

TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465

JUNE 13, 2013

CH 279 0.25 KW 747 M AMSL

TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465
CH 279 0.25 KW 747 M AMSL

JUNE 13, 2013

Table of Contents

Technical Statement

Figure 1	Engineering Specifications
Figure 2	Summary of Allocation Analysis
Figure 3	Proposed Coverage Contours
Figure 4	Contour Analysis to Relevant Facilities
Figure 5	Aerial Photo of Transmitter Site
Figure 6	Calculations of Predicted 125.1 dBu Contour
Appendix 1	Results of Towair Study
Appendix 2	Notification Letter to Arecibo Observatory
Appendix 3	Antenna Manufacturer's Data

TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465
CH 279 0.25 KW 747 M AMSL

Technical Narrative

The technical exhibit, of which this narrative is part, has been prepared on behalf of Aurio A. Matos Barreto, licensee of FM translator station W279BU in Gurabo, Puerto Rico. It is proposed to operate W279BU as a “fill-in” translator of station WNVM (Facility ID 1891). By means of this application, the licensee seeks construction permit for minor changes in the facilities of W279BU.

FM translator station W279BU presently operates on channel 279 (103.7 MHz) with an effective radiated power (ERP) of 0.01 kW (10 watts), using a directional antenna system with horizontal polarization. It is proposed to change the location of the translator to a site approximately 9.9 kilometers from the existing site, change the antenna pattern, and increase its effective radiated power to 0.25 kW. The detailed engineering specifications of the proposed facility are shown in Figure 1.

Proposed Transmitter Location

The proposed transmitting facility would use a Scala, Model CL-FM/VRM, vertically polarized directional antenna, side-mounted on an existing 16.8-meter self-support tower. The proposed translator location is described by the following NAD27 geographic coordinates:

18° 09' 17.3" North
66° 04' 50.1" West

Tower Registration

The FAA is not being notified of the proposed construction, as it is proposed to side-mount an FM antenna on an existing 16.8 meter (55 foot) lattice tower that according to the Towair program (see Appendix 1) does not require registration.

Environmental Considerations

The proposal is excluded from environmental processing, as an existing tower is to be employed and the proposal complies with the FCC Rules concerning human exposure to radio frequency (RF) energy. * The proposal would not exceed 10% of the RF exposure limit for general population/uncontrolled environments for the frequency proposed. The calculation of RF energy at 2-m above ground was made under the procedures of OET Bulletin No. 65.† The formula employed is as follows:

$$S = \frac{(33.4)F^2P}{R^2}$$

where, S = power density in $\mu\text{W}/\text{cm}^2$, F = relative field factor at the angle to the calculation point, P = the total effective radiated power relative to a dipole in watts, and R = distance from the antenna radiation center to the calculation point in meters.

Based on the vertical radiation pattern of the proposed antenna, (Appendix 3), a relative field factor of 0.645 or less for any depression angle equal or greater than 30 degrees below horizon, a total effective radiated power of 250 watts and an antenna radiation center height above ground of 15.24 m, the calculated power density will not exceed $20 \mu\text{W}/\text{cm}^2$. Therefore, the calculated RF exposure at 2 m above ground will not exceed 10% of the limit of $200 \mu\text{W}/\text{cm}^2$ for the general population and uncontrolled environments.

The antenna system shall be restricted from access and appropriate warning signs posted. In the event that personnel are required to climb the structure, the proposed FM translator transmissions shall be reduced or terminated as necessary to prevent RF exposure above the FCC recommended limits.

Quiet Zone Notification

* Given that the proposed ERP will not exceed 100 watts, the proposal is categorically excluded from environmental processing pursuant to Section 1.1307 of the FCC Rules.

† Federal Communications Commission OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (Edition 97-01, August 1997).

As required by FCC rules pertaining to radio Quiet Zones, Section 73.1030(a), the National Astronomy and Ionosphere Center (NAIC) in Arecibo, Puerto Rico is being notified of this application. A copy of the notification letter to the Arecibo Observatory of the proposed facility is included herein as Appendix 2.

FCC Monitoring Stations

FCC rules pertaining to FCC monitoring stations, Section 73.1030(c), requires that the proposed facility does not produce a field strength greater than 10 mV/m at the FCC stations. The closest FCC monitoring station to the proposed operation is located at Santa Isabel, PR, at a distance of 35 kilometers on a bearing of 242° True. The proposed operation will produce field strengths much lower than 10 mV/m at the FCC Santa Isabel, PR station.

Allocation Considerations and Predicted Coverage Contour

Figure 2 summarizes the allocation study for the proposed facility. As indicated in Figure 2, the spacing requirements with respect to IF related facilities are met. The tabulation in Figure 2 also lists the results of a numerical analysis of the potential for contour overlap for all nearby co-channel and first-, second-, and third-adjacent-channel facilities. For the purposes of the numerical study, the maximum HAAT and maximum ERP values were used in determining the maximum distance in any direction to the predicted coverage and interfering contours.[‡]

The predicted 60 dBu coverage contour was calculated in accordance with Section 73.313 of the FCC Rules. The average terrain elevations from 3 to 16 km from the proposed site were computed using the USGS 3-second terrain database. The distances to the predicted 60 dBu coverage contour for the proposed booster was determined using the average elevations of radials spaced every 5-degrees of azimuth. The antenna radiation center height above average terrain and the ERP in each radial direction were used in conjunction with the propagation prediction curves of Section 73.333 to determine the distances to the contour.

Figure 3 shows the predicted 60 dBu coverage contour of the existing and proposed translator facilities and the licensed 60 dBu coverage contour of primary FM station WNVM. As shown in Figure 3, there will be overlap of the 60 dBu service contours of the existing and proposed W279BU facilities. The predicted 60 dBu coverage contour of the

[‡] Where the maximum HAAT figure was not available the radiation center height above mean sea level was employed as a worst-case estimate.

proposed translator facility is well within the 60 dBu coverage contour of WNVN, the FM primary station to be retransmitted.

Figure 4, Sheets A to C is a depiction of the allocation situation with respect to the predicted protected contours of those stations close enough to warrant further study. This is based on the analysis in Figure 2, where there is an indication of the potential for prohibited overlapping contours. As shown in Figure 4A, the proposed facility does not involve prohibited contour overlap with the protected contours of the stations WERR and W279BV. Figure 4B offers an expanded, more detailed view of the contours with respect to WERR.

Figure 4C shows that there is no prohibitive overlap with respect to station WXLX. As shown in Figure 4C, while the predicted 54 dBu contour of station WVJP-FM fully encompasses the existing and proposed transmitter sites of W279BU, booster stations WVJP-FM1 and WVJP-FM2 are properly protected. With respect to WVJP-FM, processing pursuant to Section 73.1204(d) of the FCC Rules is requested. Specifically, it is demonstrated herein that the proposed translator facility will cause no harmful interference to WVJP-FM.

W279BU operates on Channel 279, second adjacent channel to WVJP-FM. The protection requirements of the undesired signal from W279BU is 40 dB higher than the desired signal of WVJP-FM. The proposed translator site is located 27.6 kilometers, at a bearing of 241 degrees true from station WVJP-FM, which operates on channel 277B with an omnidirectional antenna having an ERP of 28 kW and an HAAT of 645 meters along radial 241°. The predicted WVJP-FM F(50,50) field strength at the proposed site is 85.1 dBu. Using the U/D ratio of 40 dB contained in Section 74.1204, the proposed F(50,10) interfering signal is 125.1 dBu.[§] The 125.1 dBu contour thus defines the maximum extent of predicted interference to WVJP-FM from the proposed translator facility.

