APPLICATION FOR CONSTRUCTION PERMIT INFORMATION
RADIO STATION WA2XPA
ARECIBO, PUERTO RICO

680 KHZ 400 W-D 570 W-N ND

September 10, 2015

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Table of Contents

Executive Summary – WA2XPA

This engineering exhibit supports an application for construction permit for radio station WA2XPA in Arecibo, Puerto Rico. A minor change for a tower modification is proposed.

WA2XPA is presently licensed to operate fulltime on 680 kilohertz with 400 watts daytime and 570 watts nighttime, utilizing the same non-directional antenna during daytime and nighttime hours. By means of this present application, the licensee proposes to replace the existing tower. WA2XPA is presently on an STA due to mechanical failure of the existing tower. The daytime and nighttime proposed power levels remain unchanged for both daytime and nighttime operation. The daytime and nighttime services are proposed from the same site location as the presently licensed facility.

The proposal is classified as a minor change according to 47 CFR 73.3571(a)(2). As a Class B station operating on one of the channels listed in 73.25(b), the proposal satisfies 47 CFR 73.21(a)(3) which permits operation with a nominal power of not less than 0.25 kilowatt nor more than 50 kilowatts at any time.

The Federal Aviation Administration has not been notified of the proposal as the new tower construction is less than 200 feet and satisfies the analysis of the FCC TOWAIR program. The proposed tower is also shorter than the tower it replaces. See Item 6, FAA Determination of No Hazard to Air Navigation.

Matthew Folkert

September 10, 2015

Broadcast Facility – WA2XPA

The proposed facility complies with the engineering standards and assignment requirements of 47 C.F.R. Sections 73.24(e), 73.24(g), 73.33, 73.45, 73.150, 73.152, 73.160, 73.182(a)-(i), 73.186, 73.189 and 73.1650. Information included herein demonstrates compliance with all relevant requirements. The technical equipment proposed, the location of the transmitter, and other technical phases of operation comply with the regulations governing the same, and the requirements of good engineering practice.

Proposed Transmitter Location

The location of the proposed WA2XPA facility will be located at NAD27 coordinates:

18-28-18 North
66-42-35 West

The existing tower will be replaced with a shorter tower at the identical location of the licensed operation.

Nondirectional Antenna System

One tower will be employed for the daytime and nighttime nondirectional antenna pattern. The radiating element for the tower is 58.5 meters (192 feet) in height and has an overall height of 60.6 meters (199 feet) above ground level. Top loading will be added by connecting guy wire sections to its top that produce an increase in electrical height of 11.9 electrical degrees. As the tower is physically 47.8 electrical degrees in height, its top-loaded electrical height will be 59.7 degrees.

Ground System

The existing ground system at the transmitter site consists of 4 equally-spaced elevated aluminum wire radials surrounding the existing tower and extending to a length of 115.8 meters (380 feet). This non-coventional ground system was authorized in BLEX-20111026AIO.

Effective Field Intensity Determination

The licensed nondirectional antenna with a non-conventional elevated ground system specified an effective field intensity of 285.8 mV/m (@ 1km @ 1 kW). For this antenna configuration with a standard ground system(120 radial, ¼ wavelength) an effective field intensity of 291.6 mV/m is calculated per FCC guidelines. As a result, a correction factor of -5.8 mV/m is determined. Based on this analysis, the correction factor of -5.8 mV/m is applied to the calculated value for the proposed antenna configuration assuming a conventional ground system to determine the effective field intensity for the proposed non-conventional ground system. As a result, the resultant effective field intensity for the proposed tower is 283.6 mV/m (289.4 mV/m – 5.8 mV/m).

Moment Method Analysis of Proposed Top-Loaded Tower

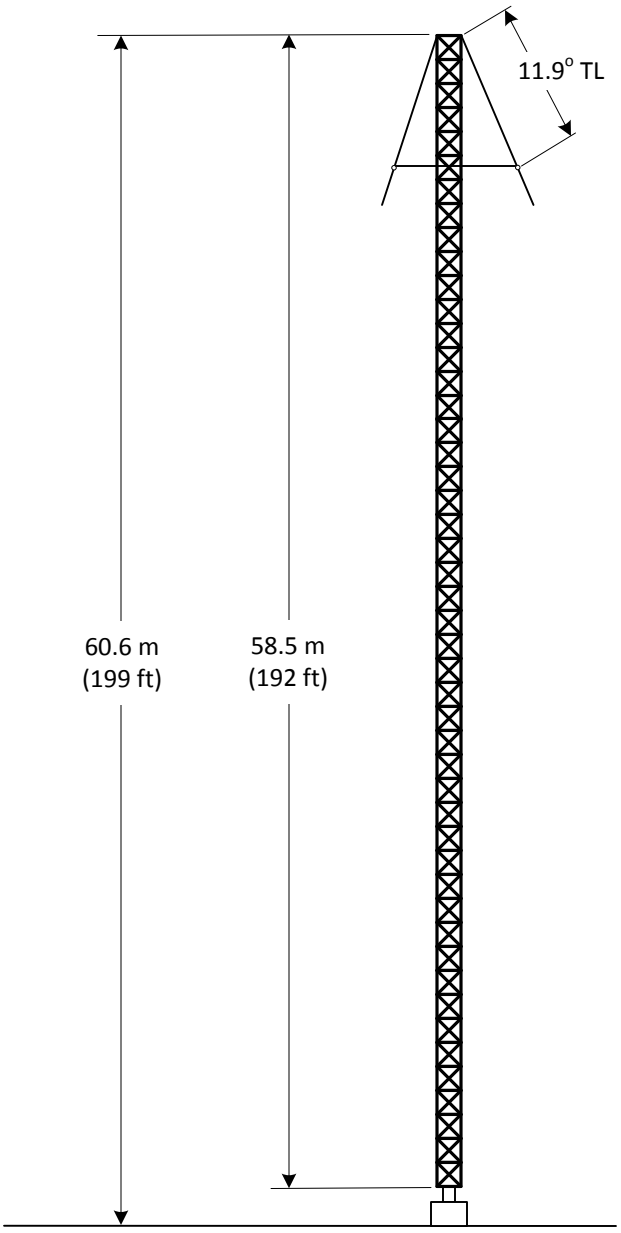
Moment method modeling was used to design the top loading for the proposed tower. The Appendix includes the results of the design utilizing recognized moment method software.

