TECHNICAL EXHIBIT

PREDICTED IMPACT OF TV
TRANSMITTING ANTENNA ON
NEARBY AM RADIO STATION WITH
DIRECTIONAL ANTENNA SYSTEM
TV STATION WPPX-TV
WILMINGTON, DELAWARE

January 26, 2018

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Executive Summary – WPPX-TV

Information regarding a study of the potential impact of an interim WPPX TV transmitting antenna, which is proposed for STA operation, on an existing tower within two miles of the daytime directional antenna pattern of AM station WNWR is included herein. As a Class D station, WNWR is not licensed for nighttime operation.

The TV antenna will be side mounted on an existing grounded tower (ASR: 1023152). The tower has been in place and has coexisted with the directional antenna facility of the present WNWR facility since before the most recent proof of performance, BMML-20171220ACU, was conducted on it.

"MoM" Analysis of Proposed Antenna

The before-after Method of Moments ("MoM") analysis presented herein demonstrates that the WPPX antenna will have no adverse impact on the WNWR daytime directional antenna system. The calculated unattenuated field strength levels at one kilometer are within the standard or modified standard values for four of the five radial directions that are specified for monitoring of the daytime antenna pattern and, thus, the requirements of 47 CFR 1.30002(b) are clearly met for them. In the fifth radial direction, where the calculated field strength exceeds the modified standard pattern in the "before" case, a net reduction will result – meaning that the construction will not cause the radiation to be increased above the modified standard pattern. Evidently, the residual re-radiation that adds to the WNWR radiation along this radial is either masked by other effects of the nearby electromagnetic environment and/or has been compensated for in the adjustment of the WNWR directional antenna pattern in the past. It is noted that the net reduction in field strength along this radial agrees in principle with the requirements of 47 CFR 1.30002(f) where a pre-construction field strength exceeds its licensed limit.

MoM Modeling at 1540 Kilohertz

To examine the situation with regard to the potential for effects on the WNWR far field radiation pattern, a Method of Moments computer study was run using a model of the directional array with voltage sources calculated to produce the authorized directional antenna pattern in accordance with the requirements of Section 1.30002(c) of the FCC Rules. Two models were run – one with the existing tower having no antenna and another with the proposed TV antenna for the WPPX interim operation side mounted on it. This modeling of the TV antenna should provide complete before and after analysis of its installation on the tower under worst case conditions.

To evaluate the effect of the TV antenna, the modeling considered the changes in far-field radiation in the specified reference point directions of the WNWR license. This is in keeping with the radial azimuth specifications of Section 1.30002(f) of the FCC Rules when before-and-after field strength measurements are run. In order to have far-field radiation values that avoid significant array proximity effects, they were calculated at a distance of 100 kilometers and then converted to their corresponding values of unattenuated field strength at 1 kilometer to comport with the standard for defining directional antenna radiation patterns. For worst-case radiation calculations, no ground loss was assumed for the modeled towers.

The modeling assumptions for the subject tower are within the range allowed for Method of Moments modeling in a directional antenna proof of performance – with the radius based directly on the 90 inch face width tower and the height equal to the tower's physical height. The TV antenna was simulated by increasing the radius of the wire section representing the area where they are side mounted on the tower to a value based on the equivalent horizontal plane area occupied by the tower plus the TV antenna. The total vertical length of the 3-bay antenna which included the space between the elements was modeled with the increased wire radius to simulate worst case conditions. Other antennas on the tower were not simulated so as to allow conclusive analysis of the singular effects of adding the TV antenna in question without any masking effects. Generic assumptions were used for the WNWR array towers as the analysis is not sensitive to them. Expert MININEC Broadcast Professional Version 14.5 was used for the modeling.

As can be seen from the before-after tabulation and Method of Moments modeling details on the following pages, the installation of the new WPPX TV interim antenna will have no material impact on the directional antenna radiation patterns of WNWR. No radiation level increase capable of being proven with field strength measurements, given the rated accuracy of field strength meters, was found.

The study indicates that there is no adverse impact. The requirement of Section 1.30002(b) of the FCC Rules is met, as the total radiation, including whatever small residual contribution comes from the WPPX antenna, will have no adverse impact on the WNWR directional antenna pattern.

