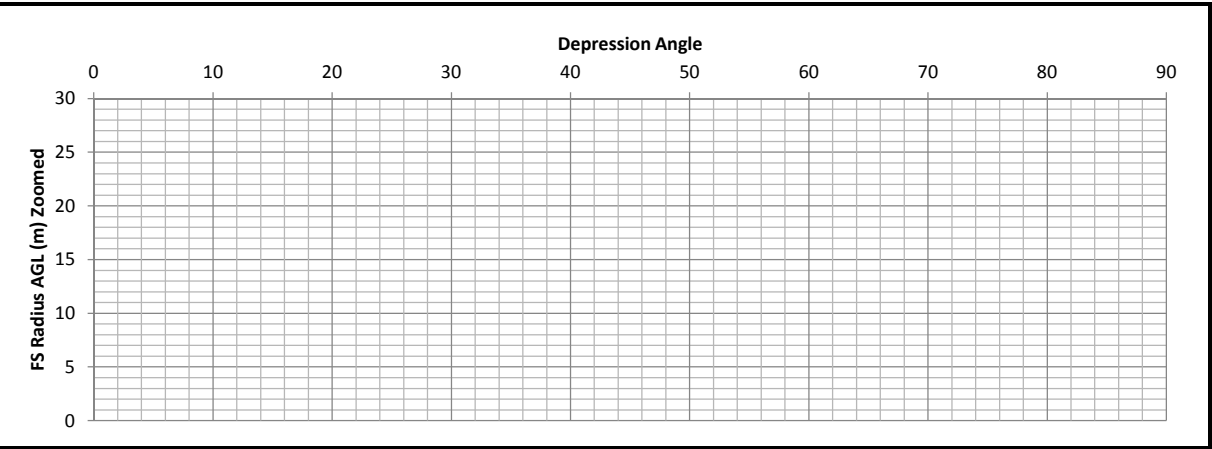
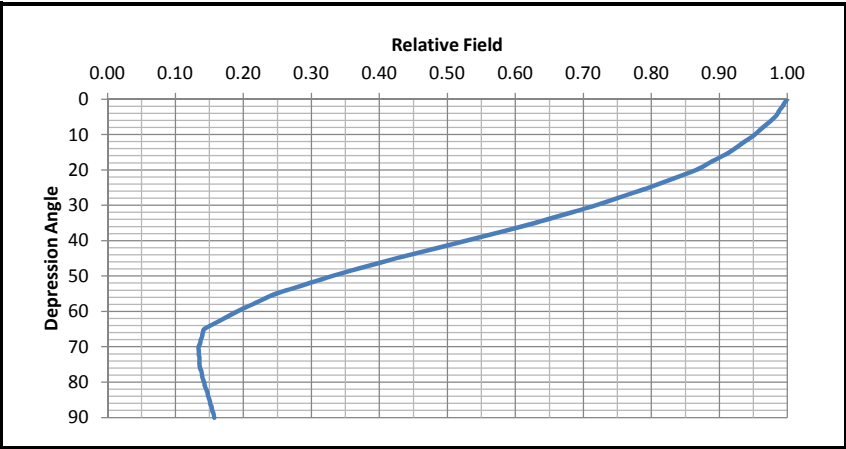
0 3 6 9 km

Exhibit E-7

Proximity Interference Analysis

K269FB - San Francisco, California

Antenna No:	81	↕	↕	Center of Radiation:	89 m AGL
Manufacturer:	Scala	↕↕↕		Effective Radiated Power:	240 Watts
Model:	CA5-FM-CPRM			FS Contour:	137.5 dBu
Number of Bays:	N/A			E Field Strength:	7.49894 V/m
Bay Spacing:	Log			Z0 (Ohms):	377 Ohms
				Power Density:	0.149162155 W/m^2



Depression Angle	Relative Field	Relative Power	ERP Watts	Radii in meters			
				Field Strength	Horizontal	Vertical	AGL
0	1.0000	1.0000	240.00	14.49	14.49	0.00	89.00
1	0.9960	0.9920	238.08	14.43	14.43	0.25	88.75
2	0.9930	0.9860	236.65	14.39	14.38	0.50	88.50
3	0.9890	0.9781	234.75	14.33	14.31	0.75	88.25
4	0.9860	0.9722	233.33	14.29	14.25	1.00	88.00
5	0.9820	0.9643	231.44	14.23	14.18	1.24	87.76
6	0.9760	0.9526	228.62	14.14	14.07	1.48	87.52
7	0.9700	0.9409	225.82	14.06	13.95	1.71	87.29
8	0.9640	0.9293	223.03	13.97	13.83	1.94	87.06
9	0.9580	0.9178	220.26	13.88	13.71	2.17	86.83
10	0.9520	0.9063	217.51	13.80	13.59	2.40	86.60
11	0.9450	0.8930	214.33	13.69	13.44	2.61	86.39
12	0.9370	0.8780	210.71	13.58	13.28	2.82	86.18
13	0.9300	0.8649	207.58	13.48	13.13	3.03	85.97
14	0.9220	0.8501	204.02	13.36	12.96	3.23	85.77
15	0.9150	0.8372	200.93	13.26	12.81	3.43	85.57
16	0.9050	0.8190	196.57	13.11	12.61	3.61	85.39
17	0.8950	0.8010	192.25	12.97	12.40	3.79	85.21
18	0.8850	0.7832	187.97	12.82	12.20	3.96	85.04
19	0.8760	0.7674	184.17	12.69	12.00	4.13	84.87
20	0.8660	0.7500	179.99	12.55	11.79	4.29	84.71
21	0.8520	0.7259	174.22	12.35	11.53	4.42	84.58
22	0.8380	0.7022	168.54	12.14	11.26	4.55	84.45
23	0.8240	0.6790	162.95	11.94	10.99	4.67	84.33
24	0.8100	0.6561	157.46	11.74	10.72	4.77	84.23
25	0.7960	0.6336	152.07	11.53	10.45	4.87	84.13
26	0.7800	0.6084	146.02	11.30	10.16	4.95	84.05
27	0.7650	0.5852	140.45	11.09	9.88	5.03	83.97
28	0.7490	0.5610	134.64	10.85	9.58	5.10	83.90
29	0.7340	0.5388	129.30	10.64	9.30	5.16	83.84
30	0.7180	0.5155	123.73	10.40	9.01	5.20	83.80
31	0.7000	0.4900	117.60	10.14	8.69	5.22	83.78
32	0.6820	0.4651	111.63	9.88	8.38	5.24	83.76
33	0.6640	0.4409	105.82	9.62	8.07	5.24	83.76
34	0.6460	0.4173	100.16	9.36	7.76	5.23	83.77
35	0.6280	0.3944	94.65	9.10	7.45	5.22	83.78
36	0.6080	0.3697	88.72	8.81	7.13	5.18	83.82
37	0.5880	0.3457	82.98	8.52	6.80	5.13	83.87
38	0.5680	0.3226	77.43	8.23	6.49	5.07	83.93
39	0.5480	0.3003	72.07	7.94	6.17	5.00	84.00
40	0.5280	0.2788	66.91	7.65	5.86	4.92	84.08
41	0.5070	0.2570	61.69	7.35	5.54	4.82	84.18
42	0.4860	0.2362	56.69	7.04	5.23	4.71	84.29
43	0.4650	0.2162	51.89	6.74	4.93	4.60	84.40
44	0.4440	0.1971	47.31	6.43	4.63	4.47	84.53
45	0.4230	0.1789	42.94	6.13	4.33	4.33	84.67

