

Station KPIX-TV • Channel 29 (Virtual Channel 5) • San Francisco, California
Proposed DTV Booster Facility for Evaluation Under FCC SFTA

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by Sutro Tower, Inc., San Francisco, California, on behalf of the licensee of Station KPIX-TV, Channel 29 (Virtual Channel 5), San Francisco, California (FCC Facility ID No. 25452) to prepare engineering materials describing a proposed Special Field Test Authorization (SFTA) for a digital television (DTV) booster/repeater system to serve South San Francisco, California, and the immediately surrounding area.

Background

A field reception survey of the eleven TV broadcast stations operating from Sutro Tower¹ was conducted in late 2009 to evaluate coverage of post-transition digital transmitting facilities. Over 40 distinct locations throughout the San Francisco Bay Area were evaluated in two project phases. The results of those surveys showed that one area in South San Francisco, about 12 kilometers south-southeast of the main transmitter site, exhibited no reception for any of the Sutro Tower TV facilities, even though normally adequate signal field strengths were observed. A second nearby location exhibited marginal or no reception of the same stations. Subsequent analysis of recorded spectrum analyzer and demodulator data indicated that reception in those areas is blocked from line-of-sight coverage, with available signals being severely distorted by multipath propagation. Terrain-sensitive propagation modeling was conducted to determine if a practical fill-in signal repeater or booster could be implemented in the identified outage area, yielding the facilities proposed below.

Proposed DTV Booster Facility

Accompanying Figure 1 provides engineering specifications for a KPIX-TV on-channel booster facility proposed for evaluation under SFTA, as codified in §73.1515 of the FCC Rules. As shown, an H/V pair of Kathrein-Scala Model PRTV-29 Paraflector antennas² would be installed on the tower used by TV Station KNTV at the San Bruno Mountain communications site. The antenna would be oriented toward 151°T (horizontal polarization) and 155°T (vertical polarization),³ and each would include 4.6° of mechanical beam tilt to place the main beam in the heart of the observed outage area.

¹ Sutro Tower hosts the following full-service TV broadcast facilities: Station KGO-TV, Channel 7; Station KOFY-TV, Channel 19; Station KPIX-TV, Channel 29; TV Station KQED, Channel 9; Station KMTP-TV, Channel 33; Station KFSF-DT, Channel 34; Station KRON-TV, Channel 38; TV Station KCNS, Channel 39; Station KCSM-TV, Channel 43; TV Station KTVU, Channel 44; and TV Station KBCW, Channel 45.

² The antenna azimuth pattern plots, azimuth pattern tabulations, and elevation pattern plots are provided in accompanying Figure 2.

³ The azimuth pattern of the PRTV antenna when used in vertical polarization is considerably narrower than that of the horizontally-polarized antenna of the same model. Since the area to be served is adjacent to San Francisco Bay, the orientation of the vertically-polarized antenna is slightly skewed toward the land area. Additionally, because of its lower operating power, the radiation envelope of the vertically-polarized antenna would be contained within the horizontally-polarized radiation envelope.



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Using a maximum power of 3.9 kW ERP (horizontal polarization) and 1.2 kW ERP (vertical polarization), propagation calculations show that the proposed booster facility would be capable of providing an undistorted signal that would overcome the presently distorted signal in that area by at least 15.5 dB.⁴ These power levels are specified as maximum limits; all field evaluations of booster performance will be conducted at or below these power levels while retaining 30% V/H elliptical radiation.

Coverage and Interference Considerations

The map of accompanying Figure 3A shows the plotted F(50,90) 40.2 dBu noise-limited and 50.2 dBu coverage contours of the main facility and the proposed booster, respectively, as based on maximum ERP requested for the booster facility.⁵ Due to the significant mechanical beam tilt of the booster transmitting antenna, practical coverage is limited to the shadowed area shown in Figure 3B, with booster coverage outside that area predicted to fall to equal or less than the signal strength provided by the main station.

