

TECHNICAL EXHIBIT
PREPARED ON BEHALF OF
CALVARY CHAPEL OF HONOLULU, INC.
APPLICANT FOR A NEW NONCOMMERCIAL EDUCATIONAL FM STATION
AT HONOLULU, HAWAII
FCC FILE NO. BNPED-19960416MA
CH 218C (91.5 MHZ) 100 KW 564 M
FCC FACILITY ID 81538

This technical exhibit was prepared on behalf of Calvary Chapel of Honolulu, Inc. (Calvary Chapel), applicant for a new noncommercial educational FM (NCE-FM) station at Honolulu, Hawaii (FCC File No. BNPED-19960416MA). The purpose of this technical exhibit is to demonstrate that field strength produced by the facilities specified in the Calvary Chapel application will not exceed 27 mV/m at the FCC's monitoring station at Waipahu, Hawaii.

Calvary Chapel proposes to operate a new NCE-FM station on channel 218C (91.5 MHz) at Honolulu, Hawaii with a directional antenna maximum effective radiated power (ERP) of 100 kilowatts (kW) and an antenna height above average terrain (HAAT) of 592 meters. Calvary Chapel proposes to utilize an existing Shively model 6014-14/1-DA, 14-bay directional antenna (Shively DA). The Shively DA is side-mounted at the 39 meter level on an existing 60.6 meter tower (ASR 1218023) located on Palikea Ridge. The antenna radiation center height above mean sea level (RCAMSL) is 734 meters. Figure 1 provides a summary of the proposed NCE-FM facilities based on the FCC's Consolidated Database System (CDBS).

The Shively DA will be shared with three (3) other Class C FM stations, all of which also operate with an ERP of 100 kW.¹ The Shively DA was specifically designed to limit radiation in the direction of the FCC's monitoring station at Waipahu, Hawaii. The Waipahu monitoring station is located 10.6 kilometers from the proposed site at a bearing of 100 degrees true. Based on the height of the Shively DA (RCAMSL 734 meters), the monitoring station is located 3.9 degrees below the horizon from the antenna system (i.e. angle of

¹ The 3 full-service FM stations which currently utilize the Shively directional antenna are: KAIM-FM, channel 238C (96.5 MHz), Honolulu, HI (BLH-19990430KB); KORL-FM, channel 266C (101.1 MHz), Waianae, HI (BLH-20070706ACG); and KQMQ-FM, channel 226C (93.1 MHz), Honolulu, HI (BLH-19970425KE).

depression). Figure 2, sheets 1-3, provides the vertical plane relative field pattern for the Shively DA based on the proposed NCE-FM frequency (91.5 MHz). As indicated by Figure 2, the Shively DA produces a vertical null at 3.9 degrees. As determined from Figure 2, the vertical plane relative field value at a depression angle of 3.9 degrees is 0.087. Thus, the Shively DA will radiate 0.757 kW $[(0.087)^2 \times 100 \text{ kW}]$ in the direction of the Waipahu monitoring station.

The field strength for the proposed NCE-FM operation at the Waipahu monitoring station has been calculated based on the FCC's standard prediction method [F(50,50)] set forth in Section 73.313 of the FCC's rules as well as the Longley-Rice propagation model.²

FCC Field Strength Calculation - The HAAT along the direct bearing to the Waipahu monitoring station at 100 degrees true is 701 meters based on a 3-second terrain database. Based on an ERP of 0.757 kW and an HAAT of 701 meters, the FCC predicted F(50,50) field strength at the Waipahu monitoring station is calculated to be 13.8 mV/m (82.8 dBu).

Longley-Rice Field Strength Calculation - Based on the Longley-Rice propagation model, the predicted field strength at the Waipahu monitoring station was calculated to be 12.9 mV/m (82.2 dBu). The following parameters were employed for the Longley-Rice calculation:

Model	Point-to-point irregular
Location Variability	50%
Time Variability	50%
Situation Variability	50%
Frequency	91.5 MHz
Polarization	Horizontal
Conductivity	0.005 S/m
Dielectric Constant	15.0
Transmitter Antenna Height AMSL	734 m
Maximum Effective Radiated Power	0.757 kW
Receive Antenna Height	9.1 m
Clutter Factor	3 dB

² Rice, P.L., A.G. Longley, K.A. Norton, and A.P. Barsis, "Transmission Loss Predictions for Tropospheric Communication Circuits," Technical Note 101

As indicated above, a 3 dB clutter factor was used to take into account field strength variations due to local clutter (e.g. trees, buildings).³ However, even without application of a clutter factor, the predicted field strength at the monitoring station would only be 18.2 mV/m (85.2 dBu).