Since an ERP of 250-watts is proposed, the 125.1 dBu signal contour is calculated by means of a free-space calculation. Based on free-space calculations, the maximum horizontal distance that the 125.1 dBu contour would reach at a height of 15 feet or less from ground level is 60 meters or 195 ft. from the transmitting antenna. This is graphically depicted in Figure 6B.

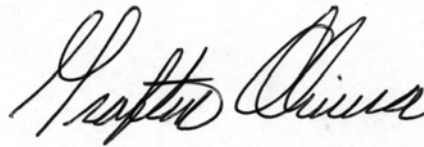
According to the information provided by the applicant, after a rigorous surveying of the proposed site area with a technical supervisor of the Puerto Rico Telephone Company (PRTC), there are no residences or office structures within a radial distance of at least 200 meters (656 ft.) from the proposed antenna radiation center. The only structures

[§] See In re Application of Living Way Ministries, Inc. for a Construction Permit for a New NCE FM Translator Station at Sun Valley, CA, File No. BPFT-19981001TA, FCC 02-244, Released: September 9, 2002

within this distance are the PRTC communications equipment room, which will house the translator equipment, and communications towers and equipment rooms belonging to other telecommunication companies which are occasionally visited by maintenance personnel. This site is a secluded radio transmission site and, as shown in Figure 5, an aerial photo of the site and surroundings, the closet house to the proposed antenna tower is about 290 meters (951 ft.) from the antenna supporting structure. Therefore, there is no predicted harmful interference to WVJP-FM as a result of the proposed translator facility.

Figure 6A is a table and Figure 6B a graphic representation showing the computed distances to the predicted 125.1 dBu contour under these assumptions. Appendix 3 shows the antenna pattern data used for these calculations.

For all the reasons stated above, it is believed that the proposed facility is in compliance with applicable FCC Rules and Regulations.



Grafton Olivera, P.E.
du Treil, Lundin & Rackley, Inc.
201 Fletcher Avenue
Sarasota, Florida 34237-6019

(941) 329-6001

June 13, 2013

TECHNICAL EXHIBIT
 APPLICATION FOR
 MINOR CHANGE IN LICENSED FACILITY
 AURIO A. MATOS BARRETO.
 FM TRANSLATOR STATION W279BU
 GURABO, PUERTO RICO
 FACILITY ID 143465
 CH 279 0.25 KW 747 M AMSL

Engineering Specifications

Channel / Frequency	279A / 103.7 MHz
Site Coordinates (NAD27)	18° 09' 17.3" North Latitude 66° 04' 50.1" West Longitude
Antenna structure Registration	N/A
Height of antenna radiation center	15 m AGL / 747 AMSL
Antenna radiation center HAAT	372 m
Transmitter	RVR, PJ-250 M
Transmitter power output	0.06 kW
Transmission line	Andrew, LDF7-50A
Transmission line length	31 m
Transmission line efficiency	85.1 %
Antenna	Scala CL-FM/VRM
Polarization	Vertical
Power gain	5.01
Antenna input power	0.05 kW
Effective radiated power	0.25 kW (Vert. MAX-DA)

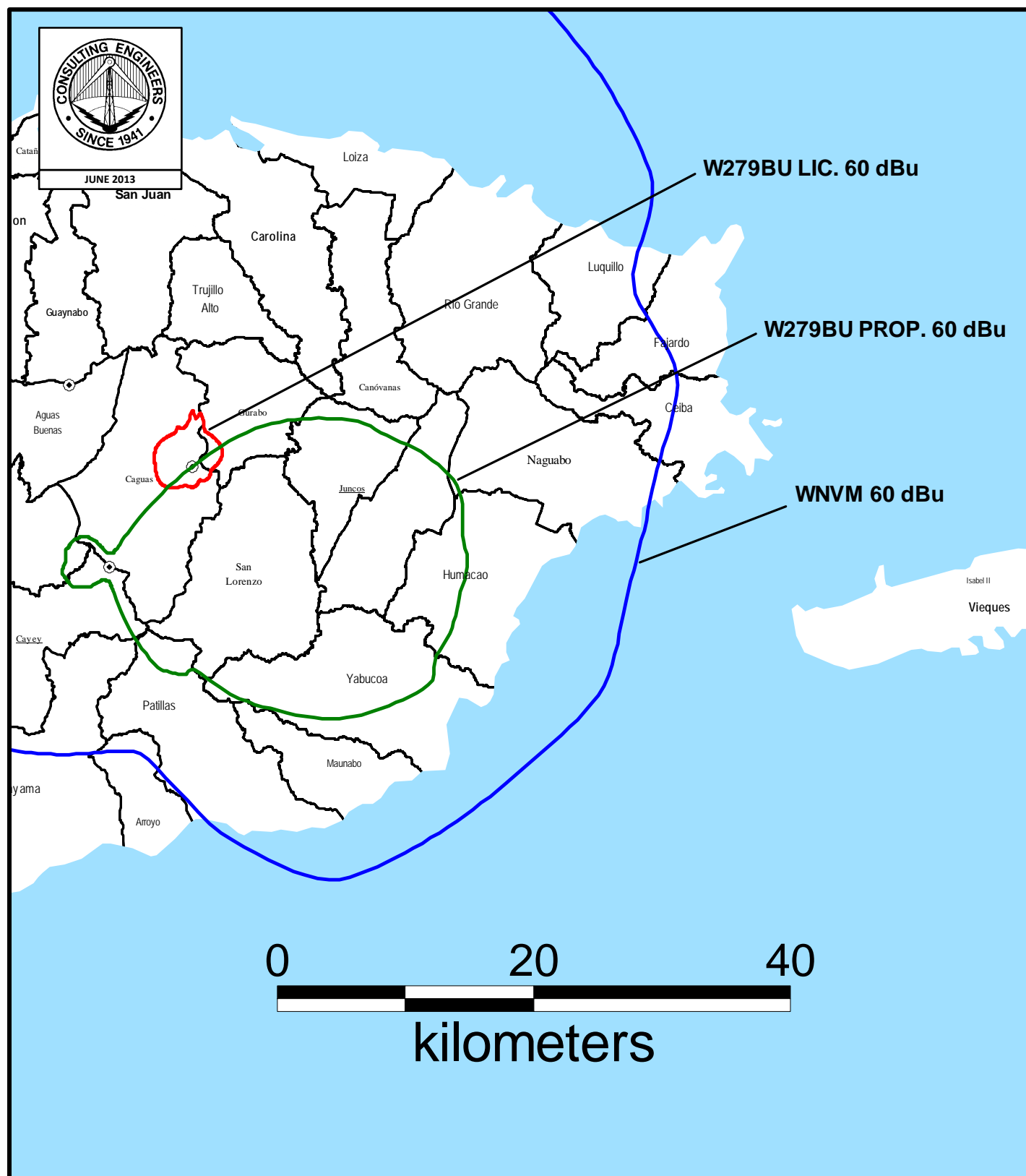
TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465
CH 279 0.25 KW 747 M

