

ENGINEERING REPORT

2012 License Renewal Radio Frequency (RF) Protection Study

WHQG(FM) – Milwaukee, WI (Analog & HD/IBOC)
WJMR-FM – Menomonee Falls (Analog & HD/IBOC)
WZBK-FM – Brookfield, WI (Analog & HD/IBOC)
WJYI(AM) – Milwaukee, WI (Analog)
WHQG(FM) – Milwaukee, WI (Analog Auxiliary)
WKLH(FM) – Milwaukee, WI (Analog Auxiliary)
APP260D – Wauwatosa, WI (Analog FM Translator)
APP267D – Milwaukee, WI (Analog FM Translator)

March, 2011

CERTIFICATION OF ENGINEERS

The firm of Munn-Reese, Inc., Broadcast Engineering Consultants, with offices at 385 Airport Drive, Coldwater, Michigan, has been retained for the purpose of preparing the technical data forming this report.

The data utilized in this report was taken from the FCC Secondary Database and data on file. While this information is believed accurate, errors or omissions in the database and file data are possible. This firm may not be held liable for damages as a result of such data errors or omissions.

The report has been prepared by properly trained electronics specialists under the direction of the undersigned whose qualifications are a matter of record before the Federal Communications Commission.

I declare under penalty of the laws of perjury that the contents of this report are true and accurate to the best of my knowledge and belief.

July 27, 2012

MUNN-REESE, INC.

By 
Wayne S. Reese, President

385 Airport Drive, PO Box 220
Coldwater, Michigan 49036

Telephone: 517-278-7339

By 
Justin W. Asher, Project Engineer

License Renewal

Compliance with Radiofrequency Radiation Guidelines

This firm was retained to study the potential for human exposure to non-ionizing radiofrequency radiation for this common multiple source site. There are eight (8) contributing RF sources at this common site or located within 315 meters of the common site.

It should be noted that while the WKLH(FM) and WHQG(FM) auxiliary operations will share the same common antenna, simultaneous or diplexed operation is not proposed. Rather only one facility will employ this auxiliary antenna at a time via switching to disengage the other auxiliary operation from the system. However, for purposes of this RF compliance study, a worst case scenario assuming both auxiliary facilities operating simultaneously has been assumed.

The WKLH(FM) – Milwaukee, WI auxiliary analog FM facility will operate on CH243B (96.5 MHz) with 8.3 kW ERP circular polarization (H&V). The facility will broadcast with an antenna COR mounted 104 meters above ground level (AGL). The antenna employed will be a 1-Bay, 1.0 λ (wavelength) spaced, ERI SHPX-1AE unit employing an EPA Type 3 element as defined by FM Model Version 2.10 Beta issued March 22, 1995. The proposed WKLH(FM) auxiliary facility will not broadcast with any HD/IBOC operation.

The WHQG(FM) – Milwaukee, WI auxiliary analog FM facility will operate on CH275B (102.9 MHz) with 11.5 kW ERP circular polarization (H&V). The facility will broadcast with an antenna COR mounted 104 meters above ground level (AGL). The antenna employed will be a 1-Bay, 1.0 λ (wavelength) spaced, ERI SHPX-1AE unit employing an EPA Type 3 element as defined by FM Model Version 2.10 Beta issued March 22, 1995. The proposed WHQG(FM) auxiliary facility will not broadcast with any HD/IBOC operation.

The WHQG(FM) – Milwaukee, WI analog FM facility operates on CH275B (102.9 MHz) with 50.0 kW ERP circular polarization (H&V). The facility broadcasts with an antenna COR mounted 135 meters above ground level (AGL). The station is licensed with a 4-Bay, 1.0 λ (wavelength) spaced, Continental (CON) G5CPS-4 “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995 .

The WHQG(FM) – Milwaukee, WI HD/IBOC facility operates on CH275B (102.9 MHz) with -14 dBc power or 2.0 kW ERP circular polarization (H&V) ($\text{Log}[0.04 \text{ or } 4\%]*10 = -14 \text{ dBc}$). The HD/IBOC facility broadcasts a diplexed signal from the WHQG(FM) main antenna mounted 135 meters above ground level (AGL). The common antenna is licensed as a 4-Bay, 1.0 λ (wavelength) spaced, Continental (CON) G5CPS-4 “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995.

For purposes of this RF Compliance Study, the sum WHQG(FM) Analog and HD/IBOC powers of 52.0 kW ERP circular polarization has been assumed as one single WHQG(FM) contribution into the common antenna.

The WJMR-FM – Menomonee Falls, WI analog FM facility operates on CH252A (98.3 MHz) with 4.9 kW ERP circular polarization (H&V). The facility broadcasts with an antenna COR mounted 116 meters above ground level (AGL). The station is licensed with a 2-Bay, 1.0 λ (wavelength) spaced, ERI SHPX-2AE “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995.

