

TECHNICAL EXHIBIT
APPLICATION FOR
A NEW LPFM STATION
CAGUAS, PUERTO RICO
CHANNEL 315

NOVEMBER 5, 2013

TECHNICAL EXHIBIT
APPLICATION FOR
A NEW LPFM STATION
CAGUAS, PUERTO RICO
CHANNEL 315

Table of Contents

	Technical Statement
Figure 1	LPFM Allocation Study
Figure 2	FM Translators within 50 Kilometers
Figure 3	Calculations of 136.2 dBu Contour to WIDA-FM
Figure 4	Calculations of 144.2 dBu Contour to WIPR-FM
Appendix 1	Notification Letter to Arecibo Observatory
Appendix 2	TOWAIR Study

TECHNICAL EXHIBIT
APPLICATION FOR
A NEW LPFM STATION
CAGUAS, PUERTO RICO
CHANNEL 315

Technical Narrative

The technical exhibit, of which this narrative is part, has been prepared on behalf of Iglesia Refugio, Sanidad y Adoración, applicant of a new LPFM station for Caguas, PR.

Proposed Transmitter Location

The proposed transmitting facility would use an ERI, 1-bay, circularly polarized antenna, side-mounted on an existing 15.2-meter monopole. The proposed translator location is described by the following NAD27 geographic coordinates:

18° 13' 33" North
66° 02' 40" West

Tower Registration

The FAA is not being notified of the proposed construction, as it is proposed to side-mount the FM antenna on an existing 15.2 m pole, which according to the TOWAIR program does not require registration (see Appendix 2).

Environmental Considerations

The proposal is excluded from environmental processing, as an existing supporting structure 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 11.7 % of the RF exposure limit for general population/uncontrolled environments for the

* 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.

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, (Figure 3A), a relative field factor of 0.78 or less for any depression angle equal or greater than 30 degrees below horizon, a total effective radiated power of 100 watts (circular polarization) and an antenna radiation center height above ground of 15.2 m, the calculated power density will not exceed $23.3 \mu\text{W}/\text{cm}^2$. Therefore, the calculated RF exposure at 2 m above ground will not exceed 11.7 % 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

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 1.

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

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

Isabel, PR, at a distance of 43 kilometers on a bearing of 235° True. The proposed operation will produce field strengths much lower than 10 mV/m at the FCC Santa Isabel, PR station.

Allocation Considerations

Figure 1 summarizes the allocation study for the proposed facility. As indicated in Figure 1, spacing with respect to co-channel and first adjacent channels is within FCC requirements. IF related facilities, though it is believed not required for LPFM stations, are met. There is short spacing predicted to two second adjacent full service channels, WIDA-FM and WIPR-FM.

Figure 2 summarizes the list of licensed FM translator within 50 kilometers of the proposed LPFM transmitter site. A detailed inspection of the licenses of these translator facilities show that none of these translators will get their input signal on the third adjacent channel, or closer, of the proposed LPFM facility.

The proposed LPFM station will operate on Channel 215, second adjacent channel to WIDA-FM, Channel 213B. Thus, the protection requirement of the undesired signal from the proposal is 40 dB higher than the desired signal of this station. The proposed transmitter site is located 12.5 kilometers, at a bearing of 3.6 degrees true from station WIDA-FM, which operates on channel 213B with an ERP of 23.15 kW and an HAAT of 790 meters along radial 3.6°. The predicted WIDA-FM, F(50,50) field strength at the proposed site is 96.2 dBu. Using the U/D ratio of 40 dB, the proposed F(50,10) interfering signal is 136.2 dBu. The 136.2 dBu contour thus defines the maximum extent of predicted interference to WIDA-FM from the proposed LPFM facility.

Since an ERP of 100 watts is proposed, the 136.2 dBu signal contour is calculated by means of a free-space calculation. Based on free-space calculations, the minimum height above ground level that the 136.2 dBu contour would reach is 10.7 m (35 feet) at a horizontal distance of 6 m (20 feet) from the transmitting antenna. This is graphically depicted in Figure 3B. Therefore, there is no predicted harmful interference to WIDA-FM as a result of the proposed LPFM facility. Figure 3A is a table and Figure 3B a graphic representation showing the computed distances to the predicted 136.2 dBu contour under these assumptions.