To prevent excessive energy within the adjacent spectrum, the booster transmitter will employ a full-service interference mask. The closest first-adjacent-channel facilities are Class A Station KFTL-CD, Channel 28, San Francisco, California, nearly collocated on San Bruno Mountain, 250 meters distant at bearing 0°T, and TV Station KQED, Channel 30 (Virtual Channel 9), San Francisco, California (FCC Facility ID No. 35500), located on Sutro Tower, 7.9 kilometers away at bearing 348.5° from the booster site.

An OET-69 interference study of the proposed booster in isolation (assuming that the main KPIX-TV facility is not operating) using actual booster azimuth and elevation patterns and maximum specified ERP yields no predicted interference to the KFTL-CD coverage area, and 0.26% interference to the KQED coverage area. However, virtually all of the interference to KQED is predicted to occur within the area where it, as other Sutro Tower TV stations, have been determined by field measurement to have no coverage. No other stations are predicted to receive any interference from the proposed operation.

Booster testing will be coordinated with the KFTL-CD and KQED licensees, and booster operation will be modified or terminated in the unlikely event that interference reports are received.

⁴ ATSC Document A/74, *ATSC Recommended Practice: Receiver Performance Guidelines*, April 7, 2010, Table 5.1 and related text at pp. 13-14 (Co-Channel Rejection).

⁵ The projected F(50,90) 40.2 dBu contour of the proposed booster facility is also fully contained within the noise-limited contour of the main facility.



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Environmental Factors

Grant of the proposed SFTA facilities would not constitute a major environmental action. The proposed transmitting antenna will be side-mounted on an existing tower that has been registered with the Commission (ASR No. 1010567), with no change in the overall height of the structure. The tower is part of an existing communications site, and no FCC Rules §1.1307 conditions, defining major environmental actions, are believed to apply.

The proposed operation would comply with FCC guidelines regarding human exposure to radio frequency energy. Calculations performed in accordance with FCC OET Bulletin No. 65 (August 1997) show that the proposed facility would produce less than 1% of the applicable power density limit for continuous public exposure at a calculation height of 2 meters above ground level. Thus, the applicant is categorically excluded by §1.1307(b)(3) of the FCC Rules from having to consider the contributions of other stations at or near the site.

Proposed Operation, Waiver Requests, and Reporting

The proposed booster is to be fed via microwave (using facilities obtained under separate authorization) and synchronized with the data stream of the main facility in accordance with ATSC recommendations. Because such synchronization is required for proper field evaluation of booster performance, waiver of §73.1515(c)(2), requiring unmodulated carrier transmission, is respectfully requested. Due to the relatively low transmitter power involved, waiver of §73.1515(c)(4), requiring logging of transmitter power in half-hour increments, is also requested. Modern low power DTV transmitters⁶ are inherently stable with respect to maintaining output power; however, a log will be kept of transmitter power employed and associated changes during all phases of booster performance evaluation. Finally, the booster facility will be operated only during times during which field testing is to occur.

Booster evaluation testing will occur during daytime hours using a mobile vehicle having an extendable mast with calibrated receiving antenna and appropriate test equipment, including a commercial ATSC demodulator and spectrum analyzer. In addition to the booster coverage area depicted in the maps of Figure 3B, surrounding areas will be evaluated for potential booster-into-main signal interference potential. A report of findings, as required by §73.1515(c)(7) of the rules, will be prepared and submitted to the Commission at the conclusion of testing. It is respectfully requested that a period of at least six months be authorized for SFTA, such that sufficient time is available for facility hardware procurement, construction and evaluation.

⁶ A transmitter that complies with FCC equipment rules and standards will be employed.



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Pending Application for KGO-TV Fill-In Translator

Station KPIX-TV has a pending application, FCC File No. BDRTCDDT-20090630ADO, to construct a permanent fill-in translator to serve Napa, California, and the surrounding area. This proposed translator shares no service area commonality with the proposed booster.

Conclusion

Grant of the requested SFTA for assessment of the proposed DTV booster facility will allow thorough evaluation of a potential resolution of an identified coverage loss area that is well contained within the KPIX-TV main service area. A successful test outcome likely will result in a request for permanent operation of booster facilities for some or all of the eleven TV stations presently operating from the Sutro Tower transmitting facility.