The WJMR-FM – Menomonee Falls, WI HD/IBOC facility operates on CH252A (98.3 MHz) with -20 dBc power or 0.049 kW ERP circular polarization (H&V) ($\text{Log}[0.01 \text{ or } 1\%]*10 = -20 \text{ dBc}$). The HD/IBOC facility broadcasts a diplexed signal from the WJMR-FM main antenna mounted 116 meters above ground level (AGL). The common antenna is licensed as a 2-Bay, 1.0 λ (wavelength) spaced, ERI SHPX-2AE “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995.

License Renewal

Compliance with Radiofrequency Radiation Guidelines

For purposes of this RF Compliance Study, the sum WJMR-FM Analog and HD/IBOC powers of 4.949 kW ERP circular polarization has been assumed as one single WJMR-FM contribution into the common antenna.

The WZBK-FM – Brookfield, WI analog FM facility operates on CH295A (106.9 MHz) with 4.4 kW ERP circular polarization (H&V). The facility broadcasts with an antenna COR mounted 121 meters above ground level (AGL). The station is licensed with a 2-Bay, 0.5λ (wavelength) spaced, ERI LPX-2E-HW “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995.

The WZBK-FM – Brookfield, WI HD/IBOC facility operates on CH295A (106.9 MHz) with -20 dBc power or 0.044 kW ERP circular polarization (H&V) ($\text{Log}[0.01 \text{ or } 1\%] * 10 = -20 \text{ dBc}$). The HD/IBOC facility broadcasts a diplexed signal from the WZBK-FM main antenna mounted 121 meters above ground level (AGL). The common antenna is licensed as a 2-Bay, 0.5λ (wavelength) spaced, ERI LPX-2E-HW “roto-tiller” antenna employing EPA Type 3 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995. WZBK-FM does not operate with HD/IBOC facilities at this time.

For purposes of this RF Compliance Study, the sum WZBK-FM Analog and HD/IBOC powers of 4.444 kW ERP circular polarization has been assumed as one single WZBK-FM contribution into the common antenna.

The APP260D – Wauwatosa, WI proposed FM analog BNPFT-20030313BPP translator facility will operate on CH260D (99.9 MHz) with 0.120 kW ERP circular polarization (H&V). The facility proposes to broadcast with an antenna COR mounted 13 meters above ground level (AGL). The APP267D – Milwaukee, WI proposed FM analog BNPFT-20030313AUK translator facility will operate on CH267D (101.3 MHz) with 0.150 kW ERP circular polarization (H&V). The facility proposes to broadcast with an antenna COR mounted 63 meters above ground level (AGL). For purposes of this RF Study, the combined translator operating power of 0.270 kW (H&V) has been assumed from the lower 13 meter AGL height. A worst case 1-Bay, 1.0λ (wavelength) spaced, EPA Type 1 elements as defined by FM Model Version 2.10 Beta issued March 22, 1995 has been assumed. Neither pending translator application proposes HD/IBOC operation at this time.

The WJYI(AM) – Milwaukee, WI analog AM facility operates on a frequency of 1340 kHz with a daytime and nighttime non-directional power of 1.0 kW. The WJYI(AM) license lists an electrified radiator 221.2° or 0.614λ (wavelengths) for operation on 1340 kHz. Existing fencing is no less than 1 meter (3 feet) for each tower. WJYI(AM) does not presently broadcast with any HD/IBOC operation.

This site has been evaluated for compliance with the FCC guidelines concerning human exposure to radiofrequency radiation. The standards employed are detailed in OET Bulletin No. 65 (Edition 97-01).

The results of the evaluation for the AM contribution(s) have been shown in both graphical and tabular forms at the end of this report. The tabular form lists the portion of the tabular output for each station, showing the region of maximum non-ionizing radiation. (The maximum values have been indicated by the use of **highlighted print**.) For the AM contribution, the maximum contribution has been assumed using maximum daytime power of 0.5 kW in conjunction with the minimum fencing distance of 1.0 meter regardless of tower. The tabulation of AM data use the units of measurement, V^2/m^2 and A^2/m^2 , which were used in the previous standards as set forth in OST Bulletin No. 65, October 1985. Inspection of the tabulations will show that the maximum contribution of WJYI(AM) at the AM tower is made by the electric field. At this point, the field has a predicted value of $12,087 \text{ V}^2/\text{m}^2$, or 109.94 V/m, which represents 17.91% of the more stringent 614 V/m uncontrolled limit.

License Renewal

Compliance with Radiofrequency Radiation Guidelines

The results of the evaluation for the FM station have been shown at the end of this RF compliance discussion. To ensure complete protection, the maximum FM contribution has been assumed without regard for the AM restricted access fencing distance.