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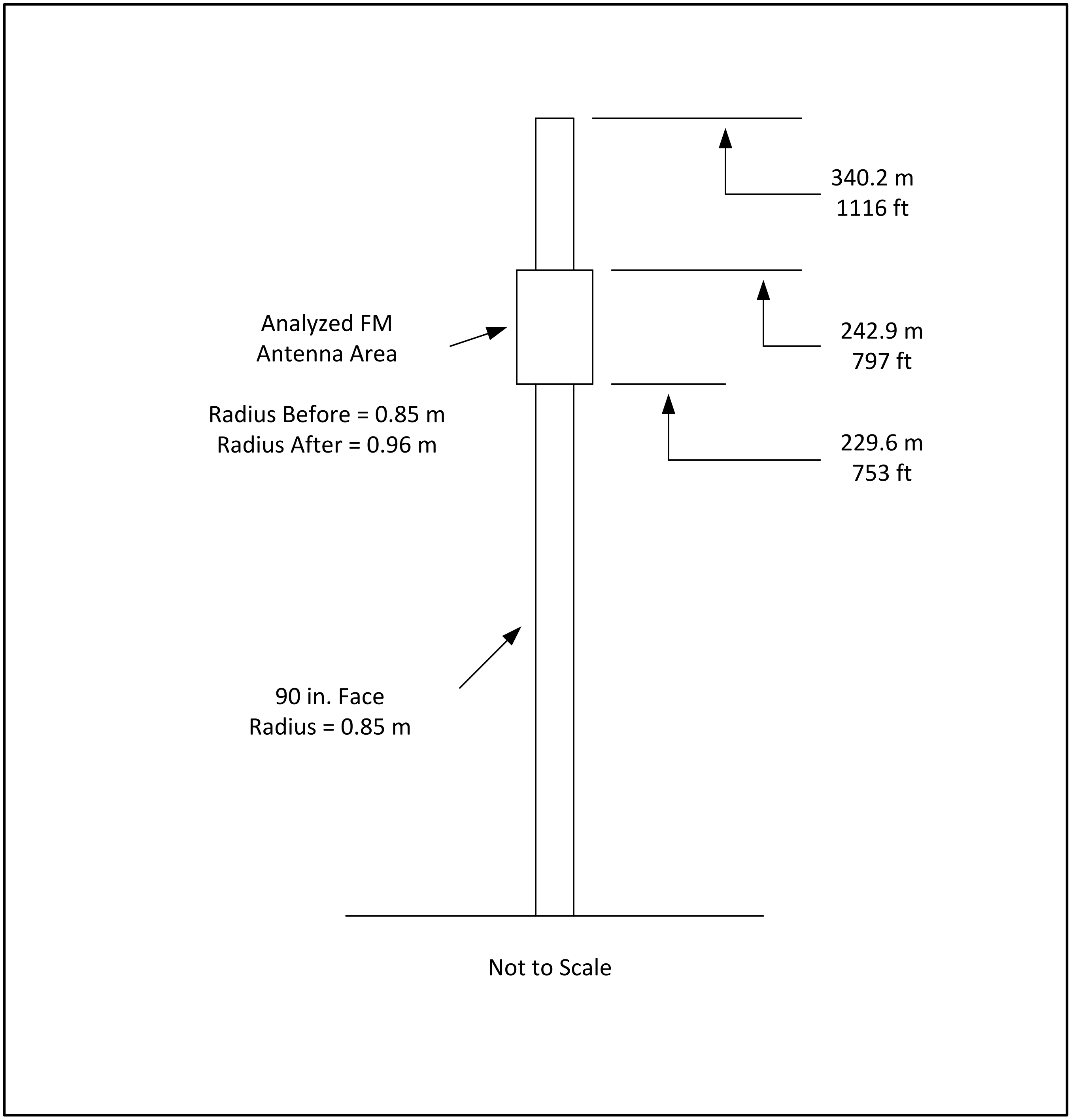
Tabulation of Before and After Radial Field Strengths – WPPX(TV)

WNWR Day DA

Radial (Deg. T.)	Modified Standard (mV/m)	Before (mV/m)	After (mV/m)	Increase/Before		
				Ratio	Percent	dB
37	1140	626.5	643.6	0.973	2.7%	0.23
138	4609	4599	4583	1.003	0.3%	-0.03
235	652.9	314.5	324.4	0.969	3.1%	0.27
290	364.6	189.9	177.6	1.069	6.9%	-0.58
342	248.3	301.2	297.0	1.014	1.4%	-0.12



