TECHNICAL EXHIBIT
MINOR MODIFICATION OF CONSTRUCTION PERMIT
ARSO RADIO CORPORATION
RADIO STATION WIVA-FM
AGUADILLA, PUERTO RICO
FACILITY ID 2876
CH 262B 23 KW 633 M

## Technical Narrative

This technical exhibit was prepared on behalf of ARSO Radio Corporation, licensee of station WIVA-FM, channel 262B, Aguadilla, Puerto Rico. By means of this application, ARSO Radio Corporation seeks modification of construction permit (CP), File Num. BPH-20141204AAQ, to make minor changes to the authorized facility of WIVA-FM. It is proposed to use a non-directional antenna of smaller size (less number of bays) and a slightly higher radiation center. Specifications for the proposed operation are included herein as Figure 1.

It is proposed to mount the antenna on an existing, registered supporting structure with 89.6 meters of overall height AGL. Thus, the proposed WIVA-FM facility will not have a significant environmental impact, as defined by 47 CFR 1.1307. It is believed that the proposal conforms to the applicable rules and regulations of the Federal Communications Commission.

## Transmitter Location

The proposed transmitting facility will use a 6-bay circularly polarized, full-wavelength, Shively Model 6813 antenna, to be side-mounted on the existing authorized self-supporting tower, ASRN 1011580. The following NAD27 geographic coordinates describe the existing (CP authorized) and proposed WIVA-FM site location:

18° 09’ 03” North Latitude
66° 59’ 21” West Longitude

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. Copy of the notification letter to NAIC and of the Observatory's Letter of Consent are included in 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 Isabel, PR, at a distance of 66.8 kilometers on a bearing of 104° True. The proposed operation will produce field strengths significantly lower than 10 mV/m at the FCC Santa Isabel station.

Environmental Considerations[1]

The proposal will comply with the FCC Rules concerning human exposure to radio frequency (RF) energy. The calculation of RF energy at 2-m above ground was made under the procedures of OET Bulletin No. 65.[2] 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.

The proposed antenna, a 6-bay, Shively 6813 full-wavelength antenna, will be mounted with radiation center at a height of 67 meters on the proposed tower structure. The power density at 2 meters above ground level at the base of the tower, based on a "worst-case" vertical relative field value of 0.286 for any depression angle greater than 10 degrees below the horizon (see vertical pattern in Appendix 2), a total ERP of 46 kW (H+V) and an antenna center of radiation height above ground level of 67 meters, the calculated power density at two meters above ground level at the base of the tower is 29.7 microwatts per

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[1] This statement addresses only human exposure to radiofrequency radiation and not to other non-radiofrequency radiation matters listed in the National Environmental Policy Act of 1969.

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

square centimeter (uW/cm$^2$), or 14.9% of the Commission's recommended limit applicable to uncontrolled exposure areas (200 uW/cm$^2$ for the FM band).

Since the total RF exposure will not exceed 15% of the FCC limits for uncontrolled environments, the proposal complies with the FCC limits for human exposure to RF radiation.

The applicant will verify that access to the tower site is restricted and the site will be appropriately marked with RFR warning signs. In addition, since this is a multi-user site, procedures will be in effect to coordinate with other users in the event that workers or other authorized personnel need to enter the restricted area or climb the tower, to ensure that appropriate measures will be taken to assure worker safety with respect to radio frequency radiation exposure. Such procedures include reducing the average exposure by spreading out the work over a longer period of time, wearing RFR exposure monitors or scheduling work when station WIVA-FM is shut down.

## Allocation Considerations

Figure 2 is an FM separation study for the WIVA-FM transmitter site locations for channel 262B operation based on the Commission's CDBS database. Shown in Figure 2 are the existing separation of the licensed facility and the separation of the proposed facility. As shown, the proposed antenna location complies with the minimum distance separation requirements of Section 73.207 for Class B operation on channel 262 towards authorized stations and allotments, except to station WSTX-FM. With respect to station WSTX-FM there exists a grandfathered short-spacing of 4.5 Kilometers that the proposed location will reduce.

## City Coverage

Figure 3 is a map showing the predicted coverage contours of the proposed facility. The proposed 70 dBu will encompass 100% of the city of Aguadilla. Line-of-sight conditions with the city of Aguadilla will remain adequate, as there is no change in the CP authorized site and the antenna radiation center is being slightly increased.