Current Distribution of Proposed Antenna

Normally, FCC construction permits that authorize new top-loaded towers have standard condition requiring that current-distribution measurements be made and submitted prior to licensing. As is explained extensively in the Appendix to this exhibit, modern antenna modeling techniques were used to design the guy wire top loading arrangement proposed for the tower. Thus, current distribution measurements should not be required. It is requested that the construction permit for the proposed tower not require them.

Proposed Nondirectional Antenna Pattern

A polar graph of the proposed daytime and nighttime horizontal plane standard radiation patterns appear on the following pages. Pertinent information with regard to their parameters and characteristics are shown along with the polar graphs.



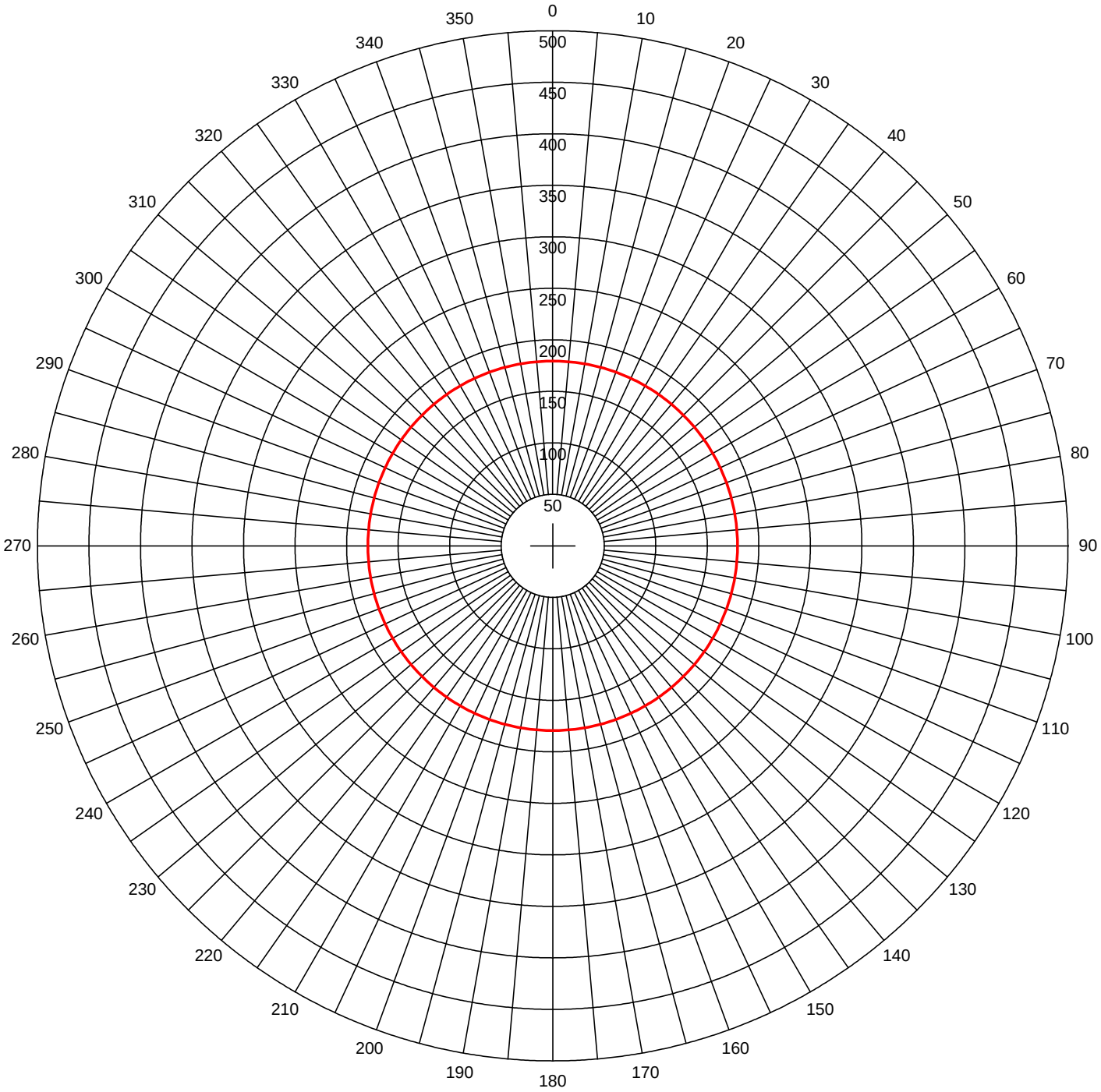
Site Coordinates(NAD 27)
18° 28' 18" N
66° 42' 35" W