List of Figures

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

1. Engineering specifications of proposed South San Francisco booster facility
2. Proposed DTV booster transmitting antenna
3. Coverage and shadow maps of proposed DTV booster operation.

January 18, 2011



Stanley Salek
Stanley Salek, P.E.

Station KPIX-TV • Channel 29 (Virtual Channel 5) • San Francisco, California

**Engineering Specifications of Proposed South San Francisco DTV Booster
Main Facility: KPIX-TV, FCC File No. BMPCDT-20080603AAG, Facility No. 25452
(Pending License Application File No. BLCDT-20091112AIZ)**

A. Tower

FCC Tower Registration No.	1010567	
KNTV Tower, San Bruno Mountain antenna farm, 900 Radio Road, Daly City, San Mateo County, California		
Geographical Coordinates	<u>ASR: (NAD-83)</u>	<u>CDBS (NAD-27)</u>
	37° 41' 06.7" N	37° 41' 06.9" N
	122° 26' 04.5" W	122° 26' 00.6" W
Elevation of site above mean sea level	381.0 m	
Overall tower height above ground level	87.8 m	
Overall tower height above mean sea level	468.8 m	

B. Effective Heights

Height of radiation center above ground level	15.2 m
Height of radiation center above mean sea level	396.2 m
Height of radiation above average terrain (based on KNTV average terrain of record)	329.4 m

C. Antenna System

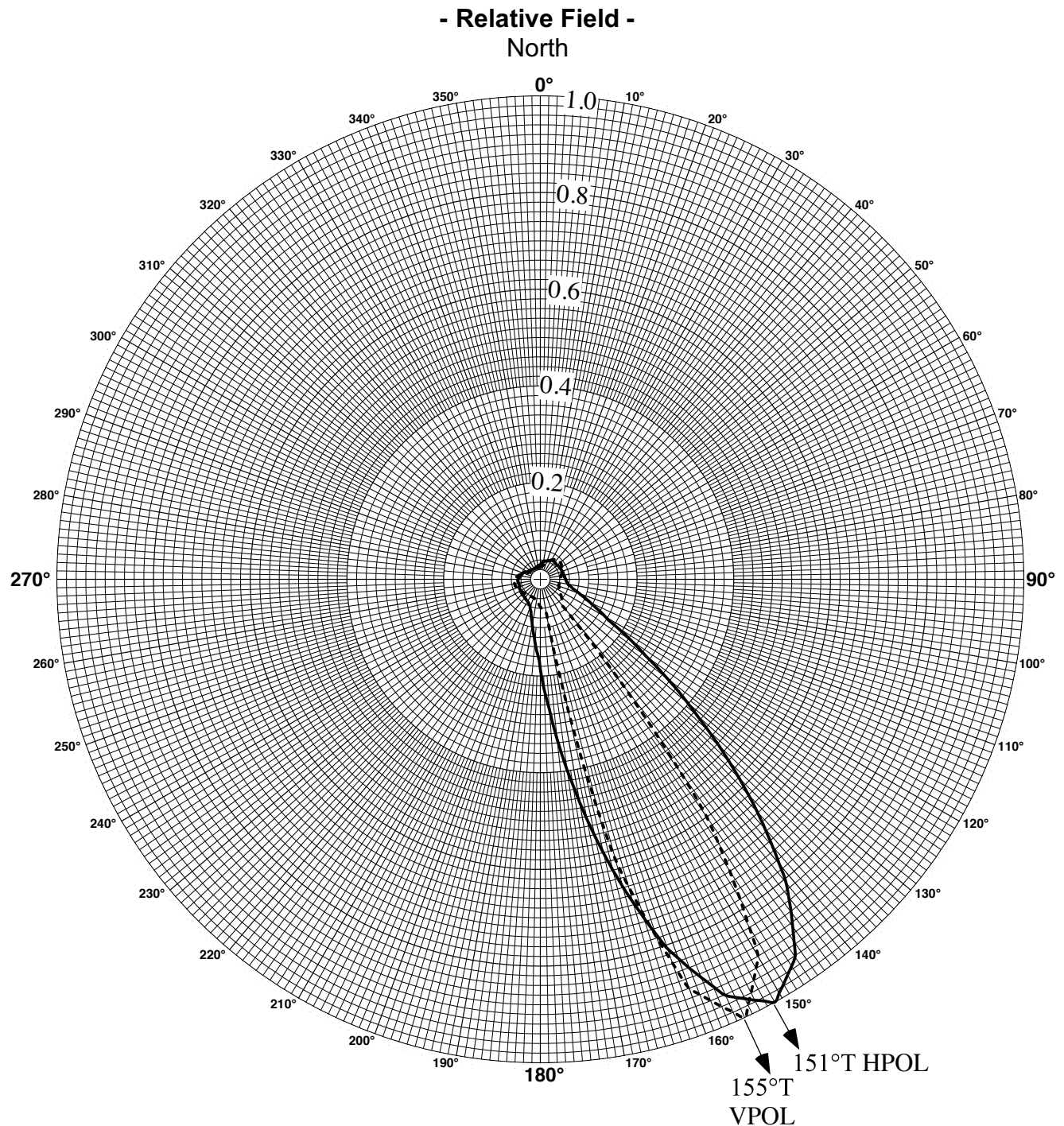
Make/model	Scala, Model PRTV-29 (two)	Paraflectors
Antenna pattern	Narrow Beam Directional	
Orientation	151°T (H), 155°T (V)	
Polarization	H/V Elliptical (V/H = 30%)	
Electrical beam tilt	none	
Mechanical down tilt	4.6° toward 151°T (H), 155°T (V)	

