TECHNICAL EXHIBIT
CONSTRUCTION PERMIT APPLICATION
NEW LPFM STATION
CEIBA, PUERTO RICO
CHANNEL 227L100
FACILITY ID 785924

Technical Narrative

The technical exhibit, of which this narrative is part, has been prepared on behalf of *Fundacion Mision con Amor, Inc.*, applicant of a New LPFM station, Facility ID 785924, in Ceiba, PR.

Proposed Transmitter Location

The proposed transmitting facility would operate on channel 227 (93.3 MHz) using an ERI, 100A-1, 1-bay, circularly polarized antenna, side-mounted on an existing tower. The proposed station location is described by the following NAD 83 geographic coordinates:

18° 16’ 47.9” North
65° 40’ 09.0” West

It is proposed to side mount the antenna with its radiation center (RC) at a height of 30.5 meters (100 ft.) above ground, on an existing tower with a site elevation of 278.9 meters AMSL. Thus, the antenna RC will be at a height of 309.4 meters AMSL, which according to the FCC web utility HAAT web utility (using 8 radials) corresponds to a HAAT of 204 meters; Appendix 1 shows the HAAT calculation. For this HAAT the corresponding ERP is 2 Watts.

Appendix 2 shows the projection of five of the radials (0°, 45°, 90°, 135°, and 180°) used for the calculation of the HAAT shown in Appendix 1; as depicted in Appendix 2, these five radials project a significant part of their length over the ocean, and thus distort the normal (FCC) calculation of the HAAT. On the bottom of the page of Appendix 2, the corrected HAAT for each of these radials is shown, using the V-Soft Contour software. As shown, after applying the corrections, the overall HAAT of the eight radials is reduced from 204 mts. to 192 mts, increasing the allowed ERP for the proposed LPFM station from 2 to

3 Watts; this is depicted in Appendix 3. The allowed maximum ERP of 3 Watts under these conditions is requested for the proposed LPFM station.

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 registered tower, ASRN 1283788
.

Environmental Considerations

The proposal is excluded from environmental processing, as an existing registered 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 0.1 % 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 uW/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 2A), a relative field factor of 0.866 or less for any depression angle equal or greater than 30 degrees below horizon, a total effective radiated power of 3 watts using circular polarization, and an antenna radiation center height above ground of 30.5 m, the calculated power density will not exceed 0.2 uW/cm^2. Therefore, the calculated RF exposure at 2 m above ground will not exceed 0.1 % of the limit of 200 uW/cm^2 for the general population and uncontrolled environments. Thus, the proposal will comply with the FCC RF exposure guidelines.

[*] 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).

The antenna system will be restricted from access and appropriate warning signs posted. In the event that personnel are required to climb the structure, the proposed LPFM station transmissions will be suspended for as long as necessary to prevent RF exposure above the FCC recommended limits.

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 in Santa Isabel, PR. at a distance of 80 kilometers. The proposed operation will produce field strengths much lower than 10 mV/m at the FCC Santa Isabel, PR station.

Quiet Zone Notification

As required by FCC rules pertaining to radio Quiet Zones, Section 73.1030(a), the National Radio Astronomy Observatory (NRAO) 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 4.

AM Stations Within 3.2 km

There are no non-directional AM stations located within 0.80 km of the above specified coordinates, nor any directional AM stations within 3.2 km of these coordinates: the closest AM Facility is WFAB, Ceiba, PR, ND1 207.8º true at a distance of 9.5 km. Thus, the proposal is believed to be compliant with Section 47 CFR 73.1692.

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 in line with FCC requirements.

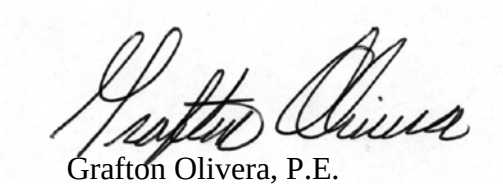
An inspection of the nearby FM translators shows no translator getting their input signal on the third adjacent channel, or closer, of the proposed facility.

There is a short pacing to second-adjacent full-service FM stations WZNT (Ch. 229B) and WYQE (Ch. 225A), whose signal strength at the proposed site are predicted, using V-Soft FMCommander software, to be 79.9 dBu and 128 dBu respectively, WZNT being the weaker of the two stations determines the maximum allowed signal for this site. As the proposed station will operate on Channel 227, second adjacent channel to WZNT, the protection requirement of the undesired signal from the proposal is 40 dB higher than the desired signal of this station, or 119.9 dBu for WZNT; this contour defines the maximum extent of allowed predicted interference.