Conclusion

Based on both the FCC's standard prediction method as well as the Longley-Rice propagation model, the field strength for the proposed NCE-FM operation will not exceed 27 mV/m at the FCC's monitoring station at Waipahu, Hawaii. If necessary, actual measurements will be made to substantiate compliance.

I hereby declare under penalty of perjury that the forgoing is true and correct to the best of my personal knowledge and belief.



W. Jeffrey Reynolds

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April 26, 2013

(Issued May 7, 1965, Revised January 1, 1967) National Bureau of Standards, Boulder, Colorado.

³ Bullington indicated that the average loss from surrounding trees for horizontal polarization may be 2 to 3 dB (see Kenneth Bullington, "Radio Propagation at Frequencies Above 30 Megacycles, Proc IRE, October, 1947).

FM Inquiry

du Treil, Lundin, & Rackley, Inc., Sarasota, Florida



Callsign: 960416MA **Service:** FM **Status:** APP **App. Status:** ACCPT **Border Code:** **Rec. Type:** C
Channel: 218 **Freq. (MHz):** 91.5 **Class:** C **Docket Number:** **Border Distance (km):**
Fac. ID: 81538 **Assoc. ID:** **Application File No.:** BNPED-19960416MA **Rule 73.215 Auth. Req.:** N
City: HONOLULU **State:** HI **Country:** US **CP Expiration Date:**
Party Name: CALVARY CHAPEL OF HONOLULU, INC. **Last Change Date:** 4/1/2011

Latitude (NAD 27): 21-23-45	Vertical HAAT (m): 564	Vertical Height AGL (m): 39
Longitude (NAD 27): 158-05-58	Horizontal HAAT (m): 564	Horizontal Height AGL (m): 39
Latitude (NAD 83): 021-23-33.6	Maximum HAAT (m): 726	Overall Height AGL (m): 61
Longitude (NAD 83): 158-05-48.1	Vertical ERP (kW): 100	Site Elevation AMSL (m):
Vertical RCAMSL (m): 734	Horizontal ERP (kW): 100	Antenna Make:
Horizontal RCAMSL (m): 734	Max. Vertical ERP (kW):	Antenna Model:
	Max. Horizontal ERP (kW):	

Antenna Type: D **Antenna ID:** 79829 **Rotation (°):** 0

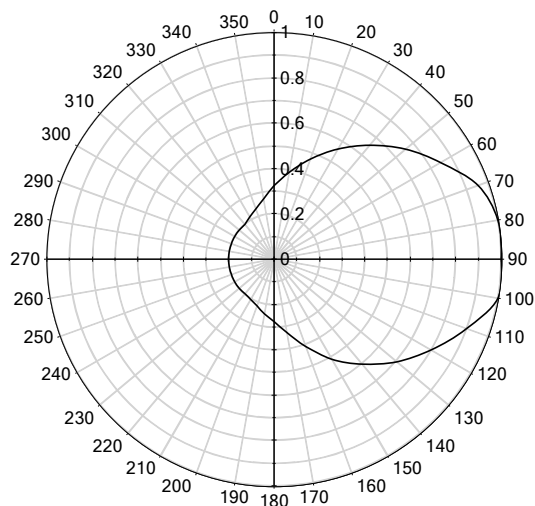
0° 0.325	90° 1.000	180° 0.275	270° 0.200
10° 0.390	100° 1.000	190° 0.245	280° 0.200
20° 0.470	110° 0.900	200° 0.220	290° 0.200
30° 0.560	120° 0.800	210° 0.205	300° 0.200
40° 0.655	130° 0.705	220° 0.200	310° 0.200
50° 0.755	140° 0.605	230° 0.200	320° 0.200
60° 0.850	150° 0.510	240° 0.200	330° 0.215
70° 0.955	160° 0.410	250° 0.200	340° 0.235
80° 1.000	170° 0.330	260° 0.200	350° 0.270