D. Operation

Channel	D29	
Transmitter emission mask	Full Service	
	<u>Vertical Polarization</u>	<u>Horizontal Polarization</u>
Maximum antenna input power (DTV average)	30 W	100 W
Antenna gain	38.9	38.9
Maximum effective radiated power	1.2 kW	3.9 kW



**Azimuth Patterns and Orientations of Proposed Kathrein–Scala Model PRTV-29
Transmitting Antenna H/V Array**



- Notes: 1. Pattern data provided by manufacturer
2. VPOL pattern to operate at 30% power of HPOL pattern; VPOL radiation envelope contained within HPOL radiation envelope

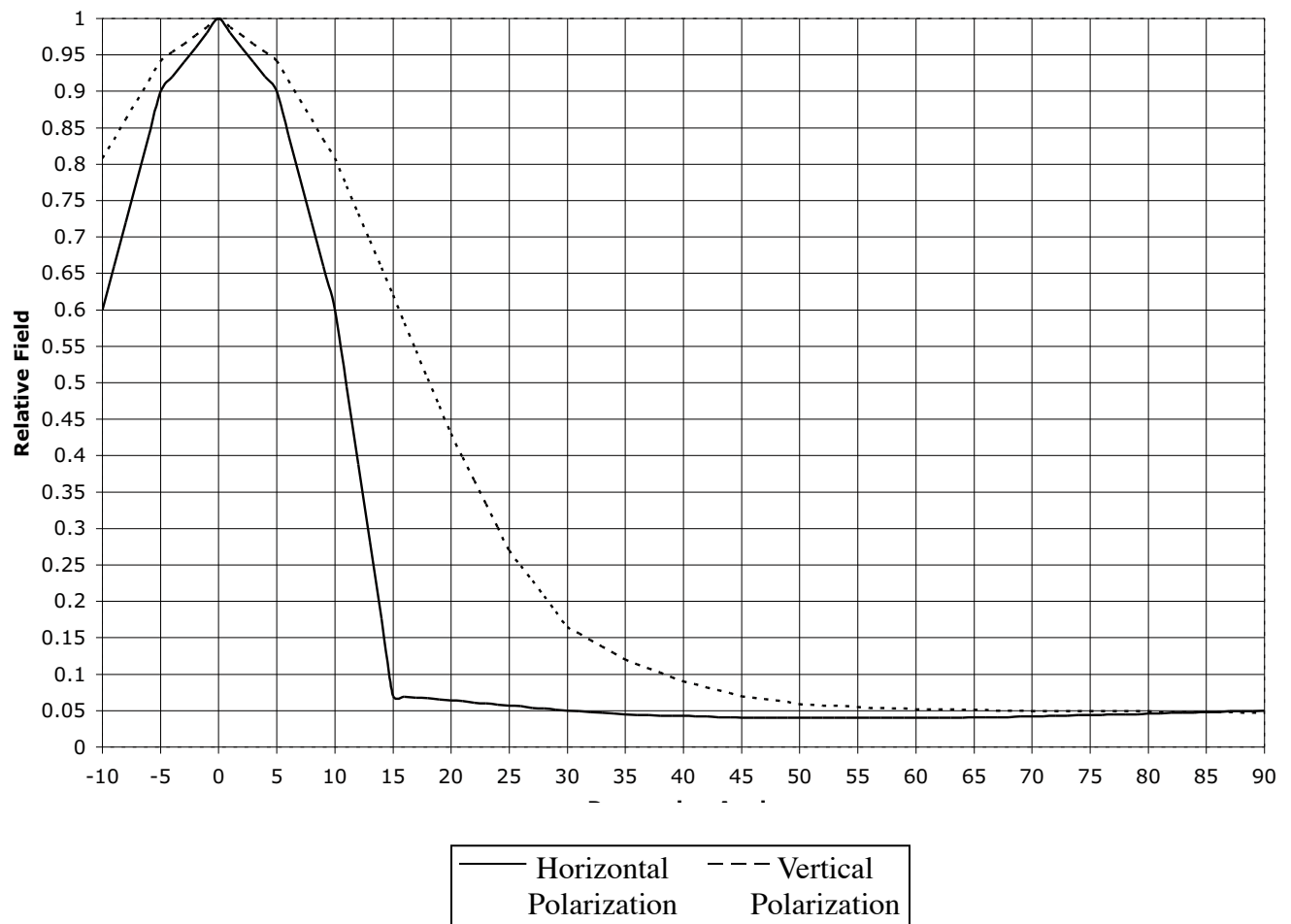
Azimuth Pattern Tabulations
Kathrien-Scala Model PRTV-29 Transmitting Antenna
H/V Array

<u>Azimuth</u>	<u>Relative Field</u>	
	<u>HPOL</u>	<u>VPOL</u>
0	1	1
10	0.808	0.6
20	0.43	0.064
30	0.165	0.05
40	0.09	0.043
50	0.059	0.04
60	0.052	0.04
70	0.049	0.042
80	0.049	0.046
90	0.047	0.05
100	0.045	0.053
110	0.046	0.054
120	0.046	0.05
130	0.04	0.041
140	0.038	0.032
150	0.03	0.027
160	0.028	0.025
170	0.026	0.024
180	0.025	0.025
190	0.026	0.024
200	0.028	0.025
210	0.03	0.027
220	0.038	0.032
230	0.04	0.041
240	0.046	0.05
250	0.046	0.054
260	0.045	0.053
270	0.047	0.05
280	0.049	0.046
290	0.049	0.042
300	0.052	0.04
310	0.059	0.04
320	0.09	0.043
330	0.165	0.05
340	0.43	0.064
350	0.808	0.6

- Notes: 1. Normalized patterns; patterns to be rotated to 151°T (HPOL) and 155°T (VPOL).
2. Pattern data provided by manufacturer.