Since an ERP of 3 watts is proposed, the 119.9 dBu signal contour is estimated by means of free-space calculations. Based on the free-space calculations the maximum distance above ground level that the interfering contour of 119.9 dBu would project is 79 ft at a horizontal distance of 24 ft from the tower base. Thus, no adverse interference is predicted to stations WZNT or WYQE as a result of the proposed LPFM facility. The interfering contour calculations are graphically depicted in Figure 2B, Figure 2A is a tabulation and Figure 2B a graphic representation showing the computed distances to the predicted interfering contour. If waiver of FCC Rules, 47 C.F.R. Section 73.807 is required, waiver of this section of The Rules is respectfully requested.

The predicted contours signal levels were calculated in accordance with Section 73.313 of the FCC Rules, using the V-Soft FMCommander@2023 software in conjunction with the 30-second Global terrain database.

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



Grafton Olivera, P.E.
Consulting Engineer
5119 60th Drive E
Bradenton, Florida 34203

(941) 323-0381

December 10, 2023

Figure 1

NEW LPFM CEIBA CH 227L1 93.3 MHZ

REFERENCE
18 16 47.90 N.
65 40 09.00 W.

CLASS = L1
PR & VI Spacings to 2nd Adj.

DISPLAY DATES
DATA 11-12-23
SEARCH 11-13-23

Channel 227 - 93.3 MHz

Call	Channel	Location		Azi	Dist	FCC	Margin
WZNT	LIC-N 229B	San Juan	PR	269.0	19.43	91.5	-72.1
WYQE	LIC-N 225A	Naguabo	PR	205.0	0.17	41.5	-41.3
W227CV	LIC-D 227D	San Lorenzo	PR	245.4	44.48	38.5	6.0
WTJX-FM	LIC 226A	Charlotte AMalie	VI	83.4	76.71	69.5	7.2
WZMT	LIC 227B1	Ponce	PR	252.4	106.49	94.5	12.0
W226CS	LIC 226D	Bayamon	PR	278.1	60.29	27.5	32.8
W226CS	CP 226D	Bayamon	PR	278.1	60.34	27.5	32.8
W226CS	APP 226D	Bayamon	PR	278.1	60.34	27.5	32.8
WVVI-FM	LIC 228B1	Christiansted	VI	120.4	120.49	81.5	39.0
WTPM	APP 225B	Aguadilla	PR	271.5	160.25	91.5	68.8
WTPM	STA 225B	Aguadilla	PR	271.5	160.25	91.5	68.8
WTPM	LIC 225B	Aguadilla	PR	271.6	160.30	91.5	68.8
W227DY	LIC-D 227D	Arecibo	PR	279.9	116.44	31.5	84.9
W227DR	LIC 227D	Aguadilla	PR	276.9	157.14	38.5	118.6
W228EF	LIC 228D	Mayaguez	PR	265.7	157.17	20.5	136.7