## Impact on Radio Multiple Ownership

Figure 3 shows the licensed and proposed City Grade contours (70 dBu) of WIVA-FM. The proposed site change is only 0.2 kilometers of the existing, licensed site. As can be appreciated in Figure 3, the coverage of WIVA-FM is essentially unchanged and will have no impact in the situation of ARSO Radio Corporation as to Radio Multiple Ownership.

The predicted contours were calculated in accordance with Section 73.313 of the FCC Rules, using the V-Soft FMCommander@2016 software in conjunction with the 30-second Global terrain database; contour calculation were made using an evenly spaced set of 72 radials. The antenna height elevation above average terrain of the current CP, adjusted for the proposed RC height increase, was used in conjunction with the propagation prediction curves of Section 73.333 to determine the distances to contours.

The applicant recognizes its responsibility to remedy any complaints of blanketing interference as required by 47 CFR 73.318 and to protect existing facilities in accordance with applicable rules.

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

(941) 323-0321

October 28, 2016

# TECHNICAL EXHIBIT
# MINOR MODIFICATION OF CONSTRUCTION PERMIT
# ARSO RADIO CORPORATION
# RADIO STATION WIVA-FM
# AGUADILLA, PUERTO RICO
# FACILITY ID 2876
# CH 262B 23 KW 633 M

## Engineering Specifications

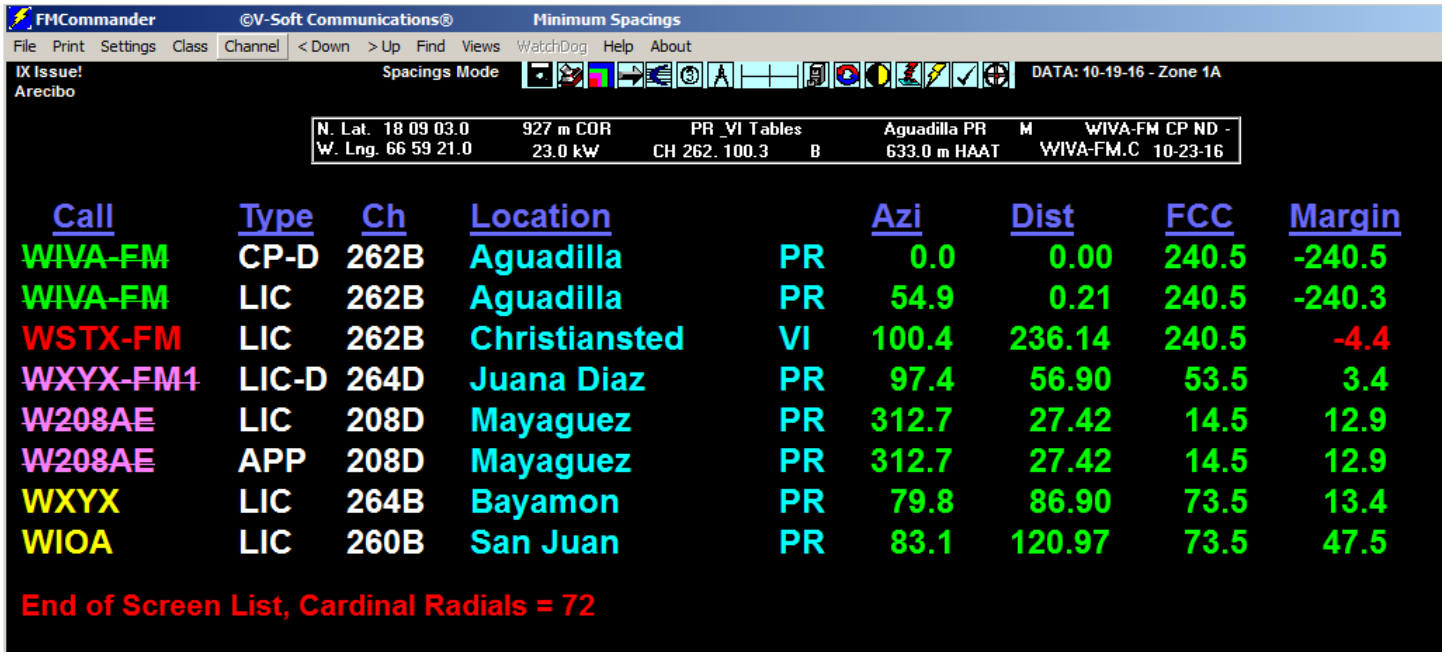
| | |
|---|---|
| Channel / Frequency | 262B / 100.3 MHz |
| Site Coordinates (NAD27) | 18° 09' 03" North Latitude<br>66° 59' 21" West Longitude |
| Site elevation | 860 m AMSL |
| Overall height of antenna structure | 89.6 m AGL / 949.6 m AMSL |
| Height of antenna radiation center | 67 m AGL / 927 m AMSL |
| Antenna radiation center HAAT | 633 m |
| Transmitter | Type Approved |
| Transmitter power output | 7.9 kW |
| Transmission line, 2-1/4“ Heliax Air-Dielectric | Andrew, HJ12-50 |
| Transmission line length | 90 m |
| Transmission line efficiency | 89.1% |
| Antenna | Shively 6813-6C |
| Polarization | Circular |
| Power gain | 3.28 |
| Antenna input power | 7.0 kW |
| Effective radiated power (Circular Polarization) | 23 kW |