SKETCH OF ANTENNA ELEMENT

RADIO STATION WA2XPA
ARECIBO, PUERTO RICO
680 KHZ 400 W-D 570 W-N ND

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

AM Nondirectional Pattern



Erss = 179.36 mV/m@1km
Theo RMS: 179.364 mV/m@1km

Theoretical Horizontal Plane Pattern

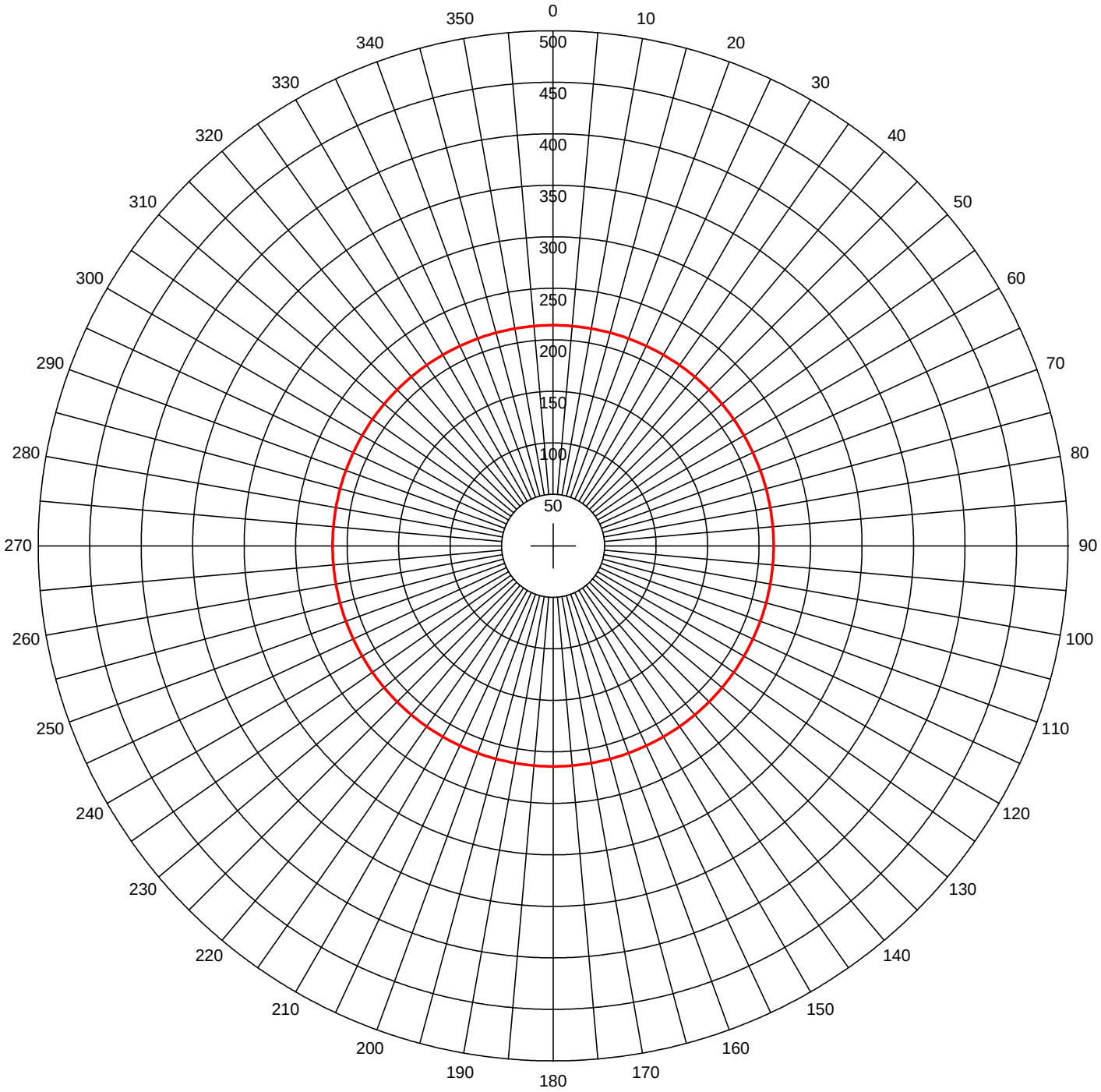
Pattern (mV/m @ 1km)
Pattern X10

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	-999.0	0	1	47.8	11.9	0.0	0.0

Call: WA2XPA
Freq: 680 kHz
ARECIBO, PR, US
Hours: D
Lat: 18-28-18 N
Lng: 066-42-35 W
Power: 0.4 kW
Theo RMS: 283.60 mV/m@1km

PROPOSED DAYTIME HORIZONTAL PLANE RADIATION PATTERN

AM Nondirectional Pattern



Erss = 214.11 mV/m@1km
Theo RMS: 214.113 mV/m@1km

Theoretical Horizontal Plane Pattern

Pattern (mV/m @ 1km)
Pattern X10

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	-999.0	0	1	47.8	11.9	0.0	0.0

Call: WA2XPA
Freq: 680 kHz
ARECIBO, PR, US
Hours: N
Lat: 18-28-18 N
Lng: 066-42-35 W
Power: 0.57 kW
Theo RMS: 283.60 mV/m@1km

PROPOSED NIGHTTIME HORIZONTAL PLANE RADIATION PATTERN

Principal Community Coverage and Service Contours – WA2XPA

The proposed facility complies with the community coverage requirements of 47 C.F.R. Section 73.24(i). The daytime 5 mV/m and nighttime interference-free contours encompass the entire principal community to be served. Maps showing the proposed and existing daytime and nighttime field strength service contours are not included as the proposed effective field intensity is only slightly reduced(2.2 mV/m) from the licensed value(283.6 mV/m versus 285.8 mV/m respectively). Thus, the extent of the predicted coverage contours will be virtually identical to the licensed contours.