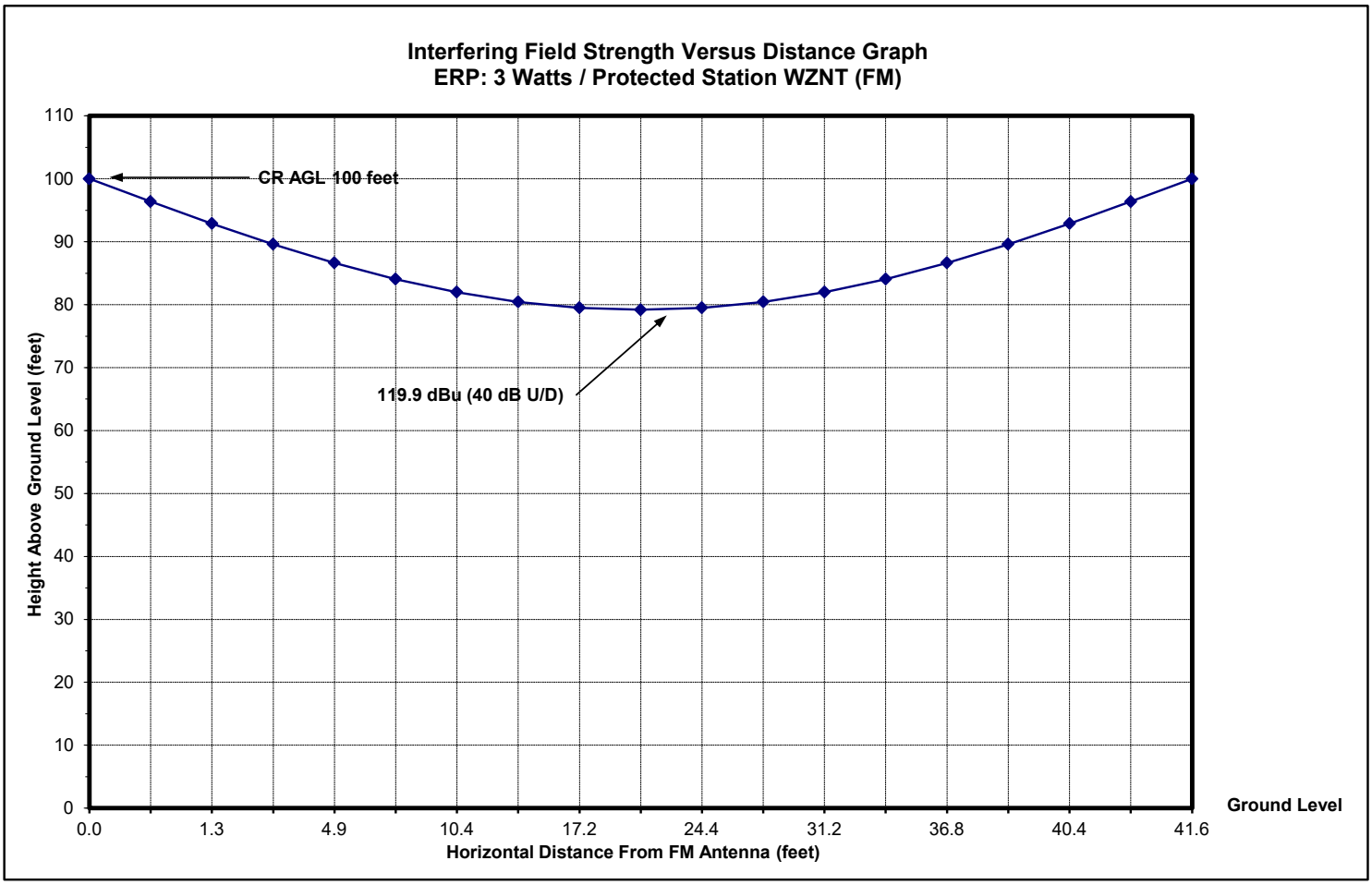
Reference station has protected zone issue: Arecibo
All separation margins include rounding

Figure 2A

			IX to	Desired dBu	79.9	WZNT
ASRN: 1283788			WZNT	U/D Ratio - dB	40	
Fundacion Mision con Amor, Inc. - Fac. ID 785924				Undesired dBu	119.9	
NEW LPFM ANGEL VAZQUEZ	CH. 227	93.3 MHz	Site Elev. - M	278.9	RCAGL-M	RCAGL-FT
NAD 83: 18 16 47.9 / 65 40 09.0	RC AMSL-M	309.4	RC AGL - M	30.5	30.5	100.0
Interfering Field Strength Vs. Distance Graph			RC AMSL - M	309.4		
Ant.: ERI 100A-1, Cpol, System Gain: 0.42			Adj. HAAT - M	192	*0.003*	kW
RC: 100 ft. AGL, 79 ft clearance AGL	*100.0*	feet	ERP [FCC] - W	3	-25.23	dBk
Interfering Contour	*119.9*	dBu				
Signal from Station	*79.9*	dBu				

Depression Angle	VRF	ERP (dBk)	Distance to ; (m)**	Distance to Contour (feet)**	Horiz. Dist. (feet)	Height AGL (feet)
90	0.000	-349.5	0.0	0	0	100
85	0.087	-46.4	1.1	4	0	96
80	0.174	-40.4	2.2	7	1	93
75	0.259	-37.0	3.3	11	3	90
70	0.342	-34.5	4.3	14	5	87
65	0.423	-32.7	5.4	18	7	84
60	0.500	-31.2	6.3	21	10	82
55	0.574	-30.1	7.3	24	14	80
50	0.643	-29.1	8.2	27	17	79
45	0.707	-28.2	9.0	29	21	79
40	0.766	-27.5	9.7	32	24	79
35	0.819	-27.0	10.4	34	28	80
30	0.866	-26.5	11.0	36	31	82
25	0.906	-26.1	11.5	38	34	84
20	0.940	-25.8	11.9	39	37	87
15	0.966	-25.5	12.3	40	39	90
10	0.985	-25.4	12.5	41	40	93
5	0.996	-25.3	12.6	41	41	96
0	1.000	-25.2	12.7	42	42	100
					MIN HGT	79