Summary of Allocation Analysis

Channel: 279 Coordinates: 018-09-17.3 066-04-50.1 (NAD 27) Page: 1 of 1
Class: A Buffer Distance: 50 km

Callsign	Status	Chan.	Serv.	Freq.	City	State	Latitude	Dist.(km)	Sep.(km)	Spacing(km)		
Fac. ID	ARN			Class	DA	Ant. ID	ERP(kW)	HAAT(m)	Longitude	Bear.(deg)	73.215	Comment
W225AY	LIC	225	FX	92.9	ARROYO	PR	018-00-36	17.09				
157296	BLFT	20071228	ABO	D	C	67340	0.05		066-01-28.4	159.8		CLEAR
WTPM-FM1	LIC	225	FB	92.9	PONCE	PR	018-07-29	78.61				
13951	BLFTB	19950503	TJ	D	D	16125	3.9	296	066-49-22	267.67		CLEAR
WYQE	LIC	225	FM	92.9	NAGUABO	PR	018-16-50	45.58	10		35.58	
19056	BLH	19950106	KB	A	N		3.9	229	065-40-13	72.05		CLEAR
W276AI	LIC	276	FX	103.1	PONCE	PR	018-00-00	59.67				
53553	BLFT	19860609	TH	D	D	13702	0.004		066-37-14	253.3		INFO
WVJP-FM1	LIC	277	FB	103.3	JUANA DIAZ	PR	018-05-02	40.51				
171222	BLFTB	20110908	ACK	D	C	88314	0.46		066-27-22	258.82		INFO
WVJP-FM2	LIC	277	FB	103.3	FAJARDO	PR	018-16-57	45.59				
178112	BLFTB	20110908	ACO	D	C	89210	2		065-40-15	71.77		INFO
WVJP-FM	LIC	277	FM	103.3	CAGUAS	PR	018-16-41	27.72	69		-41.28	
6441	BLH	19890331	KI	B			28	581	065-51-09	60.33	63 N	SHORT
W279BV	LIC	279	FX	103.7	SAN JUAN	PR	018-17-42	17.93				
26656	BLFT	20120906	ACB	D	D	16150	0.25		066-09-56	330.08		INFO
WXLX	LIC	279	FM	103.7	LAJAS	PR	017-59-37	118.36	178		-59.64	
55065	BLH	19940113	KE	B	N		50	139	067-11-09	261.45	143 N	SHORT
WERR-FM1	LIC	281	FB	104.1	CAGUAS	PR	018-16-17	13.2				
165723	BLFTB	20060921	ACG	D	C	71801	0.006		066-03-16	12.02		INFO
WERR-FM2	LIC	281	FB	104.1	YAUCO	PR	018-04-49	71.12				
183844	BLFTB	20130131	ADT	D	N	111583	0.15		066-44-53	263.4		INFO
WERR-FM3	LIC	281	FB	104.1	MAYAGUEZ	PR	018-19-31	116.78				
183848	BLFTB	20111114	AYO	D	C	97367	2.5		067-10-13	279.52		INFO
WERR	LIC	281	FM	104.1	VEGA ALTA	PR	018-17-29	63.21	69		-5.79	
54750	BLH	20080708	AJO	B	N		50	301	066-39-39	284.01	63 N	SHORT