Allocation Requirements – WA2XPA

The proposed facility complies with the requirements of 47 C.F.R. Section 73.37, 73.182 and 73.187. The proposed operation does not involve overlap of signal strength contours with other stations where there is not already such overlap. The requirement for a daytime allocation study was suspended as the proposed effective field intensity of 283.6 mV/m is slightly reduced from the licensed value of 285.8 mV/m. A nighttime allocation study shows protection to all stations and international allotments operating on the co-channel and adjacent channel frequencies. The following figures support a conclusion that this proposal comports with all interference protection requirements.

Proposed Night Allocation Protection Report

Call: WA2XPA
Freq: 680 kHz
ARECIBO, PR, US
Hours: N
Lat: 18-28-18 N
Lng: 066-42-35 W
Power: 0.57 kW
Theo RMS: 283.60 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	-999.0	0	1	47.8	11.9	0.0	0.0

Call Letters	Ct	St	City	SWFF (100uV/m)	Req Prot (mV/m)	Permis (mV/m)	Cur Rad (mV/m)	Margin (mV/m)
YVQR-B (305)	VE		CUMANA	41.51	2.511	302.50P	206.02	96.48
50% = 5.022, 25% = 5.308; WAPA=5.02 WA2XPA=1.72								
HIJX-C	DR		STGO RODRIGU	129.86	9.559	368.08	205.91	162.16
50% = 19.119, 25% = 21.422; WAPA=19.12 WPTF=8.03 WA2XPA=5.37								
WPTF	US	NC	RALEIGH	12.76	1.118	438.09	214.11	223.98
50% = 3.295, 25% = 4.472; WSCR=1.88 WKAZ=1.58 WAPA=1.57 KKYX=1.54 WRKO=1.48 KNBR=1.43 WCBM=1.33 WCTT=1.27 HOF 32-A=1.23								
HJBU-B (65)	CO		ZAMBRANO	22.15	2.265	511.15S	211.99	299.16
50% = 4.529, 25% = 4.672; WAPA=3.31 HOF 32-A=3.09 WPTF=1.15								
WRKO	US	MA	BOSTON	8.21	0.853	520.08	214.11	305.97
50% = 3.018, 25% = 3.414; CKGM/A=2.10 WCBM=1.54 WPTF=1.53 WAPA=1.29 WSCR=0.94								
CMMC-D	CU		GUANTANAMO	29.39	3.098	527.12	210.49	316.62
50% = 6.196, 25% = 6.196; WAPA=4.48 WPTF=4.28								
KNBR (120)	US	CA	SAN FRANCISCO	2.98	0.500	838.75S	214.11	624.63
CMIC-D	CU		CIEGO DE AVI	15.08	3.335	1105.99	213.01	892.98
50% = 6.67, 25% = 7.253; WPTF=6.67 WAPA=2.20 WCNN=1.81								
WCTT	US	KY	CORBIN	9.19	2.267	1233.18	214.11	1019.06
50% = 7.127, 25% = 9.067; WPTF=4.50 WKAZ=4.00 WSCR=3.82 WNZK=3.32 WCNN=2.80 WINR=2.68 WMFS=2.31								
KFEQ	US	MO	ST. JOSEPH	4.75	1.473	1550.93	214.11	1336.82
50% = 5.893, 25% = 5.893; KNBR=4.27 WSCR=4.06								
WMFS	US	TN	MEMPHIS	7.75	2.451	1581.96	214.11	1367.85
50% = 8.321, 25% = 9.805; WPTF=5.58 KFEQ=4.76 WHBE=3.93 WSCR=3.17 KNBR=3.11 WCNN=2.67								
WCBM	US	MD	BALTIMORE	9.78	3.176	1623.47	214.11	1409.36
50% = 12.702, 25% = 12.702; WPTF=12.70								
HOF 32-A	PM		RADIO RUMBOS	3.98	1.540	1932.57	214.09	1718.48
50% = 1.969, 25% = 2.36; HCVP2-A=1.74 WPTF=0.93 KKYX=0.68 WAPA=0.67 XEKQ/A=0.63 XE/A=0.61								
WINR	US	NY	BINGHAMTON	7.87	3.173	2015.33	214.11	1801.22
50% = 11.532, 25% = 12.692; WCBM=8.32 WPTF=7.99 WRKO=5.30								