Figure 2B


Interfering Field Strength Versus Distance Graph
ERP: 3 Watts / Protected Station WZNT (FM)
CR AGL 100 feet
119.9 dBu (40 dB U/D)
Height Above Ground Level (feet)
Horizontal Distance From FM Antenna (feet)
Ground Level
110
100
90
80
70
60
50
40
30
20
10
0
0.0
1.3
4.9
10.4
17.2
24.4
31.2
36.8
40.4
41.6

Appendix 1

Antenna Height Above Average Terrain Calculations -- Results

Input Data

Latitude **18° 16' 47.9"** North
Longitude **65° 40' 9"** West (NAD 83)

Height of antenna radiation center above mean sea level: **309.4** meters AMSL

Number of Evenly Spaced Radials = **8** 0° is referenced to True North

Results

Calculated HAAT = **204 meters**

Antenna Height Above Average Terrain calculated
using 1 km GLOBE terrain data

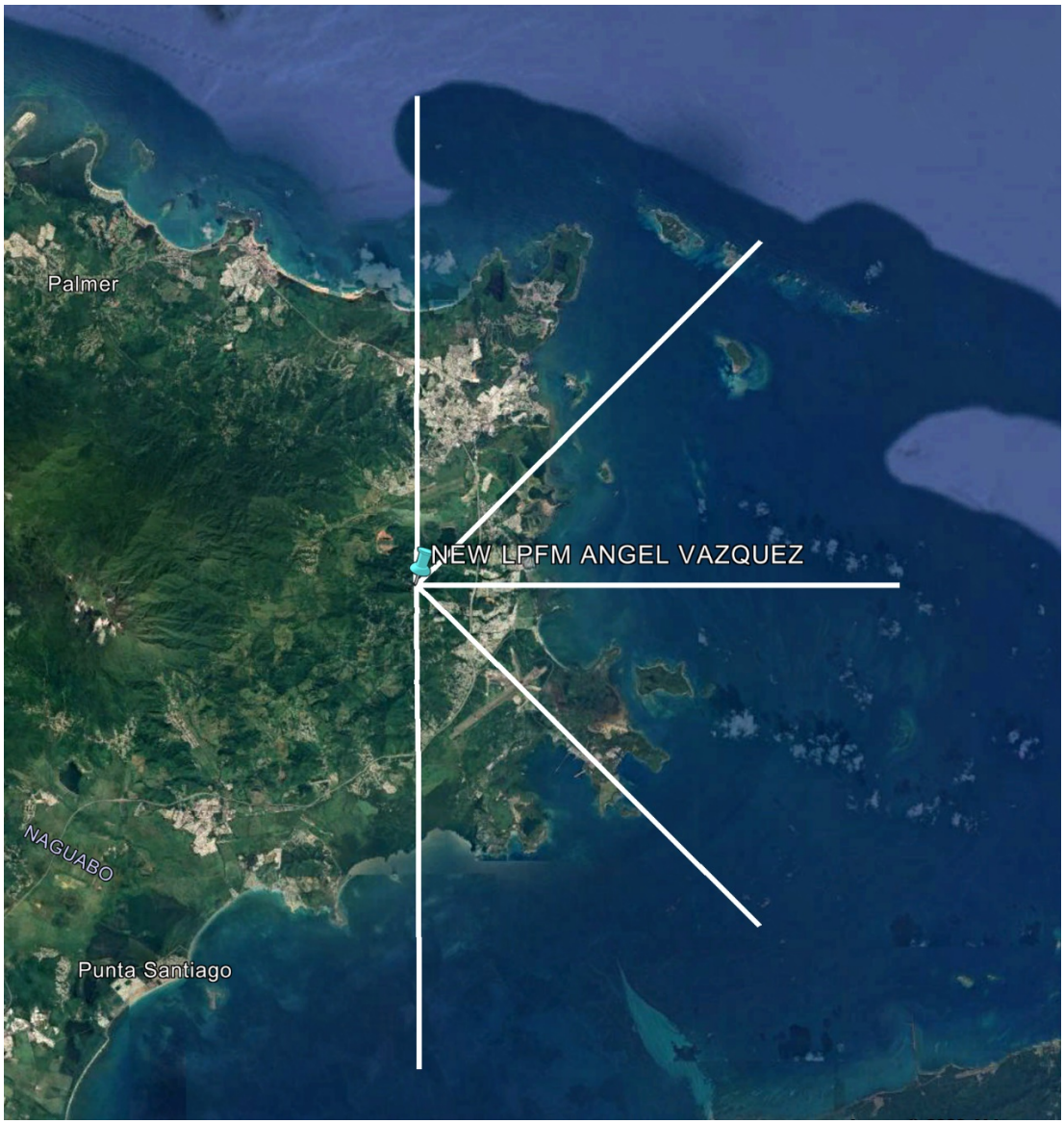
Individual "Radial HAAT" Values, in meters

0°	283.9 m
45°	305.5 m
90°	307.4 m
135°	297.5 m
180°	269.2 m
225°	233.6 m
270°	-258.5 m
315°	197.2 m

Print Results? New Calculation?