Figure 3



PREDICTED COVERAGE CONTOUR

LICENSE MOD. APPLICATION

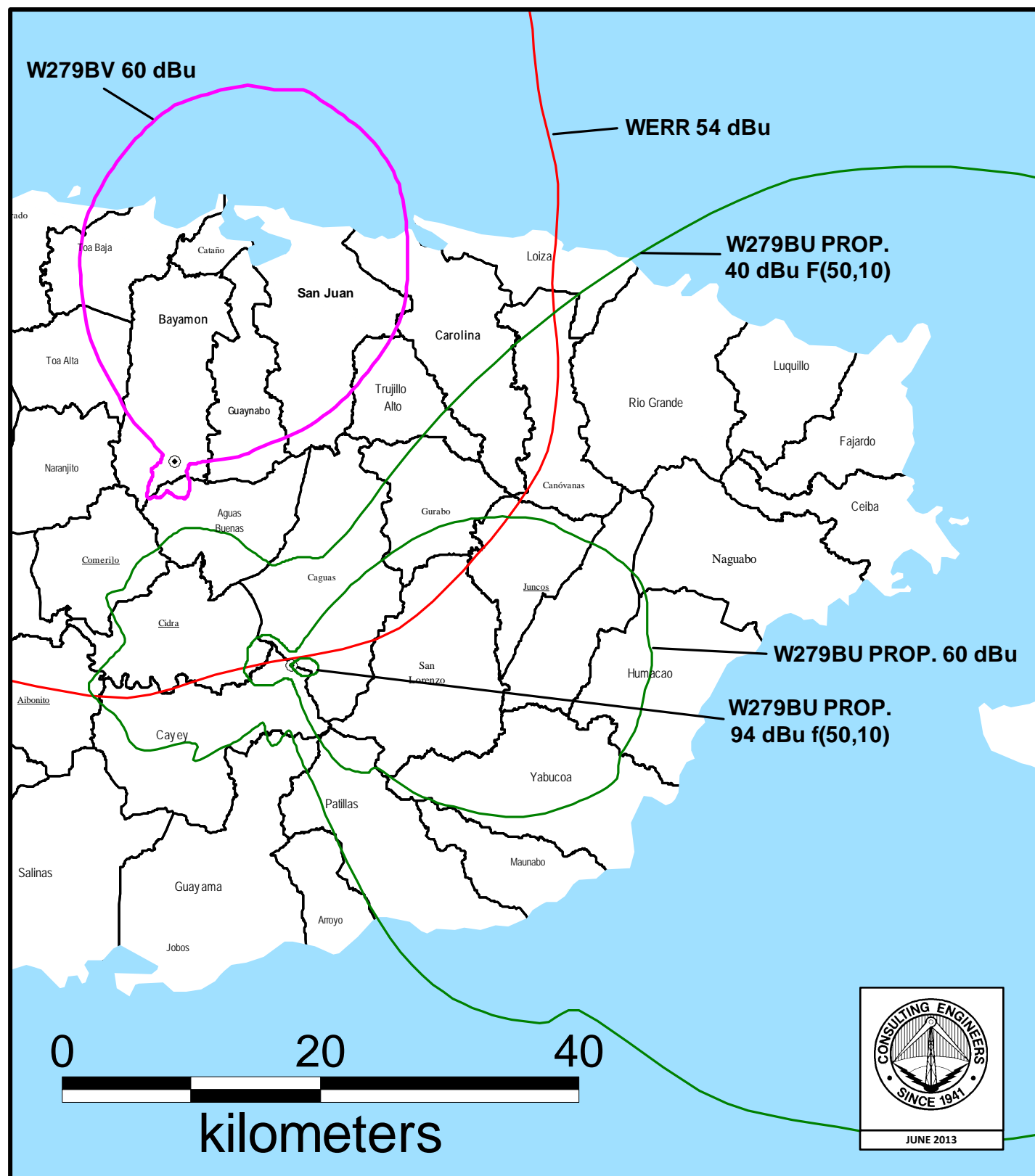
FM TRANSLATOR W279BU

GURABO, PUERTO RICO

CH 279 0.25 KW 747 M AMSL

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

Figure 4A



PROPOSED ALLOCATION SITUATION

LICENSE MOD. APPLICATION

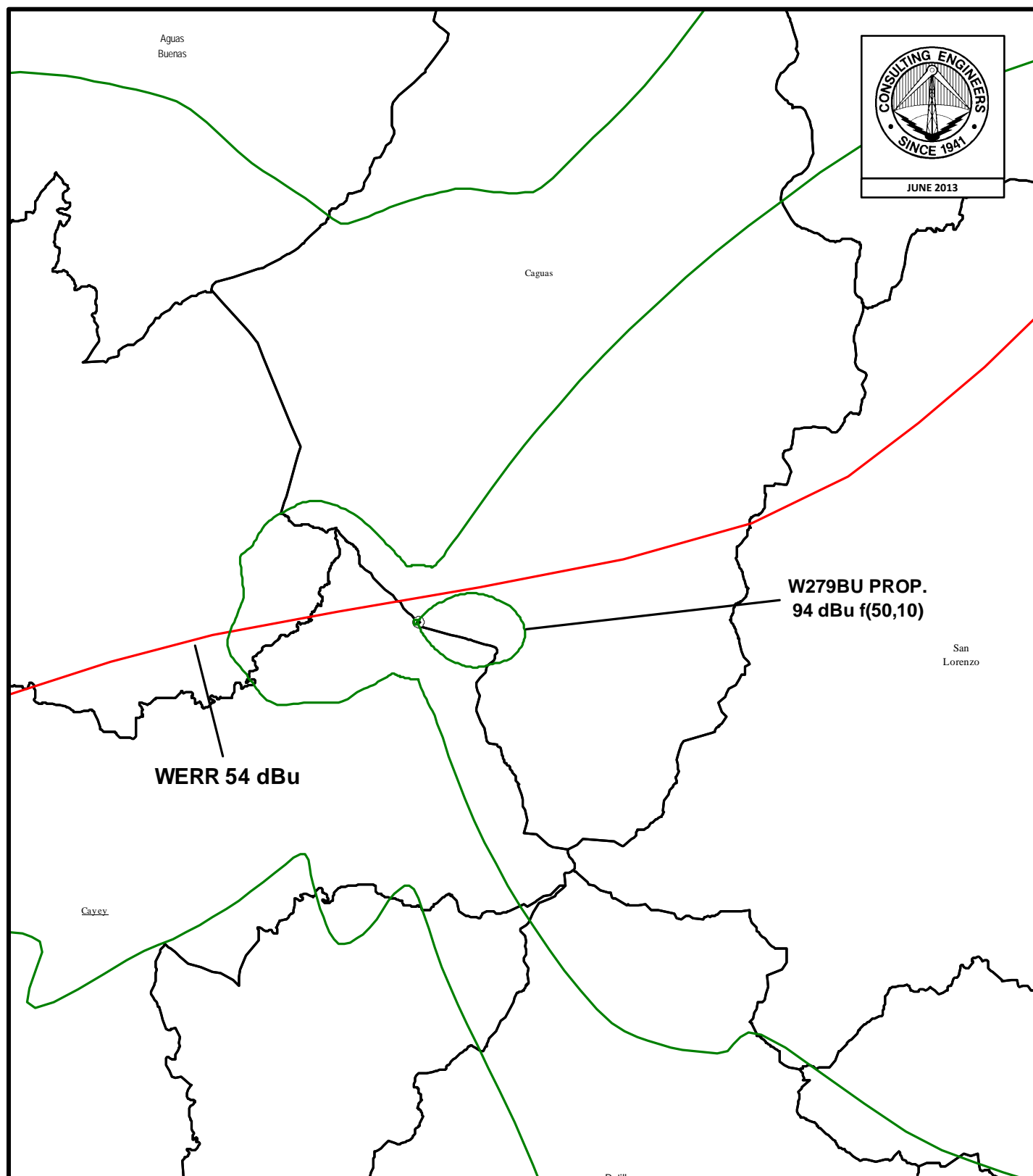
FM TRANSLATOR W279BU

GURABO, PUERTO RICO

CH 279 0.25 KW 747 M AMSL

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

Figure 4B



PROPOSED ALLOCATION SITUATION

LICENSE MOD. APPLICATION

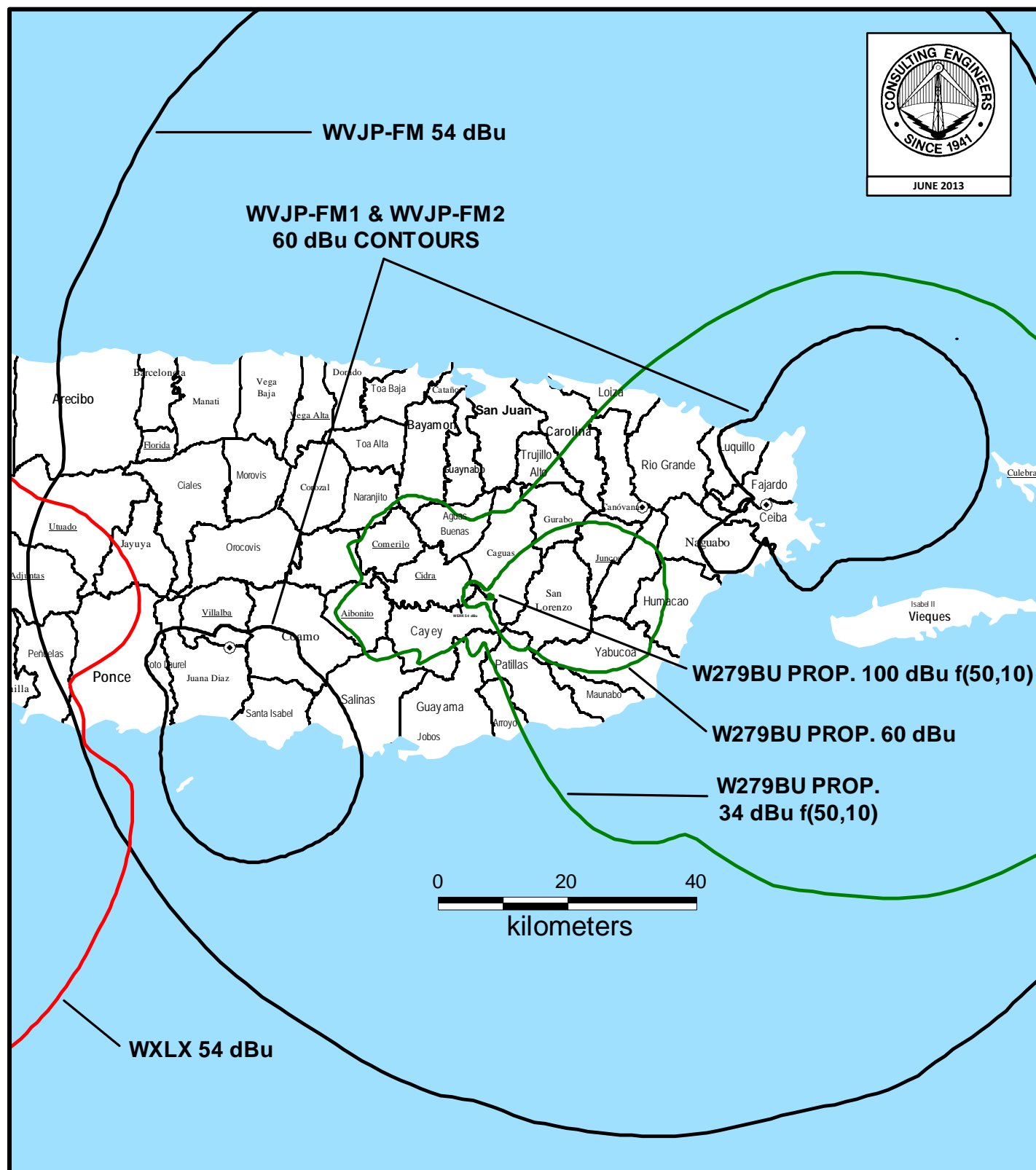
FM TRANSLATOR W279BU

GURABO, PUERTO RICO

CH 279 0.25 KW 747 M AMSL

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

Figure 4C



PROPOSED ALLOCATION SITUATION

LICENSE MOD. APPLICATION

FM TRANSLATOR W279BU

GURABO, PUERTO RICO

CH 279 0.25 KW 747 M AMSL

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

Figure 5



PROPOSED TRANSMITTER SITE

AURIO A. MATOS BARRETO
FM TRANSLATOR W279BU
GURABO, PUERTO RICO
CH 279 0.25 KW 747 M

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

Figure 6A

Interfering Field Strength Vs. Distance Graph

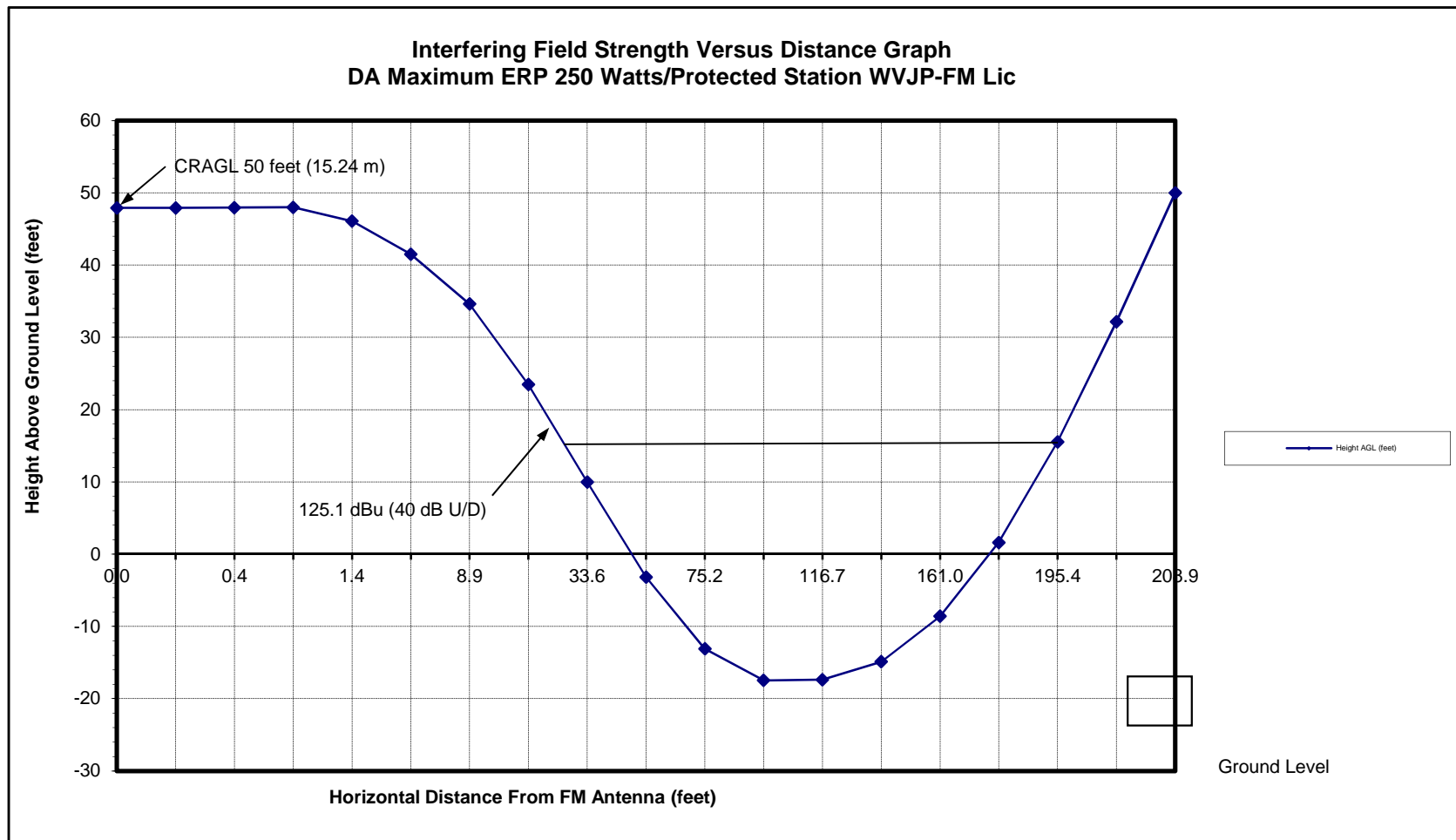
Antenna	Scala CL-FM Vert	
RCAGL	50	feet
Interfering Contour	125.1	dBu

ERP	0.25	kW
	-6.0205999	dBk

Depression Angle	VRF	ERP (dBk)	Distance to Contour (m)**	Distance to Contour (feet)**	Horiz. Dist. (feet)	Height AGL (feet)
90	0.010	-46.0	0.6	2	0	48
85	0.010	-46.0	0.6	2	0	48
80	0.010	-46.0	0.6	2	0	48
75	0.010	-46.0	0.6	2	1	48
70	0.020	-40.0	1.3	4	1	46
65	0.045	-33.0	2.9	9	4	41
60	0.085	-27.4	5.4	18	9	35
55	0.155	-22.2	9.9	32	19	23
50	0.250	-18.1	15.9	52	34	10
45	0.360	-14.9	22.9	75	53	-3