Call Letters	Ct	St	City	SWFF (100uV/m)	Req Prot (mV/m)	Permis (mV/m)	Cur Rad (mV/m)	Margin (mV/m)
KKYX	US	TX	SAN ANTONIO	6.37	2.691	2112.46	214.11	1898.35
50% = 9.636, 25% = 10.766; KFEQ=7.91 KNBR=5.51 WPTF=3.64 WCNN=3.13								
WHBE	US	KY	NEWBURG	7.81	4.108	2631.94	214.11	2417.82
50% = 11.501, 25% = 16.434; WCTT=11.50 WPTF=5.67 WKAZ=5.54 WSCR=5.52 CFTR/A=5.25 WCNN=4.12								
KWKA	US	NM	CLOVIS	4.20	2.257	2685.58	214.11	2471.46
50% = 9.027, 25% = 9.027; KNBR=9.03								
YSS-B (60)	ES		CABANAS	3.93	2.197	2793.52S	214.09	2579.43
50% = 4.8, 25% = 5.92; HOF 32-A=4.27 XE/A=2.20 XEFCSM/A=1.90 KKYX=1.77 WPTF=1.72 XEKQ/A=1.51								
WDBC	US	MI	ESCANABA	4.30	2.748	3198.58	214.11	2984.46
50% = 8.431, 25% = 10.992; WSCR=5.44 WPTF=5.09 WOGO=3.95 KFEQ=3.42 WNZK=3.33 WCTT=3.10 WHBE=2.97 CFTR/A=2.92								
HRNN 10-B	HO		JUTICALPA 1	3.52	2.298	3268.12	214.11	3054.01
50% = 4.595, 25% = 6.049; HOF 32-A=4.60 XE/A=2.19 XEFCSM/A=1.77 XEKQ/A=1.62 KKYX=1.62 WPTF=1.51								
CMAC-D	CU		BAHIA HONDA	6.01	4.044	3363.07	213.95	3149.12
50% = 8.088, 25% = 9.269; WPTF=6.86 WCNN=4.29 WMFS=3.33 KKYX=3.07								
HRNN 7-B	HO		DANLI 2	3.29	2.355	3583.81	214.11	3369.70
50% = 4.71, 25% = 5.922; HOF 32-A=4.71 XE/A=2.18 XEFCSM/A=1.71 XEKQ/A=1.68 KKYX=1.54								
WSCR (135)	US	IL	CHICAGO	6.80	0.500	3678.76G	214.11	3464.65
WKAZ	US	WV	CHARLESTON	9.10	6.902	3790.92	214.11	3576.81
50% = 26.558, 25% = 27.606; WPTF=26.56 WCTT=7.53								
HRNN 20-B	HO		S PEDRO SULA	2.83	2.212	3911.66	214.11	3697.55
50% = 4.424, 25% = 6.102; HOF 32-A=3.50 XE/A=2.70 XEFCSM/A=2.13 KKYX=2.07 XEKQ/A=1.91 XEOAX/A=1.67 XELG/A=1.55								
WWFE	US	FL	MIAMI	25.83	2.045	3957.76	214.05	3743.71
50% = 7.746, 25% = 8.18; WSCR=7.75 WPTF=2.63								
WCNN	US	GA	NORTH ATLANTA	11.40	9.047	3967.30	214.11	3753.19
50% = 36.186, 25% = 36.186; WPTF=32.28 WCTT=16.36								
HRN 31-B	HO		SIGUATEPEQUE	2.84	2.376	4189.13	214.11	3975.02
50% = 4.752, 25% = 5.925; HOF 32-A=4.04 XE/A=2.51 XEFCSM/A=1.90 XEKQ/A=1.88 KKYX=1.73 XEOAX/A=1.54								
WOGO	US	WI	HALLIE	3.98	3.909	4915.30	214.11	4701.19
50% = 14.574, 25% = 15.635; KFEQ=14.57 WSCR=5.66								
TGVP-B	GT		VOZDELAVERAP	2.17	2.416	5562.24	214.11	5348.13
50% = 5.337, 25% = 6.609; XE/A=3.09 HOF 32-A=2.64 XELG/A=2.47 XEKQ/A=2.42 XEOAX/A=2.31 KKYX=2.28 XEFCSM/A=2.16								
WNZK	US	MI	DEARBORN HEIGHT	6.41	7.207	5623.47	214.11	5409.36
50% = 27.489, 25% = 28.826; CFTR/A=24.42 WPTF=12.62 WCTT=8.68								

Licensed Night Allocation Protection Report

Call: WA2XPA
Freq: 680 kHz
ARECIBO, PR, US
Hours: N
Lat: 18-28-18 N
Lng: 066-42-35 W
Power: 0.57 kW
Theo RMS: 285.80 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	-999.0	0	1	62.2	6.2	0.0	0.0

Call Letters	Ct	St	City	SWFF (100uV/m)	Req Prot (mV/m)	Permis (mV/m)	Cur Rad (mV/m)	Margin (mV/m)
YVQR-B (305)	VE		CUMANA	41.51	2.511	302.50P	207.06	95.44
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50% = 3.295, 25% = 4.472; WSCR=1.88 WKAZ=1.58 WAPA=1.57 KKYX=1.54 WRKO=1.48 KNBR=1.43 WCBM=1.33 WCTT=1.27 HOF 32-A=1.23								
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CMMC-D	CU		GUANTANAMO	29.39	3.098	527.12	211.87	315.25
50% = 6.196, 25% = 6.196; WAPA=4.48 WPTF=4.28								
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50% = 6.67, 25% = 7.253; WPTF=6.67 WAPA=2.20 WCNN=1.81								
WCTT	US	KY	CORBIN	9.19	2.267	1233.18	215.77	1017.40
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50% = 8.088, 25% = 9.269; WPTF=6.86 WCNN=4.29 WMFS=3.33 KKYX=3.07								
HRNN 7-B	HO		DANLI 2	3.29	2.355	3583.81	215.77	3368.04
50% = 4.71, 25% = 5.922; HOF 32-A=4.71 XE/A=2.18 XEFCSM/A=1.71 XEKQ/A=1.68 KKYX=1.54								
WSCR (135)	US	IL	CHICAGO	6.80	0.500	3678.76G	215.77	3462.99
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WWFE	US	FL	MIAMI	25.83	2.045	3957.76	215.71	3742.06
50% = 7.746, 25% = 8.18; WSCR=7.75 WPTF=2.63								
WCNN	US	GA	NORTH ATLANTA	11.40	9.047	3967.30	215.77	3751.53
50% = 36.186, 25% = 36.186; WPTF=32.28 WCTT=16.36								
HRN 31-B	HO		SIGUATEPEQUE	2.84	2.376	4189.13	215.77	3973.35
50% = 4.752, 25% = 5.925; HOF 32-A=4.04 XE/A=2.51 XEFCSM/A=1.90 XEKQ/A=1.88 KKYX=1.73 XEOAX/A=1.54								
WOGO	US	WI	HALLIE	3.98	3.909	4915.30	215.77	4699.53
50% = 14.574, 25% = 15.635; KFEQ=14.57 WSCR=5.66								
TGVP-B	GT		VOZDELAVERAP	2.17	2.416	5562.24	215.77	5346.47
50% = 5.337, 25% = 6.609; XE/A=3.09 HOF 32-A=2.64 XELG/A=2.47 XEKQ/A=2.42 XEOAX/A=2.31 KKYX=2.28 XEFCSM/A=2.16								
WNZK	US	MI	DEARBORN HEIGHT	6.41	7.207	5623.47	215.77	5407.70
50% = 27.489, 25% = 28.826; CFTR/A=24.42 WPTF=12.62 WCTT=8.68								