Depression Angle	Relative Field	Relative Power	ERP Watts	Radii in meters			
				Field Strength	Horizontal	Vertical	AGL
45	0.4230	0.1789	42.94	6.13	4.33	4.33	84.67
46	0.4050	0.1640	39.37	5.87	4.08	4.22	84.78
47	0.3860	0.1490	35.76	5.59	3.81	4.09	84.91
48	0.3670	0.1347	32.33	5.32	3.56	3.95	85.05
49	0.3480	0.1211	29.06	5.04	3.31	3.81	85.19
50	0.3290	0.1082	25.98	4.77	3.06	3.65	85.35
51	0.3130	0.0980	23.51	4.54	2.85	3.52	85.48
52	0.2960	0.0876	21.03	4.29	2.64	3.38	85.62
53	0.2800	0.0784	18.82	4.06	2.44	3.24	85.76
54	0.2630	0.0692	16.60	3.81	2.24	3.08	85.92
55	0.2470	0.0610	14.64	3.58	2.05	2.93	86.07
56	0.2350	0.0552	13.25	3.41	1.90	2.82	86.18
57	0.2240	0.0502	12.04	3.25	1.77	2.72	86.28
58	0.2130	0.0454	10.89	3.09	1.64	2.62	86.38
59	0.2010	0.0404	9.70	2.91	1.50	2.50	86.50
60	0.1900	0.0361	8.66	2.75	1.38	2.38	86.62
61	0.1800	0.0324	7.78	2.61	1.26	2.28	86.72
62	0.1710	0.0292	7.02	2.48	1.16	2.19	86.81
63	0.1610	0.0259	6.22	2.33	1.06	2.08	86.92
64	0.1510	0.0228	5.47	2.19	0.96	1.97	87.03
65	0.1420	0.0202	4.84	2.06	0.87	1.86	87.14
66	0.1400	0.0196	4.70	2.03	0.83	1.85	87.15
67	0.1390	0.0193	4.64	2.01	0.79	1.85	87.15
68	0.1370	0.0188	4.50	1.99	0.74	1.84	87.16
69	0.1360	0.0185	4.44	1.97	0.71	1.84	87.16
70	0.1340	0.0180	4.31	1.94	0.66	1.82	87.18
71	0.1340	0.0180	4.31	1.94	0.63	1.84	87.16
72	0.1340	0.0180	4.31	1.94	0.60	1.85	87.15
73	0.1350	0.0182	4.37	1.96	0.57	1.87	87.13
74	0.1350	0.0182	4.37	1.96	0.54	1.88	87.12
75	0.1350	0.0182	4.37	1.96	0.51	1.89	87.11
76	0.1360	0.0185	4.44	1.97	0.48	1.91	87.09
77	0.1380	0.0190	4.57	2.00	0.45	1.95	87.05
78	0.1390	0.0193	4.64	2.01	0.42	1.97	87.03
79	0.1400	0.0196	4.70	2.03	0.39	1.99	87.01
80	0.1420	0.0202	4.84	2.06	0.36	2.03	86.97
81	0.1430	0.0204	4.91	2.07	0.32	2.05	86.95
82	0.1450	0.0210	5.05	2.10	0.29	2.08	86.92
83	0.1470	0.0216	5.19	2.13	0.26	2.11	86.89
84	0.1480	0.0219	5.26	2.14	0.22	2.13	86.87
85	0.1500	0.0225	5.40	2.17	0.19	2.17	86.83
86	0.1510	0.0228	5.47	2.19	0.15	2.18	86.82
87	0.1530	0.0234	5.62	2.22	0.12	2.21	86.79
88	0.1540	0.0237	5.69	2.23	0.08	2.23	86.77
89	0.1560	0.0243	5.84	2.26	0.04	2.26	86.74
90	0.1570	0.0246	5.92	2.28	0.00	2.28	86.72