40	0.470	-12.6	29.9	98	75	-13
35	0.563	-11.0	35.8	118	96	-17
30	0.645	-9.8	41.1	135	117	-17
25	0.735	-8.7	46.8	154	139	-15
20	0.820	-7.7	52.2	171	161	-9
15	0.895	-7.0	57.0	187	181	2
10	0.950	-6.5	60.5	198	195	16
5	0.980	-6.2	62.4	205	204	32
0	1.000	-6.0	63.7	209	209	50

**Free Space Field Equation= $\text{Dist. (km)} = \frac{\log^{-1}((107.2 + P(\text{DBK}) - \text{FS})/20)}{1000}$

Figure 6B



TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465

CH 279 0.25 KW 747 M AMSL

Results of Towair Study

{one sheet follows}

[FCC Home](#) | [Search](#) | [Updates](#) | [E-Filing](#) | [Initiatives](#) | [For Consumers](#) | [Find People](#)

Antenna Structure Registration

[FCC](#) > [WTB](#) > [ASR](#) > [Online Systems](#) > TOWAIR[FCC Site Map](#)

TOWAIR Determination Results

[? HELP](#)[New Search](#) [Printable Page](#)

*** NOTICE ***

TOWAIR's findings are not definitive or binding, and we cannot guarantee that the data in TOWAIR are fully current and accurate. In some instances, TOWAIR may yield results that differ from application of the criteria set out in 47 C.F.R. Section 17.7 and 14 C.F.R. Section 77.13. A positive finding by TOWAIR recommending notification should be given considerable weight. On the other hand, a finding by TOWAIR recommending either for or against notification is not conclusive. It is the responsibility of each ASR participant to exercise due diligence to determine if it must coordinate its structure with the FAA. TOWAIR is only one tool designed to assist ASR participants in exercising this due diligence, and further investigation may be necessary to determine if FAA coordination is appropriate.