Blanketing – WA2XPA

The provisions of 47 CFR 73.24(g) require that the population within the 1,000 mV/m contour not exceed 300 persons for both the proposed daytime and nighttime operations. As discussed in Item 3, the proposed effective field intensities of both the daytime and nighttime patterns are slightly reduced as compared with the licensed values. Thus, the requirements of 47 CFR 73.24(g) are met as the extent of each blanketing contour is slightly reduced as well.

Environmental Protection – WA2XPA

The proposed facility is excluded from environmental processing under the requirements of 47 C.F.R. Section 1.1306. The proposed facility will not have a significant environmental impact and complies with the maximum permissible radiofrequency electromagnetic exposure limits for controlled and uncontrolled environments.

The proposed WA2XPA operation will be evaluated in terms of both the electric and magnetic field components which will be present at the base of the tower. Using Figures 1 through 4 of Supplement A to OET Bulletin 65, the worst case interpolated distances at which the electric and magnetic fields would fall below ANSI guidelines will be calculated before construction. The areas surrounding the base of the tower will be appropriately restricted with a fence having the required minimum radius unless field measurement data indicates otherwise. The fence will assure that persons on the property outside the fenced area will not be exposed to radiofrequency field levels in excess of those recommended by the ANSI. In addition, warning signs will be posted.

Item 6

Determination of No Hazard to Air Navigation – WA2XPA

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76193

Aeronautical Study No.
2015-ASO-2670-OE
Prior Study No.
2000-ASO-4298-OE

Issued Date: 03/23/2015

WIFREDO G. BLANCO-PI
WAPARADIO
134 DOMENECH AVE
HATO REY
SAN JUAN, PR 00918-3502

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Antenna Tower WA2XPA-AM
Location:	ARECIBO, PR
Latitude:	18-28-10.80N NAD 83
Longitude:	66-42-33.62W
Heights:	3 feet site elevation (SE)
	199 feet above ground level (AGL)
	202 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 09/23/2016 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

A copy of this determination will be forwarded to the Federal Communications Commission (FCC) because the structure is subject to their licensing authority.

If we can be of further assistance, please contact our office at (847) 294-7575. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-ASO-2670-OE.