Standard Pattern:

Antenna Make: ODD

Antenna Model: ODD960416MA

Last Change Date:

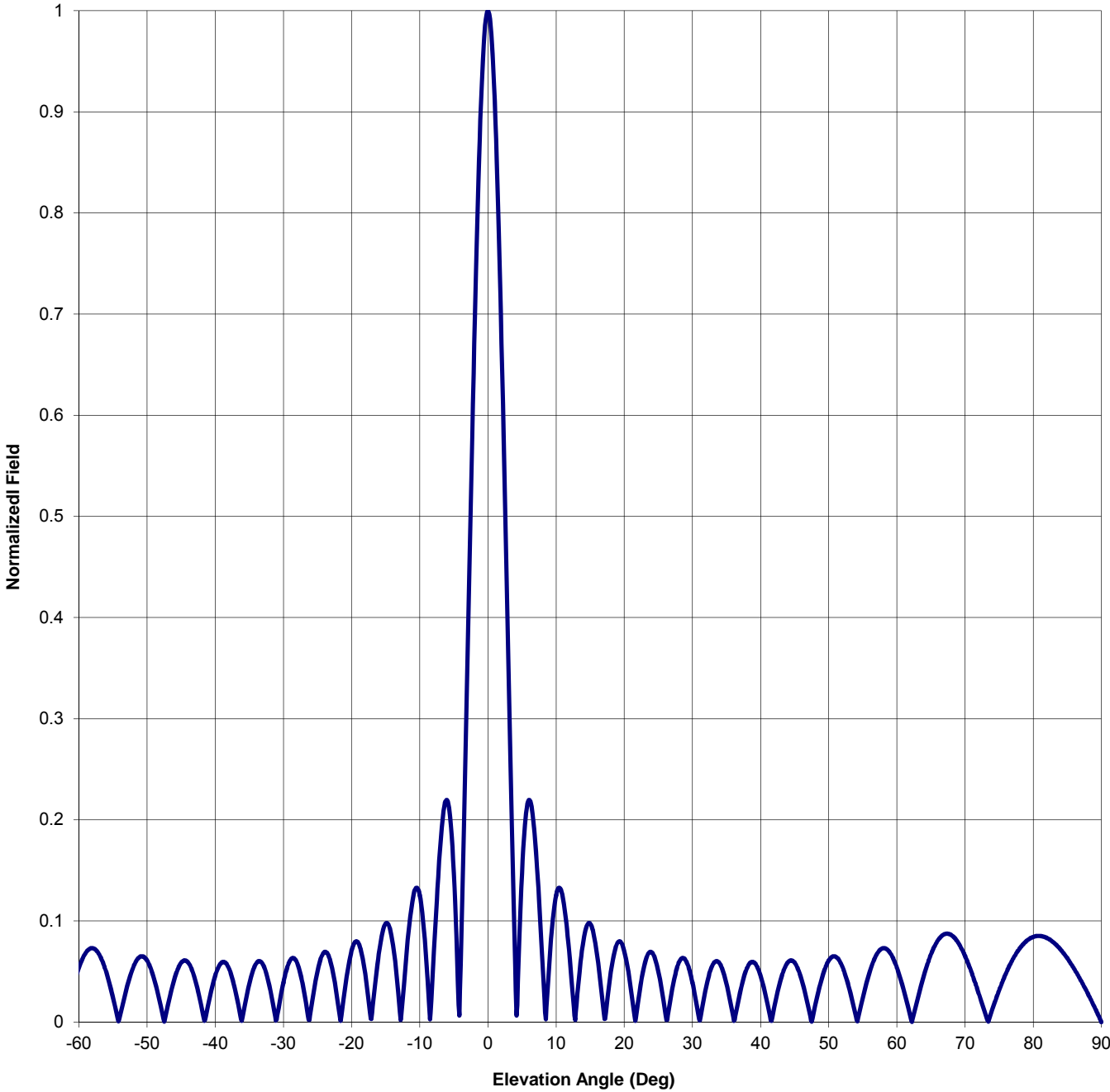


Note: Rotation or tilt is not applied to the pattern shown

Type: TOWER	ASRN: 1218023	FAA Study No.: 00-AWP-2258-OE	Structure Height (m): 60.6
Latitude (NAD 27): 021-23-45	Date Received: 10/12/2001	Structure Height (ft): 198.8	
Longitude (NAD 27): 158-05-58	Date Entered: 10/12/2001	Ground Elevation (m): 695.1	
Latitude (NAD 83): 21-23-33.6	Date Issued: 10/03/2000	Ground Elevation (ft): 2280.5	