DETERMINATION Results

Structure does not require registration. There are no airports within 8 kilometers (5 miles) of the coordinates you provided.

Your Specifications

NAD83 Coordinates

Latitude	18-09-10.2 north
Longitude	066-04-48.7 west

Measurements (Meters)

Overall Structure Height (AGL)	16.8
Support Structure Height (AGL)	0
Site Elevation (AMSL)	370.6

Structure Type

LTOWER - Lattice Tower

Tower Construction Notifications

Notify Tribes and Historic Preservation Officers of your plans to build a tower.

ASR Help

[ASR License Glossary](#) - [FAQ](#) - [Online Help](#) - [Documentation](#) - [Technical Support](#)

ASR Online Systems

[TOWAIR](#) - [CORES](#) - [ASR Online Filing](#) - [Application Search](#) - [Registration Search](#)

About ASR

[Privacy Statement](#) - [About ASR](#) - [ASR Home](#)[FCC](#) | [Wireless](#) | [ULS](#) | [CORES](#)[Help](#) | [Tech Support](#)

TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465

CH 279 0.25 KW 747 M AMSL

Notification Letter to Arecibo Observatory

{one sheet follows}



201 Fletcher Ave.
Sarasota, FL 34237-6019
941-329-6000
941-329-6031 FAX

Grafton Olivera
Direct Dial 941-329-6001
e-mail: grifton@dlr.com

June 13, 2013

Via email (prcz@naic.edu)

Dr. Michael C. Nolan, Director
Angel M. Vázquez, Spectrum Manager
National Astronomy and Ionosphere Center
Arecibo Observatory
HC3 Box 53995
Arecibo, PR 00612

Gentlemen:

On behalf of our client, Aurio A. Matos Barreto, licensee of FM Translator Station W279BU, Gurabo, Puerto Rico, in accordance with Section 73.1030 of the FCC Rules, we are hereby notifying you of proposed changes in the facility of W279BU. The particulars of the proposal are as follows:

Proposed Facility:

Geographical coordinates of antenna location (NAD27): 18-09-17.3 / 66-04-50.1
Antenna height (Scala CL-FM/VRM, Log Periodic): 15.2 m AGL; 747 m AMSL
Antenna Gain: 7 dB
Antenna Orientation: 98° True
Operating channel: 279 (103.7 MHz)
Type of emission: F3E
Effective isotropic radiated power: 0.41 kW – Vertical Polarization

Please review this proposal and let us know your findings. Please feel free to communicate via email (<mailto:grifton@dlr.com>), telefax (941-329-6030) or regular mail.

Very truly yours,

Grafton Olivera, P.E.

TECHNICAL EXHIBIT
APPLICATION FOR
MINOR CHANGE IN LICENSED FACILITY
AURIO A. MATOS BARRETO.
FM TRANSLATOR STATION W279BU
GURABO, PUERTO RICO
FACILITY ID 143465

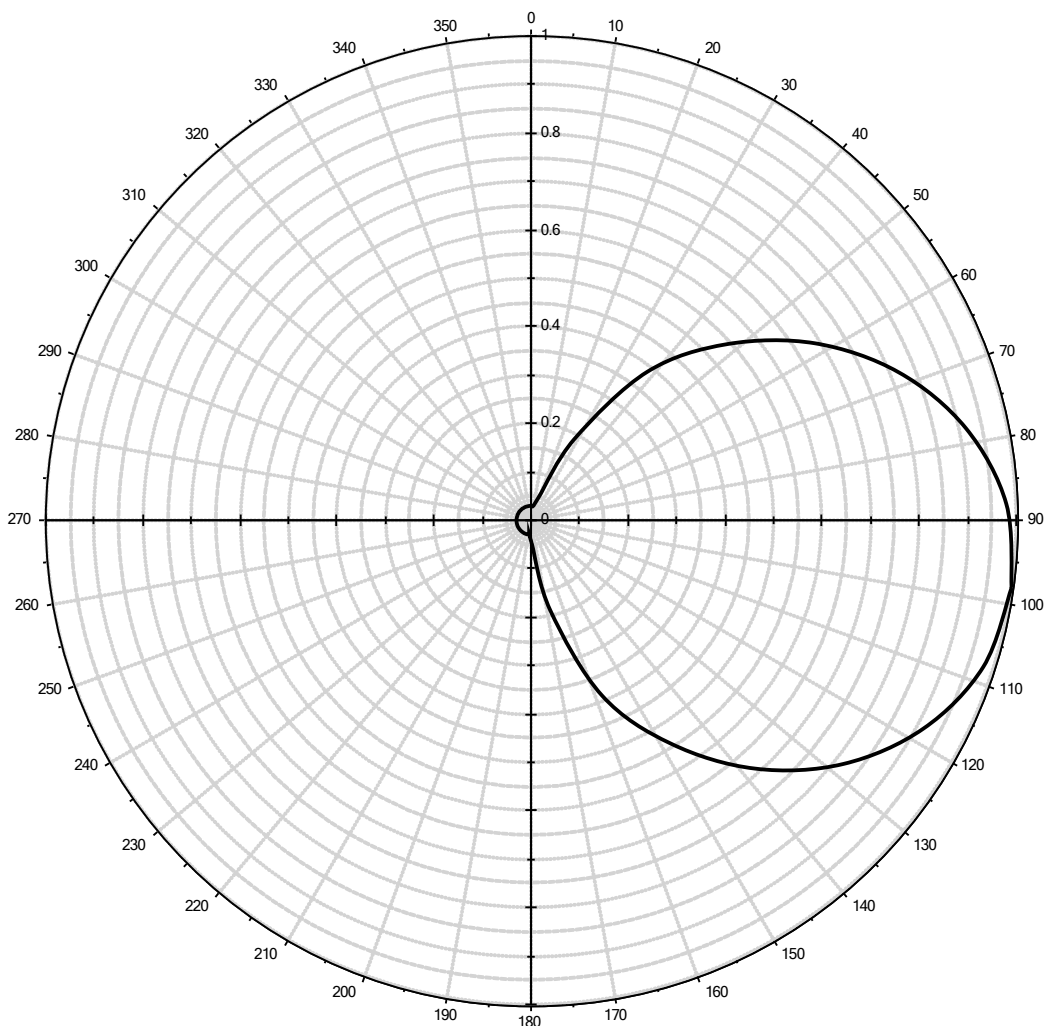
CH 279 0.25 KW 747 M AMSL

Antenna Pattern Data

{five sheets follow}



Antenna ID: 16151



Note: display reflects rotation of 98.00°

0° 1.000	60° 0.390	120° 0.030	180° 0.030	240° 0.030	300° 0.390
10° 0.980	70° 0.190	130° 0.030	190° 0.030	250° 0.030	310° 0.544
20° 0.916	80° 0.050	140° 0.030	200° 0.030	260° 0.030	320° 0.690
30° 0.817	90° 0.030	150° 0.030	210° 0.030	270° 0.030	330° 0.817
40° 0.690	100° 0.030	160° 0.030	220° 0.030	280° 0.050	340° 0.916
50° 0.544	110° 0.030	170° 0.030	230° 0.030	290° 0.190	350° 0.980