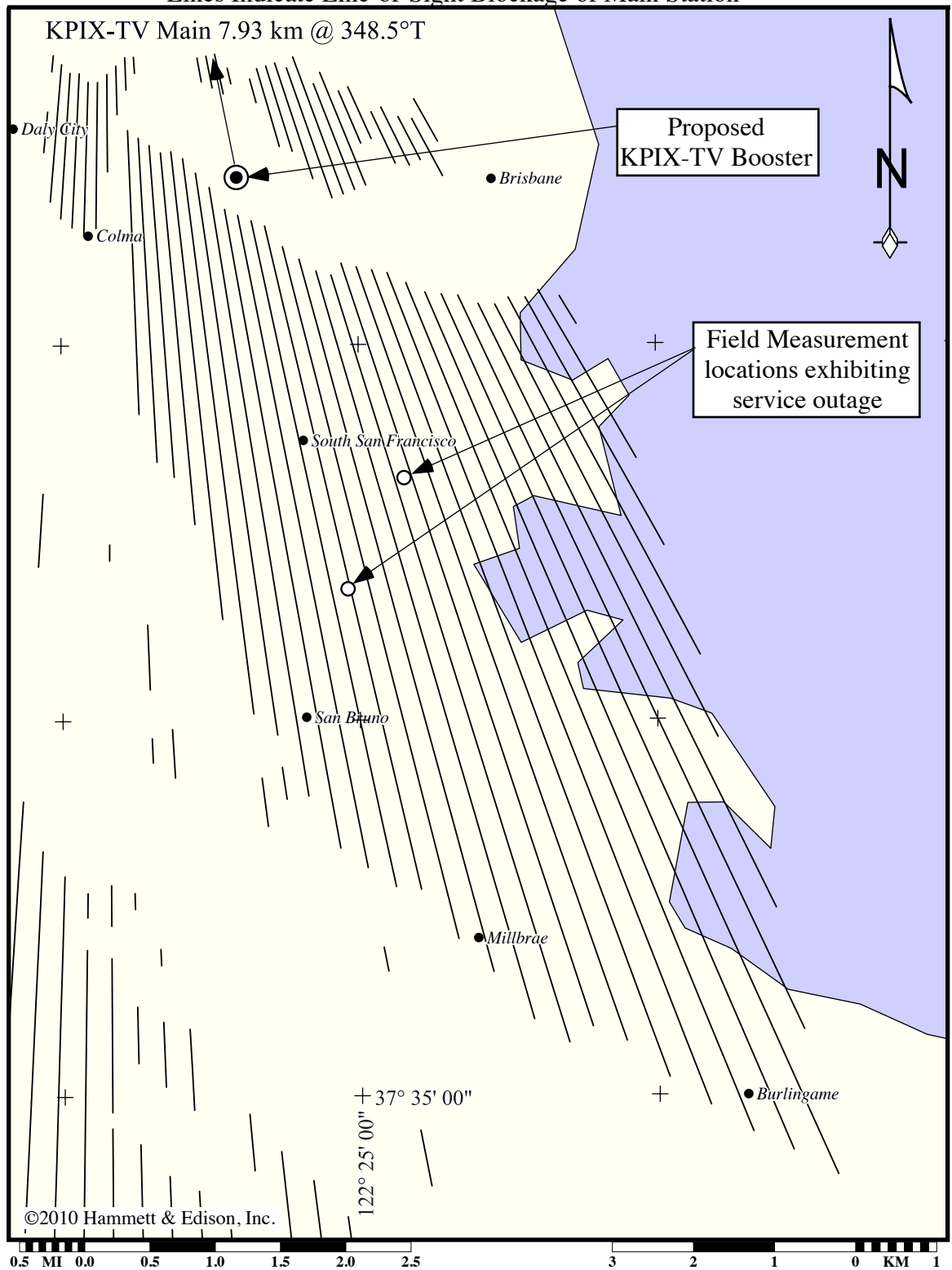
Elevation Pattern Plots
Kathrein-Scala Model PRTV-29 Transmitting Antenna
H/V Array



Pattern data provided by manufacturer.

Shadow Map of Proposed Primary Booster Coverage Area

Lines Indicate Line-of-Sight Blockage of Main Station



Tranverse Mercator map projection. Map data taken from Sectional Aeronautical Charts, published by the National Ocean Survey. Geographic coordinate marks shown at 2-minute 30-second increments. City names shown taken from U.S. Census Bureau TIGER/Line 2000 data.