SKETCH SHOWING TOWER MODELING ASSUMPTIONS

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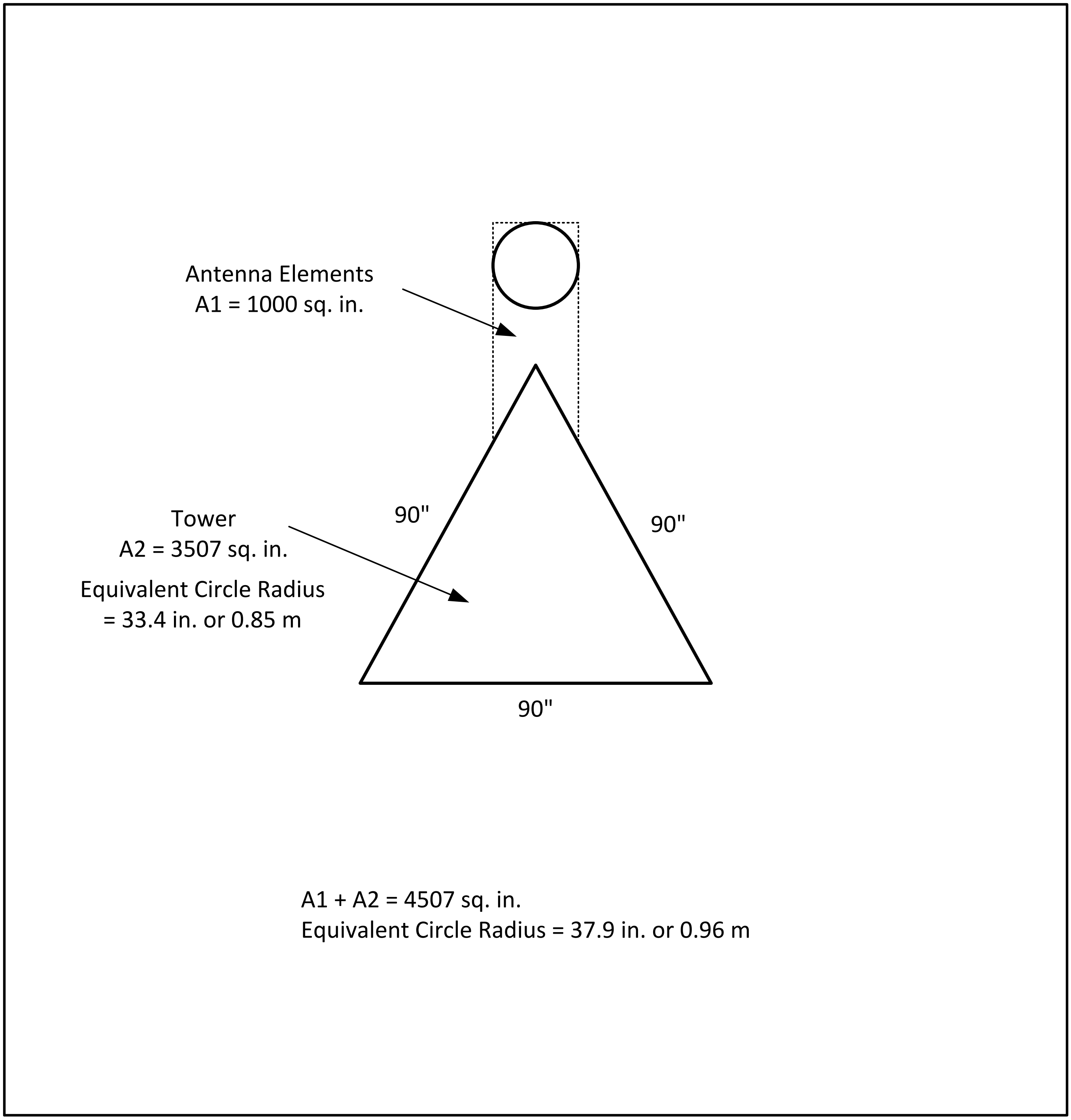

SKETCH SHOWING TV ANTENNA MODELING ASSUMPTIONS

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Method of Moments Model Details for WNWR Daytime Directional Antenna Before TV Antenna Installation – WPPX(TV)

WNWR Model without WPPX(TV)

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1540 KHz

tower	field ratio magnitude	phase (deg)
1	1.000	0.0
2	0.512	-123.5
3	0.651	143.5

NOTE: The array synthesis calculations (above) were performed to solve for the base voltage drives required to produce the specified field parameters for the three towers of the daytime directional radiation pattern. The following information is for the model without the new antenna for the "before" case.