Antenna Make: SCA

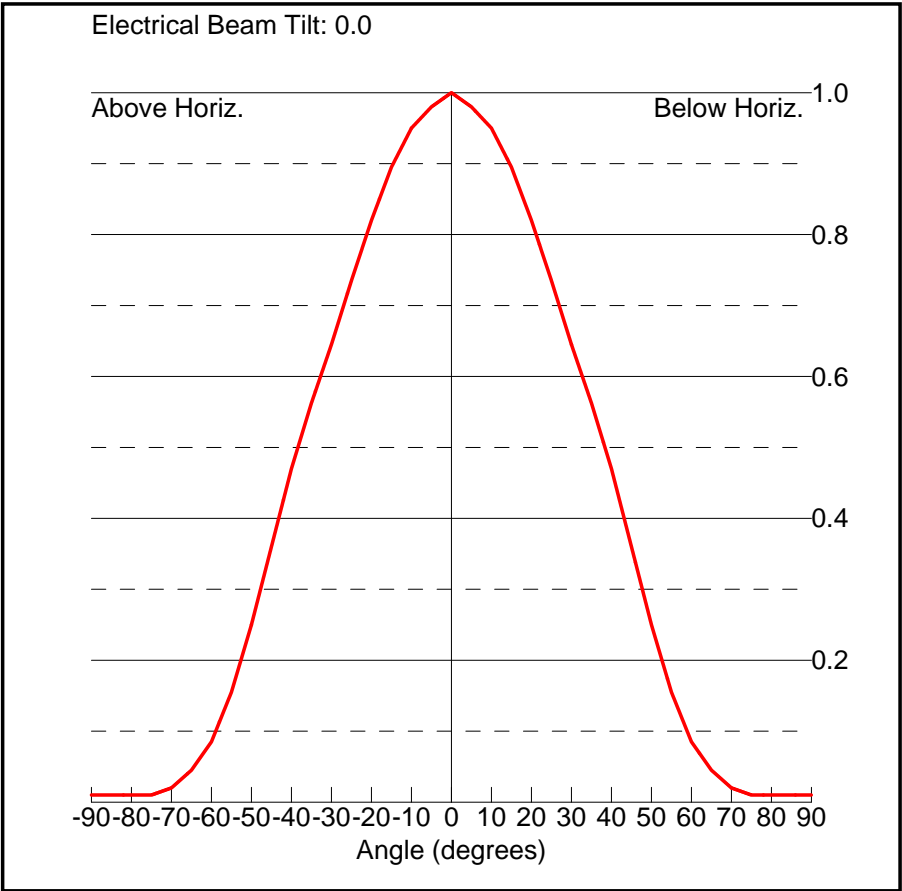
Standard Pattern: Y

Antenna Model: CL-FM(V)

Last Change Date:

Vertical Elevation Pattern

Angle (deg)	Relative Field
-90.0	0.01
-89.0	0.01
-88.0	0.01
-87.0	0.01
-86.0	0.01
-85.0	0.01
-84.0	0.01
-83.0	0.01
-82.0	0.01
-81.0	0.01
-80.0	0.01
-79.0	0.01
-78.0	0.01
-77.0	0.01
-76.0	0.01
-75.0	0.01
-74.0	0.012
-73.0	0.014
-72.0	0.016
-71.0	0.018
-70.0	0.02
-69.0	0.025
-68.0	0.03
-67.0	0.035
-66.0	0.04
-65.0	0.045
-64.0	0.053
-63.0	0.061
-62.0	0.069
-61.0	0.077
-60.0	0.085
-59.0	0.099
-58.0	0.113
-57.0	0.127
-56.0	0.141
-55.0	0.155
-54.0	0.174
-53.0	0.193
-52.0	0.212
-51.0	0.231
-50.0	0.25
-49.0	0.272
-48.0	0.294
-47.0	0.316
-46.0	0.338
-45.0	0.36
-44.0	0.382
-43.0	0.404



-42.0	0.426
-41.0	0.448
-40.0	0.47
-39.0	0.488
-38.0	0.507
-37.0	0.525
-36.0	0.544
-35.0	0.563
-34.0	0.579
-33.0	0.596
-32.0	0.612
-31.0	0.628
-30.0	0.645
-29.0	0.663
-28.0	0.681
-27.0	0.699
-26.0	0.717
-25.0	0.735
-24.0	0.752
-23.0	0.769
-22.0	0.786
-21.0	0.803

-20.0	0.82	32.0	0.612
-19.0	0.835	33.0	0.596
-18.0	0.85	34.0	0.579
-17.0	0.865	35.0	0.563
-16.0	0.88	36.0	0.544
-15.0	0.895	37.0	0.525
-14.0	0.906	38.0	0.507
-13.0	0.917	39.0	0.488
-12.0	0.928	40.0	0.47
-11.0	0.939	41.0	0.448
-10.0	0.95	42.0	0.426
-9.0	0.956	43.0	0.404
-8.0	0.962	44.0	0.382
-7.0	0.968	45.0	0.36
-6.0	0.974	46.0	0.338
-5.0	0.98	47.0	0.316
-4.0	0.984	48.0	0.294
-3.0	0.988	49.0	0.272
-2.0	0.992	50.0	0.25
-1.0	0.996	51.0	0.231
0.0	1.0	52.0	0.212
1.0	0.996	53.0	0.193
2.0	0.992	54.0	0.174
3.0	0.988	55.0	0.155
4.0	0.984	56.0	0.141
5.0	0.98	57.0	0.127
6.0	0.974	58.0	0.113
7.0	0.968	59.0	0.099
8.0	0.962	60.0	0.085
9.0	0.956	61.0	0.077
10.0	0.95	62.0	0.069
11.0	0.939	63.0	0.061
12.0	0.928	64.0	0.053
13.0	0.917	65.0	0.045
14.0	0.906	66.0	0.04
15.0	0.895	67.0	0.035
16.0	0.88	68.0	0.03
17.0	0.865	69.0	0.025
18.0	0.85	70.0	0.02
19.0	0.835	71.0	0.018
20.0	0.82	72.0	0.016
21.0	0.803	73.0	0.014
22.0	0.786	74.0	0.012
23.0	0.769	75.0	0.01
24.0	0.752	76.0	0.01
25.0	0.735	77.0	0.01
26.0	0.717	78.0	0.01
27.0	0.699	79.0	0.01
28.0	0.681	80.0	0.01
29.0	0.663	81.0	0.01
30.0	0.645	82.0	0.01
31.0	0.628	83.0	0.01

The Kathrein Scala Division CL-FM is a ruggedly built log-periodic antenna, designed for professional FM transmit and receive applications.