The proposed LPFM station will operate on Channel 215, second adjacent channel to WIPR-FM, Channel 217. Thus, the protection requirement of the undesired signal from the proposal is 40 dB higher than the desired signal of this station. The proposed transmitter site is located 12.6 kilometers, at a bearing of 3.3 degrees true from station

WIPR-FM, which operates on channel 217B with an ERP of 125 kW and an HAAT of 1,021 meters along radial 3.3°. The predicted WIPR-FM, F(50,50) field strength at the proposed site is 104.2 dBu. Using the U/D ratio of 40 dB, the proposed F(50,10) interfering signal is 144.2 dBu. The 144.2 dBu contour thus defines the maximum extent of predicted interference to WIPR-FM from the proposed LPFM facility.

Since an ERP of 100 watts is proposed, the 144.2 dBu signal contour is calculated by means of a free-space calculation. Based on free-space calculations, the minimum height above ground level that the 144.2 dBu contour would reach is 13.4 m (44 feet) at a horizontal distance of 2.2 m (7 feet) from the transmitting antenna. This is graphically depicted in Figure 4B. Therefore, there is no predicted harmful interference to WIPR-FM as a result of the proposed LPFM facility. Figure 4A is a table and Figure 4B a graphic representation showing the computed distances to the predicted 144.2 dBu contour under these assumptions.

If waiver of FCC Rules, 47 C.F.R. Section 73.807 is required, waiver of this section of The Rules is respectfully requested.

For 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

November 5, 2013

LPFM Study

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



Channel: 215 **Coordinates:** 018-13-33 066-02-40 (NAD 27) **Buffer:** 10 km **Type:** LP100

Comment:

<i>Callsign</i>	<i>Status</i>	<i>Channel</i>	<i>Service</i>	<i>Freq.</i>	<i>City</i>		<i>State</i>	<i>Co.</i>	<i>Rec.</i>	<i>Latitude</i>	<i>Dist. (km)</i>	<i>Sep. (km)</i>	<i>Spac. (km)</i>	
<i>Facility ID</i>	<i>ARN</i>			<i>Class</i>	<i>DA</i>	<i>Ant. ID</i>	<i>ERP (kW)</i>	<i>HAAT (m)</i>		<i>Longitude</i>	<i>Bear. (deg)</i>	<i>Comment</i>		
WIDA-FM	LIC	213	FM	90.5	CAROLINA			PR	US	C	18-06-48	12.48	92	-79.52
10955	BLED	19830711AI		B	D	13541	25	579		066-03-07	183.63	SHORT		
WIPR-FM	LIC	217	FM	91.3	SAN JUAN			PR	US	C	18-06-42	12.66	92	-79.34
53860	BLED	19910107KA		B	N		125	825		066-03-05	183.31	SHORT		
W267BL	LIC	268	FX	101.5	PATILLAS			PR	US	C	18-06-47.1	12.5	4	8.5
157307	BLFT	20100226AGH		D	C	93653	0.0115			066-03-05.4	183.4	CLOSE		

FM Inquiry

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



Listed stations are within 50 km of the point at 018-13-33 066-02-40.

<i>Callsign</i>	<i>Chan.</i>	<i>Freq.</i>	<i>Class</i>	<i>Service</i>	<i>Status</i>	<i>City</i>	<i>State</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Distance (km)</i>	
<i>ARN</i>	<i>DA</i>	<i>Antenna ID</i>	<i>Rotation</i>	<i>ERP (kW)</i>	<i>HAAT (m)</i>	<i>RCAMSL (m)</i>	<i>Rec. Type</i>	<i>Facility ID</i>	<i>Bearing (deg)</i>		
W225AY	225	92.9	D	FX	LIC	ARROYO	PR	018-00-36	066-01-28.4	23.98	
BLFT-20071228ABO			C	67340		0.05		54	C	157296	174.99
W225AY	227	92.9	D	FX	APP	ARROYO	PR	018-06-47	066-03-06	12.51	
BPFT-20130903ABG			D	16176	180	0.01		911	C	157296	183.48
W267BL	266	101.3	D	FX	LIC	SAN JUAN	PR	018-16-49	066-06-35	9.16	
BLFT-20110504ABC			C	102502	13	0.25		531	C	157307	311.3
W266CF	266	101.1	D	FX	CP	LUQUILLO	PR	018-18-36	065-47-41	28	
BNPFT-20130819AFS			C	116360		0.01		1035	C	143549	70.42
W267BL	267	101.3	D	FX	LIC	SAN JUAN	PR	018-16-49	066-06-35	9.16	
BLFT-20120827AAO			C	109336	16	0.25		531	C	157307	311.3
W267BL	268	101.3	D	FX	LIC	PATILLAS	PR	018-06-47.1	066-03-05.4	12.5	
BLFT-20100226AGH			C	93653		0.0115		925	C	157307	183.4
W279BU	279	103.7	D	FX	LIC	GURABO	PR	018-13-25	066-01-11	2.63	
BLFT-20080306ACB			C	69095		0.01		133	C	143465	95.4
W279BV	279	103.7	D	FX	LIC	SAN JUAN	PR	018-17-42	066-09-56	14.92	
BLFT-20120906ACB			D	16150	20	0.25		578	C	26656	301.04
W279BU	279	103.7	D	FX	APP	GURABO	PR	018-09-17	066-04-50	8.75	
BPFT-20130618ABG			D	16151	98	0.25		747	C	143465	205.76