Figure 2

# WIVA-FM ALLOCATION STUDY

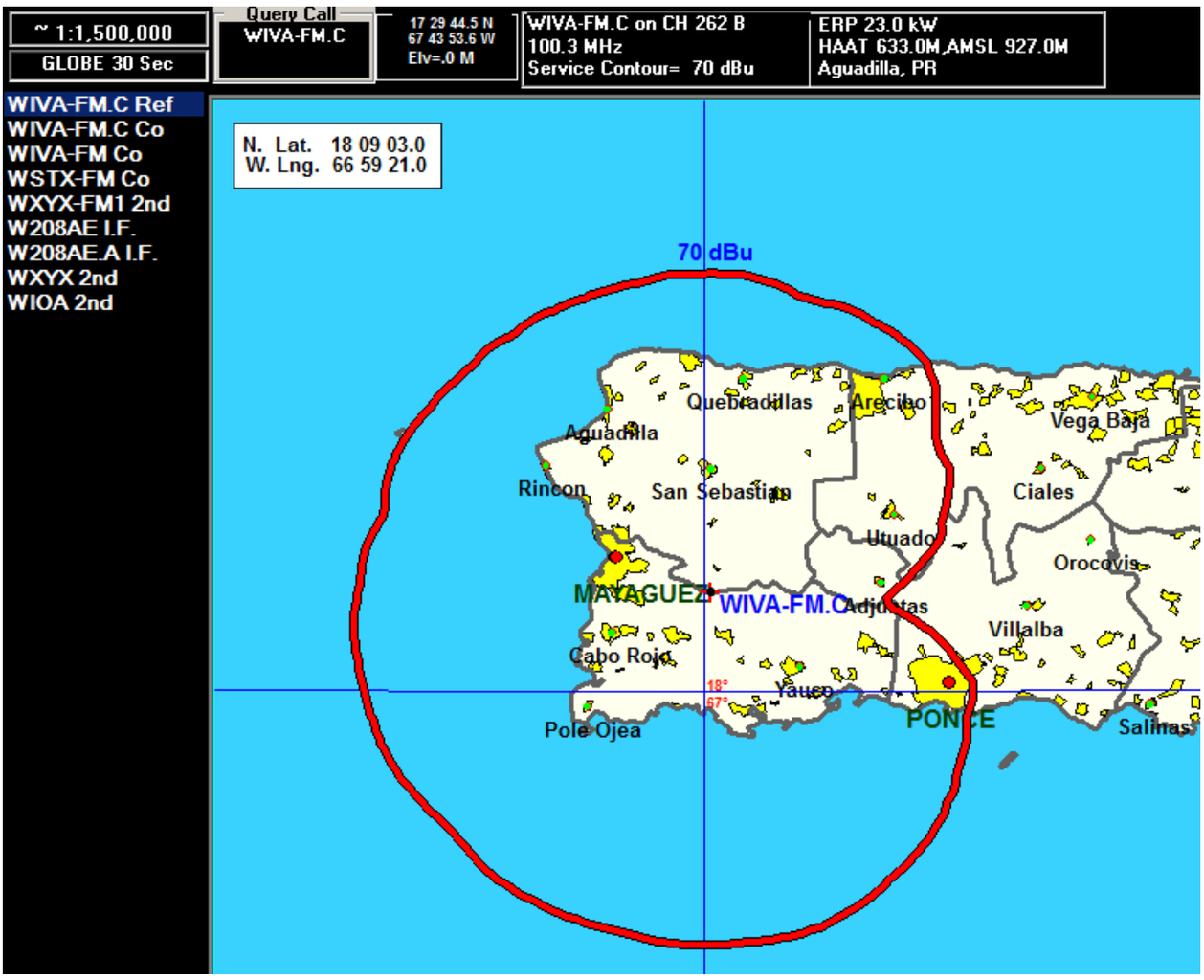
## WIVA-FM – LICENSED FACILITY


## WIVA-FM – PROPOSED FACILITY

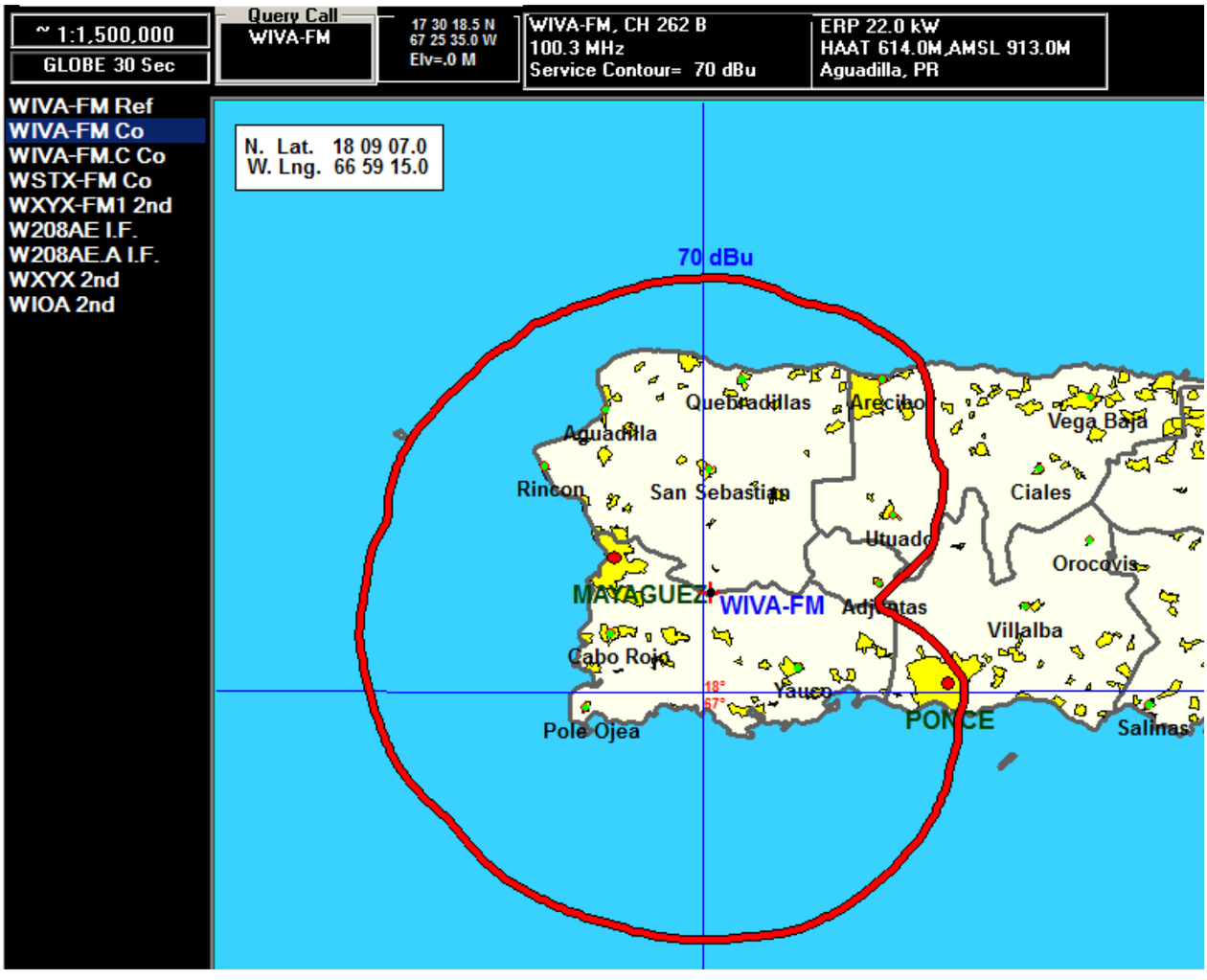


WIVA-FM CITY OF LICENSE COVERAGE

**PROPOSED CP MODIFICATION**




**EXISTING LICENSED FACILITY**



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Notification to the National Astronomy and Ionosphere Center