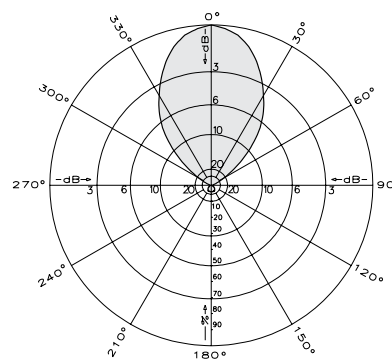
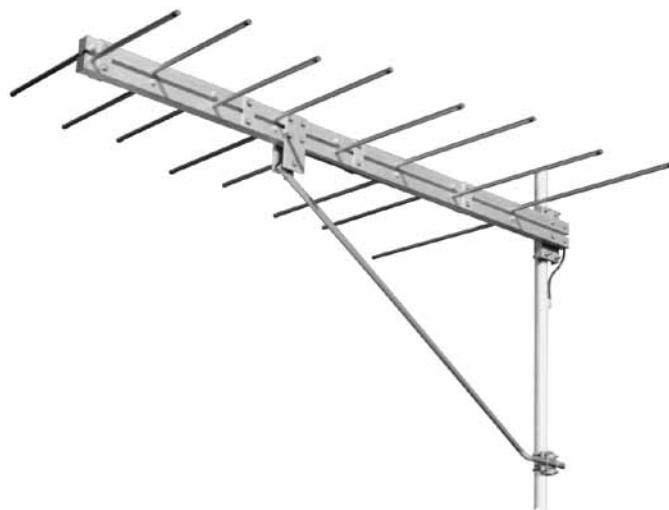
Like all Kathrein Scala Division antennas, the CL-FM is made of the finest materials using state of the art electrical and mechanical designs, resulting in superior performance and long service life.

The CL-FM may be used stand-alone or in stacked arrays for higher gain, increased side-lobe suppression, or custom azimuth patterns.

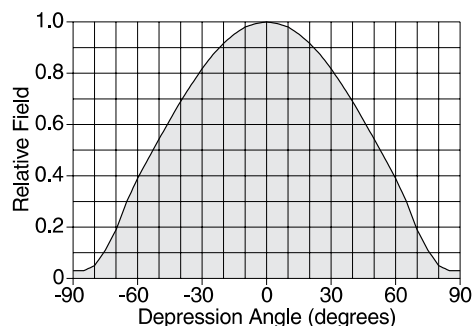
Specifications:

Frequency range	88–108 MHz (broadband)
Gain	7 dBd
Power gain	5.01
Impedance	50 or 75 ohms
VSWR	< 1.5:1
Polarization	Horizontal or vertical
Front-to-back ratio	>25 dB
Maximum input power	250 watts, type "N" 75 ohm connector 500 watts, type "N" 50 ohm connector
Azimuth pattern	52 degrees (half-power) horizontal polarization
Elevation pattern	78 degrees (half-power) horizontal polarization
Connector	Female 50Ω or 75Ω N
Weight	45 lb (20.4 kg)
Dimensions	104 x 67.9 inches (2642 x 1724 mm)
Wind load	at 100 mph (160 kph) 138 lbf (611 N) maximum
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	116 x 14.5 x 6 inches (2946 x 369 x 153 mm)
Shipping weight	56 lb (25.4 kg)
Mounting	For masts of 2.375 inches (60 mm) OD.
CL-FM/HCM	Horizontal polarization center-mount
CL-FM/HRM	Horizontal polarization rear-mount
CL-FM/VRM	Vertical polarization rear-mount

See reverse for order information.



Azimuth pattern (E-plane)



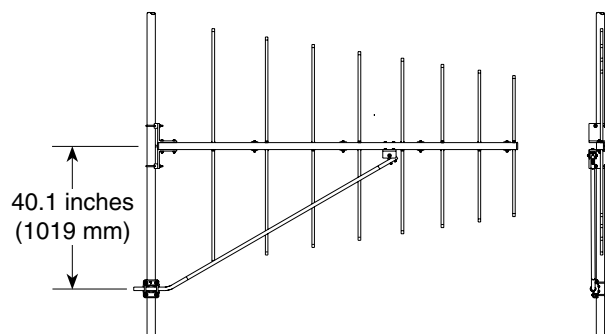
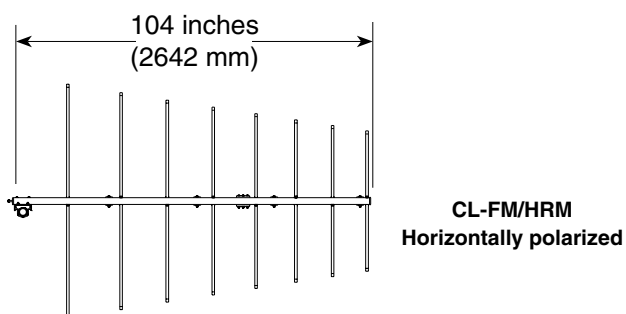
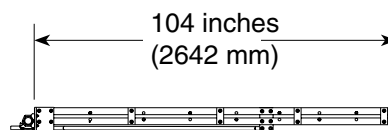
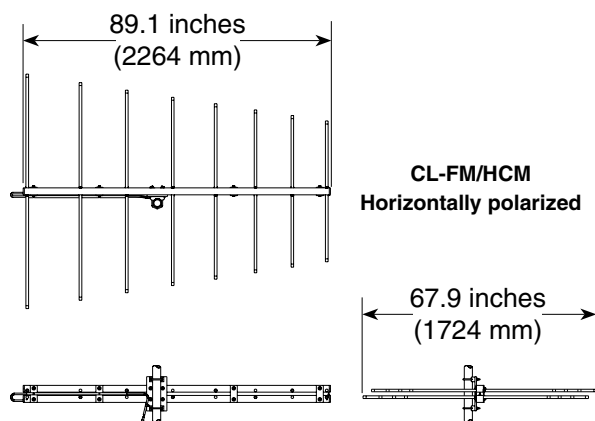
Elevation pattern (H-plane)

* Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.



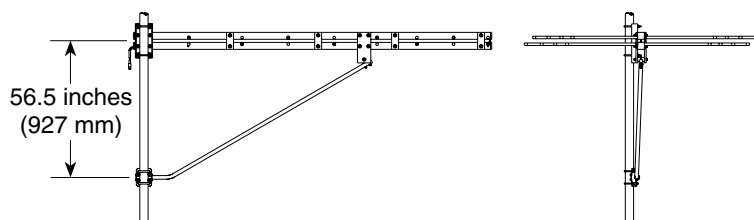
10492-F





CL-FM/VRM
Vertically polarized

Vertically polarized antennas require lateral stabilization (not supplied) to prevent the antenna from turning on the mounting pipe.



Order Information:

Model	Description
CL-FM/HCM/50N	Antenna with 50 Ω N connector Horizontal polarization center-mount
CL-FM/HCM/75N	Antenna with 75 Ω N connector Horizontal polarization center-mount
CL-FM/HRM/50N	Antenna with 50 Ω N connector Horizontal polarization rear-mount

Order Information:

Model	Description
CL-FM/HRM/75N	Antenna with 75 Ω N connector Horizontal polarization rear-mount
CL-FM/VRM/50N	Antenna with 50 Ω N connector Vertical polarization rear-mount

All specifications are subject to change without notice. The latest specifications are available at www.kathrein-scala.com.