FIGURE 3A

Interfering Field Strength Vs. Distance Graph

Antenna ERI 1-Bay
 RCAGL 50 feet ERP 0.1 kW
 Interfering Contour 136.2 dBu -10 dBk

Depression Angle	VRF	ERP (dBk)	Distance to Contour (m)**	Distance to Contour (feet)**	Horiz. Dist. (feet)	Height AGL (feet)
90	0.016	-45.9	0.2	1	0	49
85	0.041	-37.7	0.5	2	0	48
80	0.077	-32.3	0.9	3	0	47
75	0.124	-28.1	1.4	5	1	46
70	0.181	-24.8	2.0	7	2	44
65	0.245	-22.2	2.7	9	4	42
60	0.317	-20.0	3.6	12	6	40
55	0.394	-18.1	4.4	15	8	38
50	0.473	-16.5	5.3	17	11	37
45	0.554	-15.1	6.2	20	14	36
40	0.633	-14.0	7.1	23	18	35
35	0.709	-13.0	8.0	26	21	35
30	0.780	-12.2	8.8	29	25	36
25	0.843	-11.5	9.5	31	28	37
20	0.897	-10.9	10.1	33	31	39
15	0.941	-10.5	10.6	35	33	41
10	0.974	-10.2	10.9	36	35	44
5	0.993	-10.1	11.1	37	36	47
0	1.000	-10.0	11.2	37	37	50