Letter of Consent from the National Astronomy and Ionosphere Center

*{two sheets follow}*

# *Appendix 1*

***Grafton Olivera, P.E.***

Consulting Engineer

October 23, 2016

Via email (prcz@naic.edu)

Angel M. Vázquez, Spectrum Manager
National Astronomy and Ionosphere Center
Arecibo Observatory
HC3 Box 53995
Arecibo, PR 00612

Gentlemen:

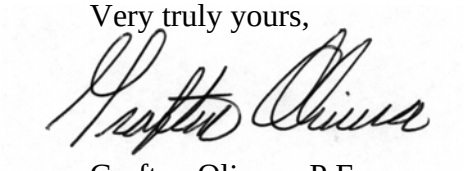
On behalf of our client, ARSO RADIO CORPORATION, licensee of WIVA-FM, in Aguadilla, Puerto Rico, in accordance with Section 73.1030 of FCC Rules, we hereby notify proposed changes to the Construction Permit (CP) of this facility, FCC File No. BPH-20141204AAQ. The particulars of the proposed amendment are as follows:

Proposed Facility:

Geographical coordinates of antenna location (NAD27): 18-09-03 / 66-59-21 (no change)
Antenna height: 67 m AGL; 927 m AMSL (a 7 mts increase)
Antenna Gain (horizontal plane): 0 dBd (non-directional)
Operating channel: 262B, 100.3 MHz (no change)
Type of emission: F3E (no change)
Effective isotropic radiated power: 37.72 kW – Circular Polarization (no change)

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

Very truly yours,



Grafton Olivera, P.E.
5119 60th Drive E
Bradenton, FL 34203

Tel. 941-323-0381
Email: Grafton.Olivera@me.com

# ARECIBO OBSERVATORY

The William E. Gordon Telescope
Angel Ramos Foundation Science and Visitor Center


October 25, 2016

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

Re: WIVA-FM, Canal 262B
ARSO Radio Corporation

Dear Grafton Olivera:

Thank you very much for the copy of your FCC application sent to us in accordance with the Puerto Rico Coordination zone agreements. We have considered the technical aspects of your application and find that your installation/path originating in Aguadilla is unlikely to cause harmful interference to the passive use of the Radio Astronomy bands at the Observatory. We therefore have no objection to your proposed installation.

Sincerely yours,

Angel M. Vázquez
Spectrum Manager

AV:ws

Cc: PRCZ files [File #001600100019]

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Antenna Gain Specs & Vertical Plane Radiation Pattern

*{three sheets follow}*

# Shively Labs®

## Model 6813 Circularly-Polarized FM Antenna — Full-Wave-Spaced

### True circular polarization

### Power rating: 3 kW per bay

### Shively standard features:

- Ring stub design
- Low weight and windload
- Consistently predictable patterns
- Digital-ready
- Pattern studies available
- No factory personnel needed to install
- Adjustable fine-matching transformer
- Radomes and deicers available
- Rugged corrosion-resistant mounts
- Works with regular towers; no need for special frequency-sensitive tower sections
- Pressure relief valve for easy purging of the system
- Special spacing, H/V ratios, null fill and beam tilt available

### Performance specifications:

Polarization: Right circular

VSWR: 1.08 : 1 ± 100 kHz
1.16 : 1 ± 200 kHz (optional 1.10 : 1; see factory for details)

Azimuth pattern circularity: Horizontal component ± 1.5 dB on pole.