Signature Control No: 244437679-246944512 (DNE)
Vivian Vilaro
Specialist

Attachment(s)
Frequency Data

cc: FCC

Frequency Data for ASN 2015-ASO-2670-OE

LOW FREQUENCY	HIGH FREQUENCY	FREQUENCY UNIT	ERP	ERP UNIT
680	680	kHz	0.57	kW

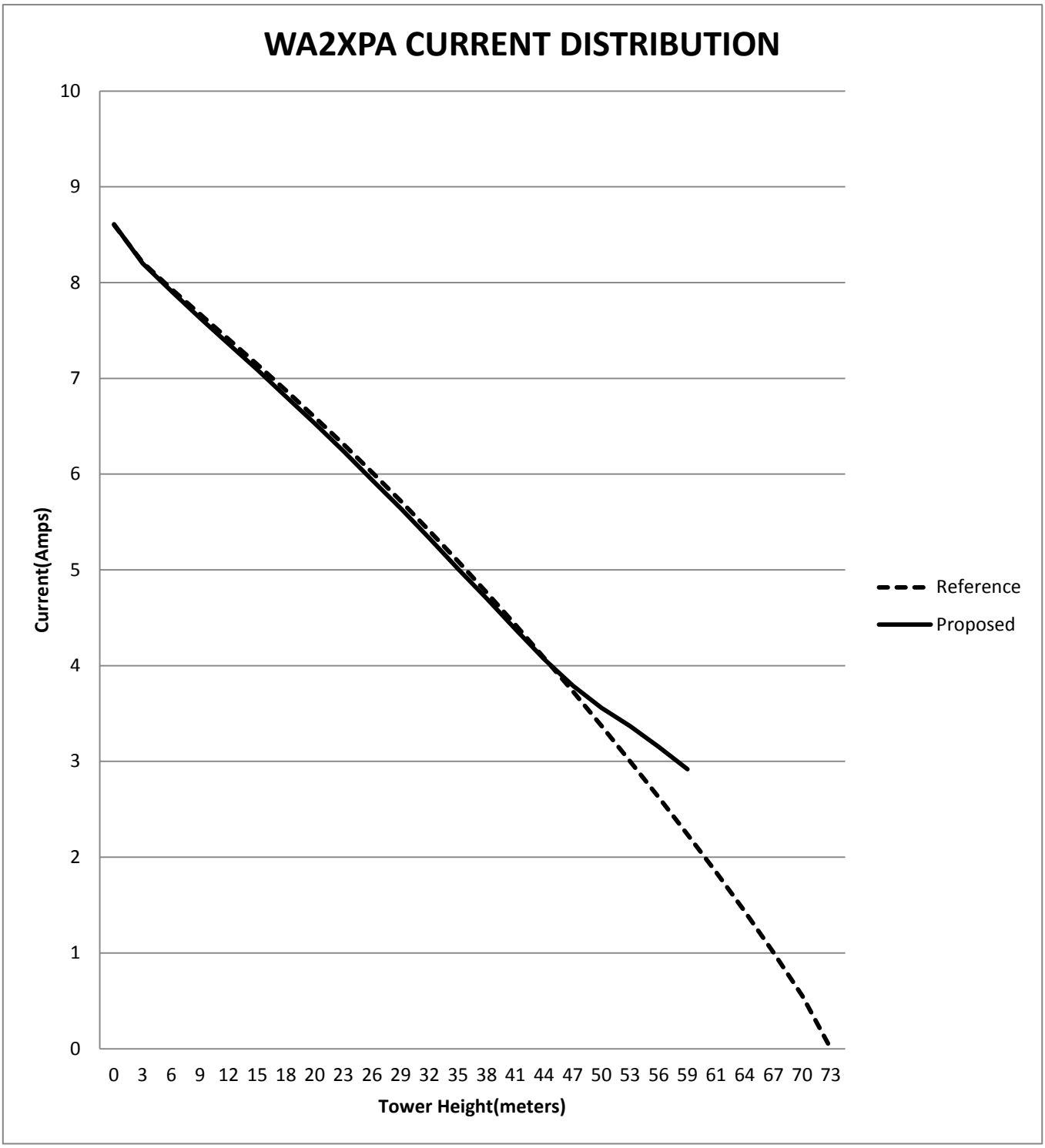
CURRENT DISTRIBUTION ANALYSIS OF PROPOSED WA2XPA TOP LOADED TOWER

Moment method modeling, which calculates tower current distribution rather than assuming it to have a sinusoidal characteristic, was used to design the top loading scheme for the proposed tower. It represents the state-of-the-art for calculating both tower current distribution and radiation characteristics in cases such as this. Modern research and experience indicate that moment method modeled current should match "real world" conditions more closely than the sinusoidal assumption that the FCC has used for analyzing current distribution measurements when new top-loaded antennas have been licensed in the past. The MININEC Broadcast Professional software package that is commonly used for proofing AM directional antennas in FCC applications for license was used to evaluate the top loading design. The details of the model are provided herein.

The top loading analysis of the proposed WA2XPA tower was performed using the current distribution of a tower with a total electrical height of 47.8 + 11.9 = 59.7 electrical degrees as a reference. The physical characteristics of the top loading wire sections connected to the top of the tower were selected to provide a match between the predicted current distribution along the proposed 47.8 degree top loaded tower with that of the lower 47.8 degree portion of the reference 59.7 electrical degree tower. Current distributions for both the reference and top-loaded models are plotted on the graphs that are shown on sheet 2. The currents were calculated assuming an antenna input power that would correlate the differing integrand length between the two models to ensure their shapes when scaled together are essentially the same over the comparable span of height.

The models used a conductor with the equivalent radius of a triangular tower having a face width of 18 inches to represent the proposed WA2XPA tower. The top loading wires have the radius of the ¼ inch EHS guy cable from which they will be constructed. Details of the modeled geometry of the reference tower are shown on sheet 3 and a list of the modeled current nodes is shown on sheet 4. Details of the modeled geometry of the proposed top loaded tower are shown on sheet 6 and the modeled current nodes are shown on sheet 7.

Both models included an assumed loss resistance of 1.0 ohm at the tower base. This is in keeping with standard FCC practice for calculating radiation efficiency of AM antennas. The horizontal plane radiation efficiencies of the reference tower and the proposed top loaded tower are shown on sheets 5 and 8, respectively.



REFERENCE: 59.7 DEGREE TOWER

PROPOSED: 47.8 + 11.9 DEGREE TOP LOADED TOWER

CALCULATED CURRENT DISTRIBUTION

WA2XPA REFERENCE MODEL

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire	caps	X	Y	Z	radius	segs
1	none	0	0	0	.182	25
		0	0	73.125		

Number of wires = 1
current nodes = 25

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	2.925	1	2.925
segment/radius ratio	1	16.0714	1	16.0714
radius	1	.182	1	.182

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	680.	0	1	6.63E-03	6.63E-03

Sources

source	node	sector	magnitude	phase	type
1	1	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.	0	0	0	0

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
680.	13.516	-162.4	162.96	274.8	42.971	-.40434	-10.511

CURRENT rms
Frequency = 680 KHz
Input power = 400. watts
Efficiency = 92.6 %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	5.44006	85.2	.451206	5.42132
2	0	0	2.925	5.19367	85.	.449023	5.17422
3	0	0	5.85	5.01783	84.9	.44593	4.99798
4	0	0	8.775	4.85096	84.8	.441552	4.83082
5	0	0	11.7	4.68548	84.7	.435849	4.66517
6	0	0	14.625	4.51815	84.6	.428802	4.49776
7	0	0	17.55	4.34734	84.5	.420411	4.32696
8	0	0	20.475	4.17215	84.4	.410678	4.15189
9	0	0	23.4	3.99209	84.3	.39961	3.97204
10	0	0	26.325	3.80685	84.2	.387214	3.7871
11	0	0	29.25	3.61628	84.1	.373501	3.59694
12	0	0	32.175	3.42033	84.	.358483	3.4015
13	0	0	35.1	3.21896	83.9	.342172	3.20073
14	0	0	38.025	3.01222	83.8	.324579	2.99468
15	0	0	40.95	2.80014	83.7	.305714	2.7834
16	0	0	43.875	2.58275	83.7	.285586	2.56691
17	0	0	46.8	2.36009	83.6	.264202	2.34526
18	0	0	49.725	2.13217	83.5	.24156	2.11845
19	0	0	52.65	1.8989	83.4	.21765	1.88638
20	0	0	55.575	1.66012	83.3	.192452	1.64892
21	0	0	58.5	1.41547	83.3	.165918	1.40571
22	0	0	61.425	1.16428	83.2	.137962	1.15607
23	0	0	64.35	.905298	83.1	.108421	.898782
24	0	0	67.275	.635883	83.	.0769564	.631209
25	0	0	70.2	.349912	83.	.0427935	.347285
END	0	0	73.125	0	0	0	0