Longitude (NAD 83): 158-05-48.1	Date Constructed: 10/03/2000	Overall Height AGL (m): 60.6	
	Date Dismantled:	Overall Height AGL (ft): 198.8	
Struct. Address:			Overall Height AMSL (m): 755.7
Palikea Ridge, 26.9 km NW of Honolulu at 292? True			Overall Height AMSL (ft): 2479.3
Makakilo HI			
Entity Name: Salem Media of Hawaii			

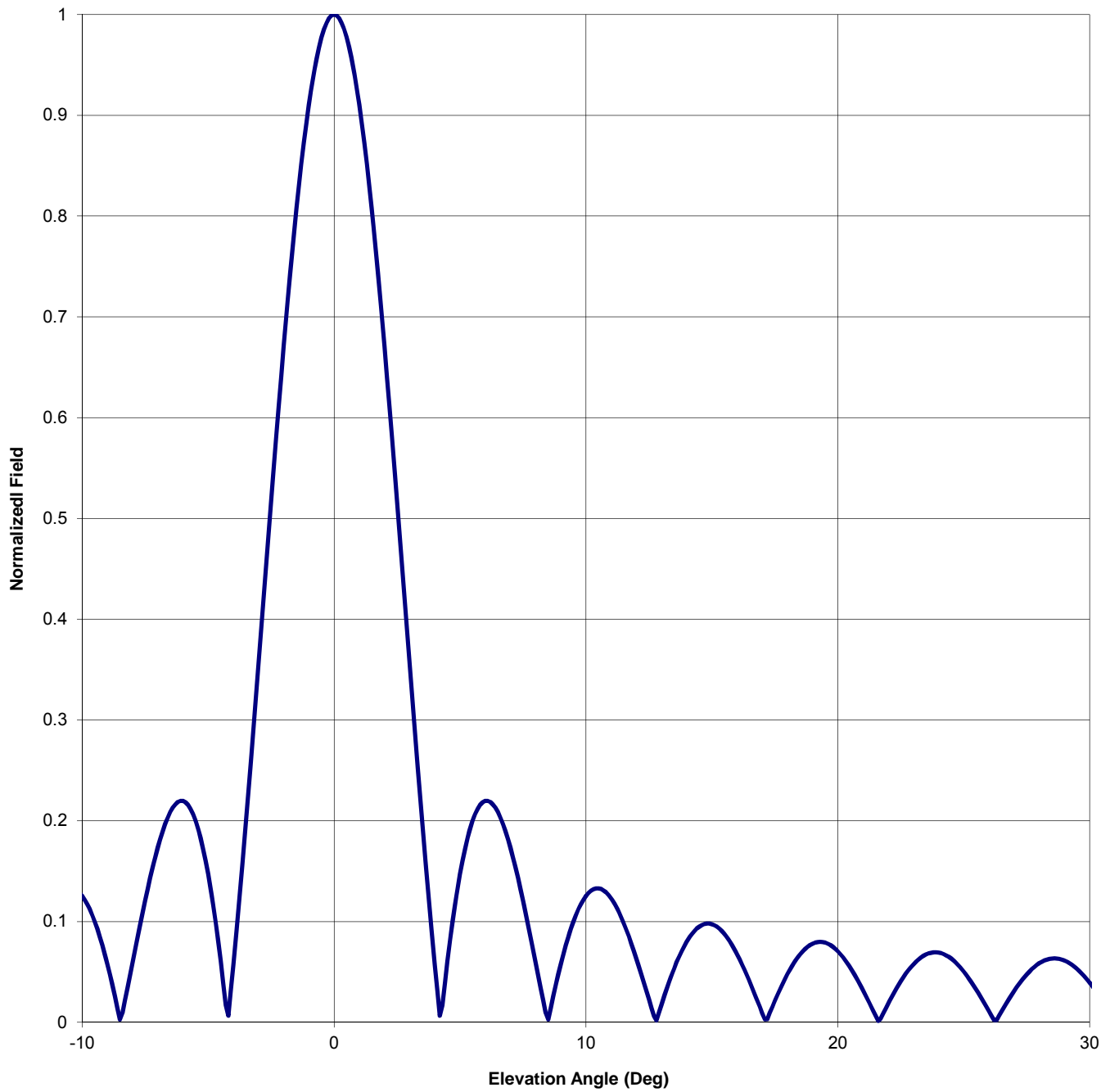
Antenna Mfg.: Shively Labs
Antenna Type: 6014-14/1-DA
Station: new FM
Frequency: 91.5
Channel #: 218
Figure: 3