Input connection: 1-5/8 in EIA Female

### Electrical specifications:

| No. of Bays | Gain | | Power Rating | No. of Bays | Gain | | Power Rating |
|---|---|---|---|---|---|---|---|
| | Power | dB | kW | | Power | dB | kW |
| 1 | 0.46 | -3.40 | 3 | 7 | 3.87 | 5.88 | 12 |
| 2 | 0.99 | -0.04 | 6 | 8 | 4.46 | 6.50 | 15 |
| 3 | 1.55 | 1.90 | 9 | 10 | 5.65 | 7.52 | 15 |
| 4 | 2.12 | 3.26 | 10 | 12 | 6.85 | 8.36 | 15 |
| 5 | 2.70 | 4.31 | 12 | 14 | 8.05 | 9.06 | 15 |
| 6 | 3.28 | 5.16 | 12 | 16 | 9.25 | 9.66 | 15 |

### Notes:

1. Our gain figures are derived from the computed directivity and include the losses in the antenna feed system.

   Gain is provided for one polarization and is equal in circularly polarized antennas for both horizontal and vertical components. Gain will be reduced if null fill, beam tilt, special H/V ratio, or special wavelength spacing is provided. Gain will increase in a directional array by the directivity of the azimuth pattern.

Pub. No. ds-6813-fw (150318)

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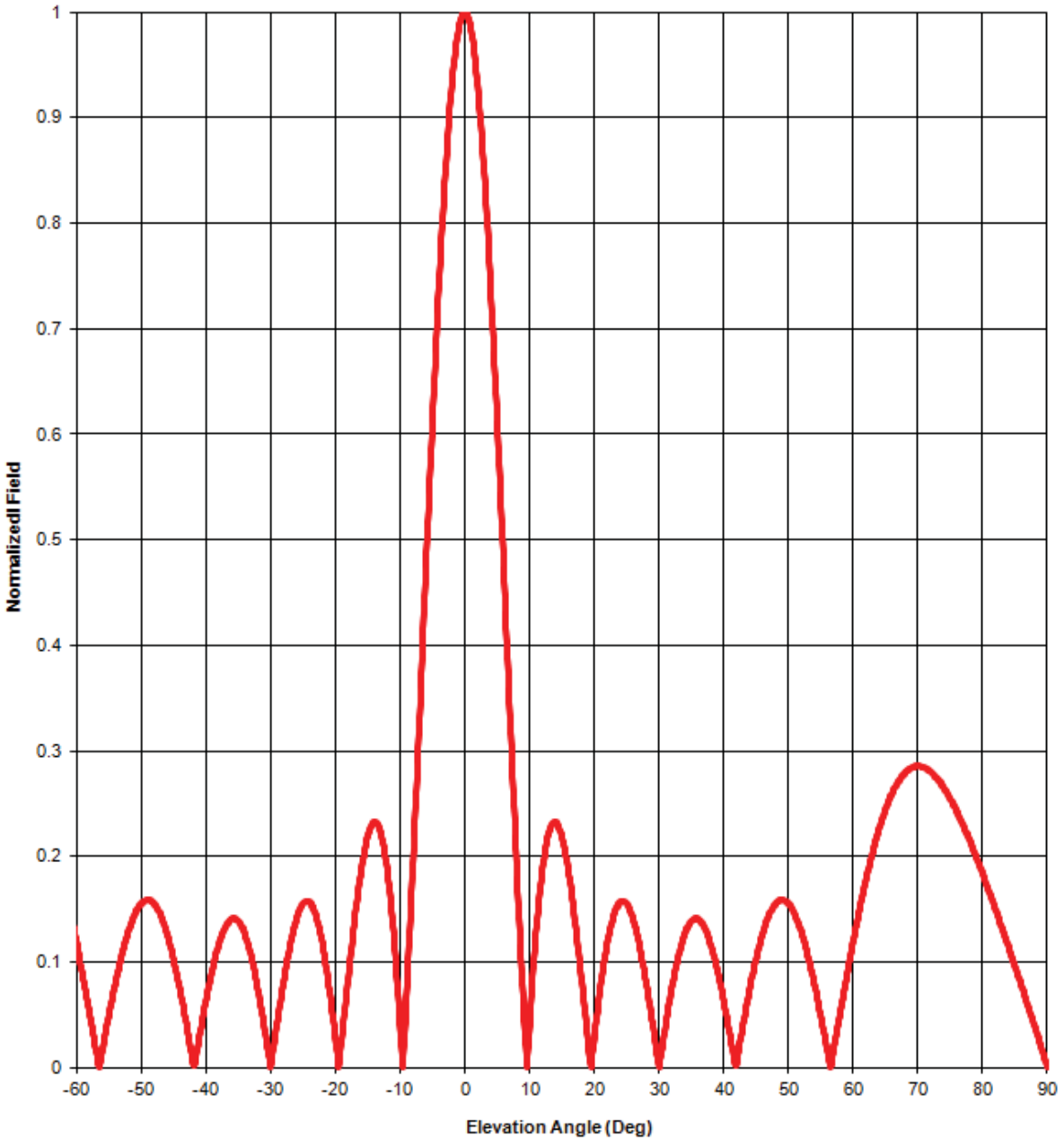
## Elevation pattern