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

FIGURE 3B

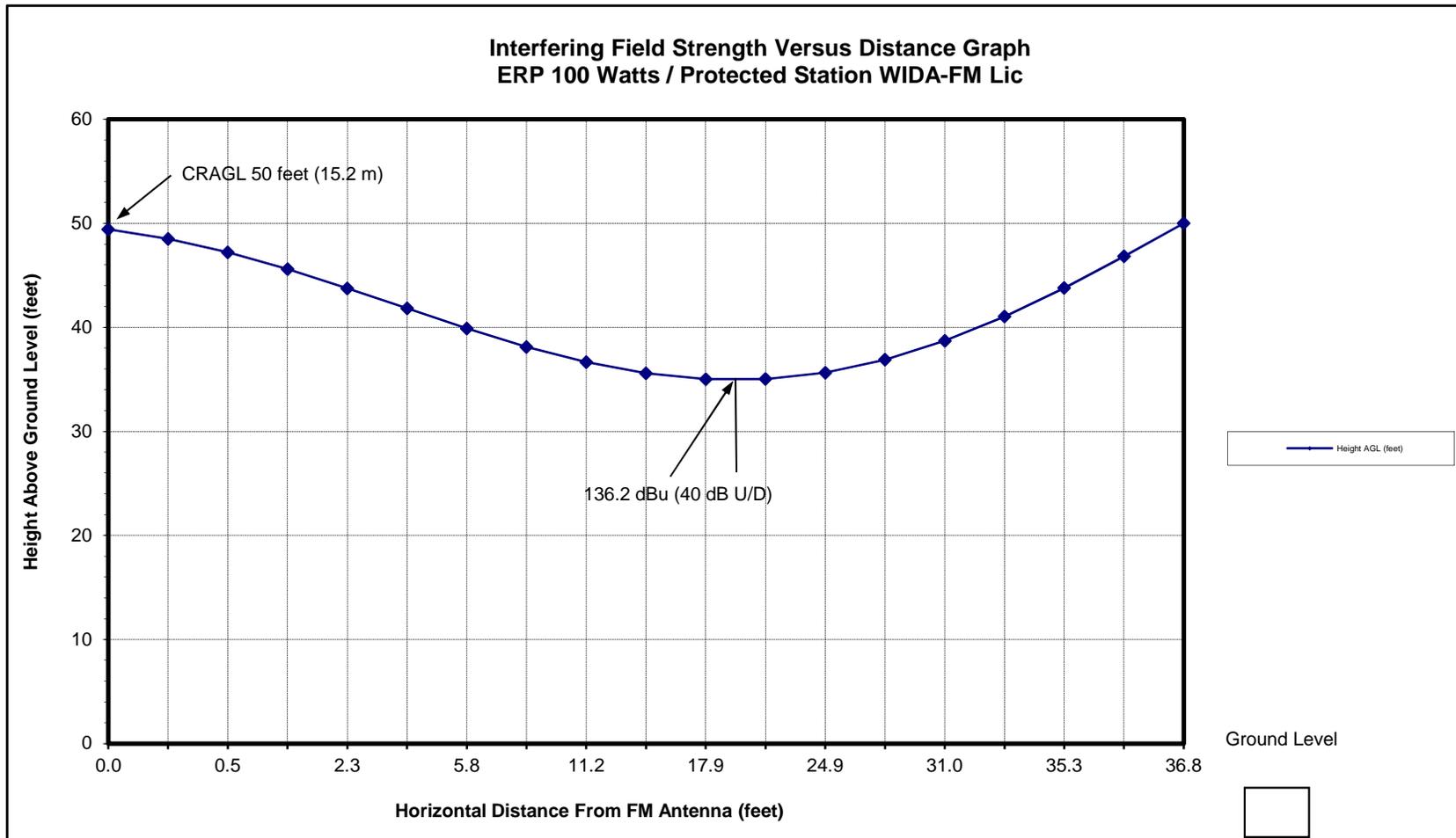


FIGURE 4A

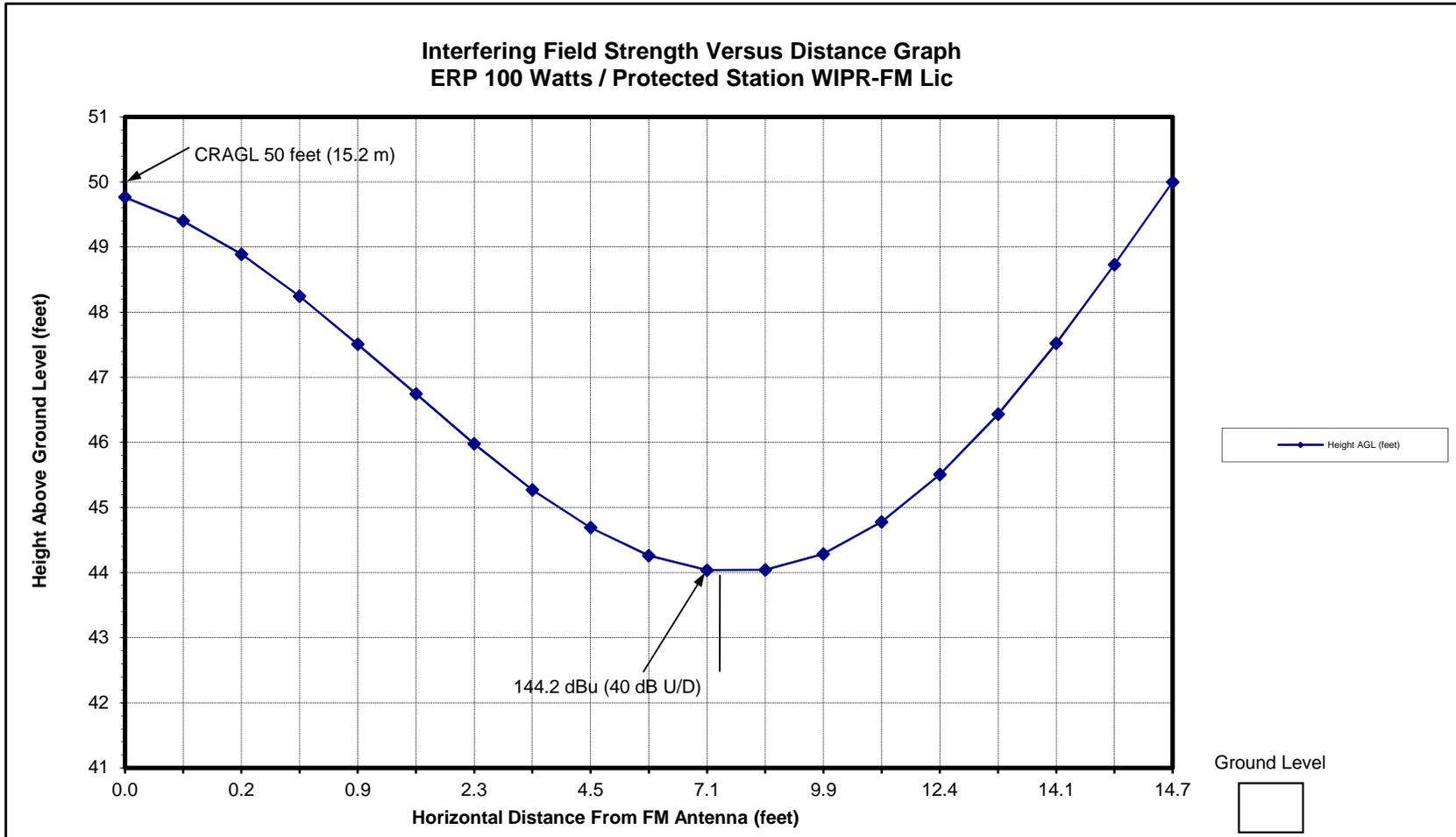
Interfering Field Strength Vs. Distance Graph