Beam Tilt	0	
Gain (Max)	31.164	14.937 dB
Gain (Horizon)	31.164	14.937 dB



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Antenna Mfg.: Shively Labs
Antenna Type: 6014-14/1-DA

Date: 9/7/2012

Station: new FM

Beam Tilt 0

Frequency: 91.5

Gain (Max) 31.164 14.937 dB

Channel #: 218

Gain (Horizon) 31.164 14.937 dB

Figure: 3

Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field
-90	0.000	-44	0.059	0	1.000	46	0.042
-89	0.015	-43	0.043	1	0.911	47	0.015
-88	0.028	-42	0.015	2	0.671	48	0.016
-87	0.041	-41	0.018	3	0.355	49	0.043
-86	0.053	-40	0.046	4	0.057	50	0.061
-85	0.063	-39	0.059	5	0.147	51	0.065
-84	0.072	-38	0.053	6	0.220	52	0.055
-83	0.079	-37	0.029	7	0.173	53	0.033
-82	0.083	-36	0.005	8	0.059	54	0.005
-81	0.085	-35	0.038	9	0.058	55	0.024
-80	0.084	-34	0.058	10	0.125	56	0.049
-79	0.080	-33	0.057	11	0.123	57	0.067
-78	0.073	-32	0.034	12	0.063	58	0.073
-77	0.062	-31	0.002	13	0.018	59	0.068
-76	0.048	-30	0.039	14	0.080	60	0.054
-75	0.031	-29	0.061	15	0.097	61	0.032
-74	0.012	-28	0.059	16	0.067	62	0.005
-73	0.008	-27	0.031	17	0.009	63	0.022
-72	0.029	-26	0.011	18	0.048	64	0.047
-71	0.048	-25	0.050	19	0.078	65	0.067
-70	0.065	-24	0.069	20	0.071	66	0.081
-69	0.078	-23	0.058	21	0.032	67	0.087
-68	0.086	-22	0.019	22	0.019	68	0.086
-67	0.087	-21	0.032	23	0.058	69	0.078
-66	0.081	-20	0.071	24	0.069	70	0.065
-65	0.067	-19	0.078	25	0.050	71	0.048
-64	0.047	-18	0.048	26	0.011	72	0.029
-63	0.022	-17	0.009	27	0.031	73	0.008
-62	0.005	-16	0.067	28	0.059	74	0.012
-61	0.032	-15	0.097	29	0.061	75	0.031
-60	0.054	-14	0.080	30	0.039	76	0.048
-59	0.068	-13	0.018	31	0.002	77	0.062
-58	0.073	-12	0.063	32	0.034	78	0.073
-57	0.067	-11	0.123	33	0.057	79	0.080
-56	0.049	-10	0.125	34	0.058	80	0.084
-55	0.024	-9	0.058	35	0.038	81	0.085
-54	0.005	-8	0.059	36	0.005	82	0.083
-53	0.033	-7	0.173	37	0.029	83	0.079
-52	0.055	-6	0.220	38	0.053	84	0.072
-51	0.065	-5	0.147	39	0.059	85	0.063
-50	0.061	-4	0.057	40	0.046	86	0.053
-49	0.043	-3	0.355	41	0.018	87	0.041
-48	0.016	-2	0.671	42	0.015	88	0.028
-47	0.015	-1	0.911	43	0.043	89	0.015
-46	0.042	0	1.000	44	0.059	90	0.000
-45	0.059			45	0.059		