Appendix 2

NEW LPFM CEIBA, FIVE RADIALS PARTIALLY OVER THE OCEAN, HAAT CALCULATION



			RC AMSL, MTS	
			309.4	
			CALC. HAAT	
FCC HAAT - 8 RADIALS			204	CORRECTED
AZIMUTH	HAAT M	RC AMSL	V-SOFT "CONTOUR" CORRECTION	HAAT M
0	283.9	309.4	48.0	261.4
45	305.5	309.4	12.5	296.9
90	307.4	309.4	18.9	290.5
135	297.5	309.4	18.9	290.5
180	269.2	309.4	81.7	227.7
225	233.6	-	-	233.6
270	-258.5	-	-	-258.5
315	197.2	-	-	197.2
HAAT	204	-	-	192
ERP Watts	2		ERP Watts	3

Appendix 3

Choose a U.S. State or Possession: PR - Puerto Rico

Station Class: 100 watt LPFM

192 meters Antenna Height Above Average Terrain (HAAT)

Find Result Print Clear Data

Results:

Calculated ERP (rounded per Section 73.212) = 0.003 kW

Unrounded ERP = **0.002586 kW**

Comments:

Low Power FM (LPFM) stations are authorized throughout the United States.

Maximum class limit determined from:
Class: L1 Reference ERP: 0.1 kW Reference HAAT: 30 meters Distance to 60 dBu F(50,50) contour: 5.6 km

Appendix 4

Grafton Olivera, P.E.
Consulting Engineer

December 10, 2023

Via email (avazquez@nrao.edu)

Mr. Angel M. Vazquez
Puerto Rico Coordination Zone Program Administrator
National Radio Astronomy Observatory (NRAO)
520 Edgemont Road
Charlottesville, VA 22903-2475

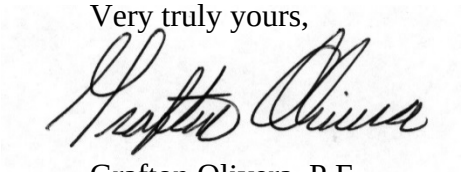
Gentlemen:

On behalf of our client, ***Fundacion Mision con Amor, Inc.***, applicant of a New LPFM station, Facility ID 785924, in Ceiba, PR., in accordance with Section 73.1030 of FCC Rules, we hereby notify the Observatory of the proposed facility. The particulars of the proposal are as follows:

Geographical coordinates of antenna location (NAD83): 18-16-47.9 / 65-40-09.0
Antenna height: 30.5 m AGL, 309.4 m AMSL
Antenna Gain (horizontal plane): 0 dBd (non-directional)
Operating channel: 227L, 93.3 MHz
Type of emission: F3E
Effective isotropic radiated power: 0.005 kW (3 Watts ERP, Circular Polarization)

Please review this proposal and let me know your findings; feel free to communicate via email (mailto:Grafton.Olivera@outlook.com), telephone (941-323-0381) or regular mail.

Very truly yours,



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National Radio Astronomy Observatory
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December 11, 2023

Grafton Olivera, P.E.
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5119 60th Drive E
Bradenton, FL 34203
grafton.olivera@outlook.com

Re: New LPFM - Fundación Misión con Amor, Inc.
Ceiba, Puerto Rico
Proposed Frequency: 93.3 MHz

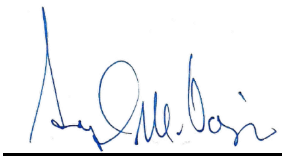
Dear Grafton Olivera,

Thank you very much for your PRCZ approval request sent to us in accordance with the Puerto Rico Coordination Zone agreements. We have considered the technical aspects of your application and find that the following LPFM installation in **Ceiba, PR** is unlikely to cause harmful interference to the passive use of the Radio Astronomy bands at the Arecibo Observatory.

We therefore have no objections to the proposed installation.

Antenna Location	City, PR	Frequency
18° 16' 47.9" N + 065° 40' 09.0 W	**Ceiba, PR**	**93.3 MHz**

Sincerely yours,



Angel M. Vázquez
Puerto Rico Coordination Zone
Program Administrator
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Cc: PRCZ files [File #11Dec23_04]