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	2	0	0	0	.218	10
		0	0	48.7		
2	2	57.9	129.8	0	.218	10
		57.9	129.8	48.7		
3	2	40.3	324.9	0	.218	10
		40.3	324.9	48.7		
4	2	457.	238.6	0	.85	20
		457.	238.6	340.2		

Number of wires = 4
current nodes = 50

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	4.8918	4	17.0525
segment/radius ratio	4	20.0618	1	22.4395
radius	1	.218	4	.85

ELECTRICAL DESCRIPTION

Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1,540.	0	1	.025128	.0875946

Sources

source	node	sector	magnitude	phase	type
1	1	1	2,441.39	66.	voltage
2	11	1	2,540.36	304.8	voltage
3	21	1	462.975	185.6	voltage

RADIATION PATTERN rms

geographic coordinate system

Radial distance (meters) = 100,000.

Frequency = 1,540. KHz

Input power = 50,000. Watts

Efficiency = 100. %

elevation	azimuth	E-theta		E-phi	
angle	angle	mag (mv/m)	phase (deg)	mag (mv/m)	phase
0	37.	6.26491	16.2	0	0
0	138.	45.995	104.1	0	0
0	235.	3.14488	175.2	0	0
0	290.	1.89917	144.6	0	0
0	342.	3.0155	20.5	0	0

NOTE: The radiation values were calculated for a distance of 100 kilometers, to minimize array element proximity effects, and must be multiplied by 100 to obtain their equivalent inverse distance unattenuated values at 1.0 kilometer.

Method of Moments Model Details for WNWR Daytime Directional Antenna After TV Antenna Installation – WPPX(TV)

WNWR Model with WPPX(TV)

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1540 KHz

tower	field ratio magnitude	phase (deg)
1	1.000	0.0
2	0.512	-123.5
3	0.651	143.5

NOTE: The array synthesis calculations (above) were performed to solve for the base voltage drives required to produce the specified field parameters for the three towers of the daytime directional radiation pattern. The following information is for the model with the new antenna for the "after" case.

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	2	0	0	0	.218	10
		0	0	48.7		
2	2	57.9	129.8	0	.218	10
		57.9	129.8	48.7		
3	2	40.3	324.9	0	.218	10
		40.3	324.9	48.7		
4	2	457.	238.6	0	.85	15
		457.	238.6	229.6		
5	2	457.	238.6	229.6	.96	3
		457.	238.6	242.9		
6	2	457.	238.6	242.9	.85	5
		457.	238.6	340.2		

Number of wires = 6
current nodes = 53

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	4.75333	6	19.63
segment/radius ratio	5	4.95139	6	23.0941
radius	1	.218	5	.96

ELECTRICAL DESCRIPTION

Frequencies (KHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1,540.	0	1	.025128	.0875946

Sources

source	node	sector	magnitude	phase	type
1	1	1	2,441.39	66.	voltage
2	11	1	2,540.36	304.8	voltage
3	21	1	462.975	185.6	voltage

RADIATION PATTERN rms
geographic coordinate system

Radial distance (meters) = 100,000.
Frequency = 1,540. KHz
Input power = 50,000. Watts
Efficiency = 100. %

elevation angle	azimuth angle	E-theta mag (mv/m)	phase (deg)	E-phi mag (mv/m)	phase
0	37.	6.43554	17.1	0	0
0	138.	45.8315	104.	0	0
0	235.	3.24357	178.	0	0
0	290.	1.77567	149.	0	0
0	342.	2.97009	17.	0	0

NOTE: The radiation values were calculated for a distance of 100 kilometers, to minimize array element proximity effects, and must be multiplied by 100 to obtain their equivalent inverse distance unattenuated values at 1.0 kilometer.