WA2XPA TOP-LOADED MODEL

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire	caps	X	Y	Z	radius	segs
1	none	0	0	0	.182	20
		0	0	58.5		
2	none	0	0	58.5	.0032	3
		-4.84	2.8	50.21		
3	none	0	0	58.5	.0032	3
		4.84	2.8	50.21		
4	none	0	0	58.5	.0032	3
		0	-5.59	50.21		
5	none	-4.84	2.8	50.21	.0032	3
		4.84	2.8	50.21		
6	none	4.84	2.8	50.21	.0032	3
		0	-5.59	50.21		
7	none	0	-5.59	50.21	.0032	3
		-4.84	2.8	50.21		

Number of wires = 7
current nodes = 41

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	2.925	2	3.33316
segment/radius ratio	1	16.0714	2	1,041.61
radius	2	3.2E-03	1	.182

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	680.	0	1	6.63E-03	7.56E-03

Sources

source	node	sector	magnitude	phase	type
1	1	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.	0	0	0	0

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
680.	11.277	-171.14	171.51	273.8	56.585	-.30703	-11.659

CURRENT rms
Frequency = 680 KHz
Input power = 400. watts
Efficiency = 91.13 %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	5.95576	86.2	.391596	5.94288
2	0	0	2.925	5.67192	86.1	.389335	5.65854
3	0	0	5.85	5.47035	86.	.386345	5.45669
4	0	0	8.775	5.27999	85.8	.382214	5.26614
5	0	0	11.7	5.09218	85.8	.376897	5.07821
6	0	0	14.625	4.90316	85.7	.37038	4.88916
7	0	0	17.55	4.71114	85.6	.362665	4.69716
8	0	0	20.475	4.51519	85.5	.353759	4.50131
9	0	0	23.4	4.31482	85.4	.343679	4.30111
10	0	0	26.325	4.1099	85.4	.332446	4.09643
11	0	0	29.25	3.9005	85.3	.320095	3.88735
12	0	0	32.175	3.68701	85.2	.306669	3.67423
13	0	0	35.1	3.47007	85.2	.292239	3.45774
14	0	0	38.025	3.25094	85.1	.276919	3.23913
15	0	0	40.95	3.03197	85.1	.260911	3.02072
16	0	0	43.875	2.81794	85.	.244625	2.8073
17	0	0	46.8	2.62018	85.	.229025	2.61015
18	0	0	49.725	2.46492	85.	.216346	2.45541
19	0	0	52.65	2.33589	85.	.205234	2.32686
20	0	0	55.575	2.18097	85.	.191319	2.17256
END	0	0	58.5	2.02355	85.	.176655	2.01582
2J1	0	0	58.5	.674483	85.	.0588822	.671907
22	-1.61333	.933333	55.7367	.574565	85.	.0495872	.572421
23	-3.22667	1.86667	52.9733	.451104	85.1	.0384789	.44946
END	-4.84	2.8	50.21	.32765	85.1	.0277643	.326471
2J1	0	0	58.5	.674495	85.	.0588832	.67192
25	1.61333	.933333	55.7367	.574577	85.	.0495883	.572433
26	3.22667	1.86667	52.9733	.451116	85.1	.0384799	.449472
END	4.84	2.8	50.21	.327662	85.1	.0277652	.326484
2J1	0	0	58.5	.674571	85.	.05889	.671995
28	0	-1.86333	55.7367	.574659	85.	.0495957	.572515
29	0	-3.72667	52.9733	.451204	85.1	.0384879	.44956
END	0	-5.59	50.21	.327757	85.1	.0277738	.326578
2J2	-4.84	2.8	50.21	.163817	85.1	.0138816	.163228
31	-1.61333	2.8	50.21	.0524949	85.1	4.45E-03	.0523056
32	1.61333	2.8	50.21	.0524765	265.1	-4.45E-03	-.0522872
END	4.84	2.8	50.21	.163798	265.1	-.0138798	-.163209
2J3	4.84	2.8	50.21	.163864	85.1	.0138853	.163275
35	3.22667	3.33E-03	50.21	.0524786	85.1	4.45E-03	.0522893
36	1.61333	-2.79333	50.21	.0524898	265.1	-4.45E-03	-.0523005
END	0	-5.59	50.21	.163863	265.1	-.0138856	-.163274
2J4	0	-5.59	50.21	.163894	85.1	.0138882	.163304
39	-1.61333	-2.79333	50.21	.0525197	85.1	4.46E-03	.0523302
40	-3.22667	3.33E-03	50.21	.0524484	265.1	-4.45E-03	-.0522592
END	-4.84	2.8	50.21	.163833	265.1	-.0138827	-.163244

NEAR ELECTRIC FIELDS rms
Cartesian coordinate system
Dimensions in meters

Frequency = 680. KHz
Input power = 1,000. watts

location			field magnitude (mv/m)/phase (deg)			
X	Y	Z	X	Y	Z	maximum
1,000.	0	0	0	0	289.401	289.401