Antenna models: 6014, 6015, 6020, 6510, 6513, 6600, 68xx except 6832, & Versa2une, 6-bay full-wave-spaced

Test frequency: 98.1 MHz

Gain (maximum):

| | Power | dB |
|---|---|---|
| 6014, 6015, 68xx: | 3.32 | 5.22 dB |
| 6510, 6513, 6600: | 6.44 | 8.22 dB |



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| Degrees | Rel. Field |
|---|---|
| 1 | 0.982 |
| 2 | 0.931 |
| 3 | 0.848 |
| 4 | 0.740 |
| 5 | 0.613 |
| 6 | 0.474 |
| 7 | 0.332 |
| 8 | 0.194 |
| 9 | 0.067 |
| 10 | 0.041 |
| 11 | 0.127 |
| 12 | 0.188 |
| 13 | 0.223 |
| 14 | 0.232 |
| 15 | 0.219 |
| 16 | 0.187 |
| 17 | 0.141 |
| 18 | 0.086 |

| Degrees | Rel. Field |
|---|---|
| 19 | 0.028 |
| 20 | 0.029 |
| 21 | 0.078 |
| 22 | 0.117 |
| 23 | 0.144 |
| 24 | 0.157 |
| 25 | 0.155 |
| 26 | 0.141 |
| 27 | 0.115 |
| 28 | 0.081 |
| 29 | 0.042 |
| 30 | 0.001 |
| 31 | 0.040 |
| 32 | 0.076 |
| 33 | 0.105 |
| 34 | 0.127 |
| 35 | 0.139 |
| 36 | 0.141 |

| Degrees | Rel. Field |
|---|---|
| 37 | 0.133 |
| 38 | 0.117 |
| 39 | 0.093 |
| 40 | 0.063 |
| 41 | 0.030 |
| 42 | 0.006 |
| 43 | 0.041 |
| 44 | 0.074 |
| 45 | 0.103 |
| 46 | 0.127 |
| 47 | 0.144 |
| 48 | 0.155 |
| 49 | 0.159 |
| 50 | 0.155 |
| 51 | 0.145 |
| 52 | 0.128 |
| 53 | 0.106 |
| 54 | 0.080 |

| Degrees | Rel. Field |
|---|---|
| 55 | 0.049 |
| 56 | 0.017 |
| 57 | 0.018 |
| 58 | 0.052 |
| 59 | 0.086 |
| 60 | 0.119 |
| 61 | 0.150 |
| 62 | 0.179 |
| 63 | 0.204 |
| 64 | 0.226 |
| 65 | 0.245 |
| 66 | 0.260 |
| 67 | 0.271 |
| 68 | 0.279 |
| 69 | 0.284 |
| 70 | 0.286 |
| 71 | 0.284 |
| 72 | 0.280 |

| Degrees | Rel. Field |
|---|---|
| 73 | 0.274 |
| 74 | 0.265 |
| 75 | 0.255 |
| 76 | 0.243 |
| 77 | 0.229 |
| 78 | 0.215 |
| 79 | 0.200 |
| 80 | 0.184 |
| 81 | 0.167 |
| 82 | 0.150 |
| 83 | 0.132 |
| 84 | 0.114 |
| 85 | 0.096 |
| 86 | 0.078 |
| 87 | 0.059 |
| 88 | 0.040 |
| 89 | 0.021 |
| 90 | 0.000 |

## Elevation Pattern Tabulation

Antenna models: 6014, 6015, 6020, 6510, 6513, 6600, 68xx except 6832, & Versa2une, 6-bay full-wave-spaced.

Relative Field at 0° Depression = 1.000