Antenna ERI 1-Bay
 RCAGL 50 feet ERP 0.1 kW
 Interfering Contour 144.2 dBu -10 dBk

Depression Angle	VRF	ERP (dBk)	Distance to Contour (m)**	Distance to Contour (feet)**	Horiz. Dist. (feet)	Height AGL (feet)
90	0.016	-45.9	0.1	0	0	50
85	0.041	-37.7	0.2	1	0	49
80	0.077	-32.3	0.3	1	0	49
75	0.124	-28.1	0.6	2	0	48
70	0.181	-24.8	0.8	3	1	48
65	0.245	-22.2	1.1	4	2	47
60	0.317	-20.0	1.4	5	2	46
55	0.394	-18.1	1.8	6	3	45
50	0.473	-16.5	2.1	7	4	45
45	0.554	-15.1	2.5	8	6	44
40	0.633	-14.0	2.8	9	7	44
35	0.709	-13.0	3.2	10	9	44
30	0.780	-12.2	3.5	11	10	44
25	0.843	-11.5	3.8	12	11	45
20	0.897	-10.9	4.0	13	12	46
15	0.941	-10.5	4.2	14	13	46
10	0.974	-10.2	4.4	14	14	48
5	0.993	-10.1	4.4	15	14	49
0	1.000	-10.0	4.5	15	15	50

**Free Space Field Equation= Dist. (km)=LOG-1((107.2+P(DBK)-FS)/20)

FIGURE 4B



du Treil, Lundin & Rackley, Inc.

Consulting Engineers



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

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

October 31, 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, Iglesia Refugio, Sanidad y Adoración, applicant for a New LPFM station, in accordance with Section 73.1030 of the FCC Rules, we are hereby notifying you of proposed new facility. ***As this application is being filed with the FCC in the current competitive FMLP window, it is respectfully requested that this information be kept strictly private and confidential until said window closes on November 14, 2013.*** The particulars of the proposal are as follows:

Proposed Facility:

Geographical coordinates of antenna location (NAD27): 18-13-33 / 66-02-40
Antenna height: 15.2 m AGL; 94 m AMSL
Antenna Gain: 0 dB
Antenna Orientation: ND
Operating channel: 215 (90.9 MHz)
Type of emission: F3E
Effective isotropic radiated power: 0.328 kW – Circular Polarization

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

Very truly yours,

Grafton Olivera, P.E.

APPENDIX 2



[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 18-13-26.3 north
Longitude 066-02-39.1 west

Measurements (Meters)

Overall Structure Height (AGL) 15.2
Support Structure Height (AGL) 0
Site Elevation (AMSL) 79

Structure Type

BPOLE - Building with Pole

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](#)