To evaluate the total exposure to non-ionizing radiofrequency radiation it is necessary to sum the individual contributions as a decimal fraction of the maximum permissible limit. If the resulting sum is less than or equal to unity, the exposure is concluded to be within the guidelines of OET Bulletin No. 65 (Edition 97-01). The table that follows provides the same information with respect to those locations defined as an "uncontrolled environment." This includes locations where there could be exposure to the general public. The total decimal fraction is also shown.

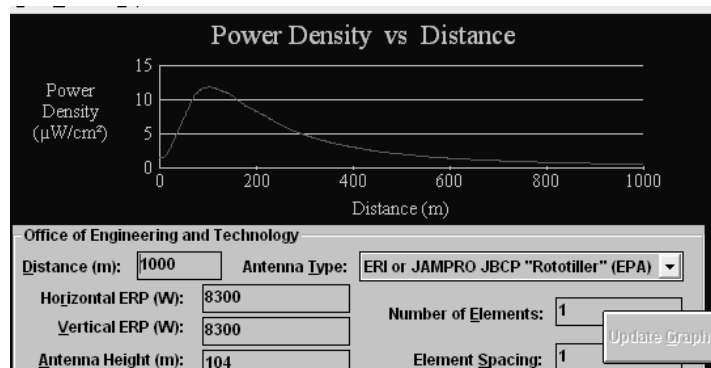
<u>Contributing Station</u>	<u>Maximum Contribution</u>	<u>Uncontrolled Environment Limit</u>	<u>Decimal Fraction of Limit</u>
WKLH(FM) auxiliary (analog)	11.8606 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.05930
WHQG(FM) auxiliary (analog)	16.4333 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.08217
WHQG(FM) (Analog & HD/IBOC)	17.035 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.08518
WJMR-FM (Analog & HD/IBOC)	3.654 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.01827
WZBK-FM (Analog & HD/IBOC)	1.865 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.00933
APP260D & APP267D (analog)	88.875 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.44438
WJYI(AM) (Analog)	109.94V/m	614 V/m	<u>0.17906</u>
Total Decimal Fraction:			0.87769

Since the Total Decimal Fraction is less than unity for the uncontrolled environment, the operation of the combined transmitting plants is in compliance with the provisions of OET Bulletin No. 65 (Edition 97-01). Protection of the uncontrolled environment implies protection of the controlled environment. There are no other broadcast sources of radiofrequency non-ionizing radiation present at this site.

In addition to the protection afforded by the existing AM fencing and the FM antenna heights above ground, the facility is properly marked with signs, and entry to the facility is restricted by means of fencing with locked doors and/or gates. Any other means as may be required to protect employees and the general public will be employed.

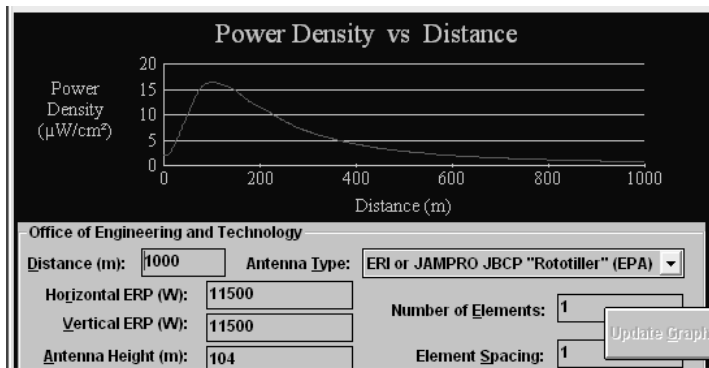
In the event work would be required in proximity to the antenna such that the person or persons working in the area would be potentially exposed to fields in excess of FCC guidelines, an agreement, signed by all broadcast parties at the site, is in effect for the offending transmitter(s) to reduce power, or cease operation during the critical period.

PLOT OF TOTAL POWER DENSITY
WKLH(FM) Auxiliary (Analog)
Channel 243B – Milwaukee, WI



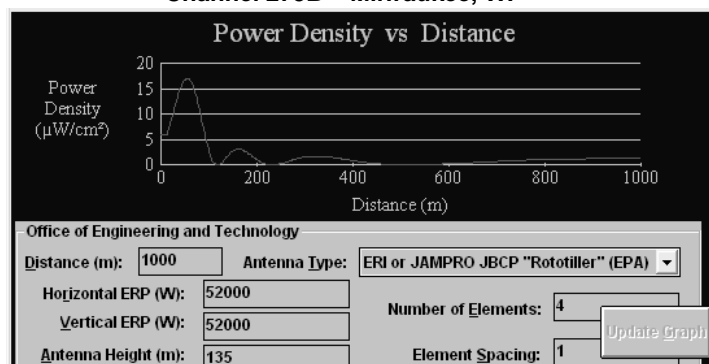
The Max Power Density was found to be 11.8606134356998 $\mu\text{W}/\text{cm}^2$ at 102 meters.
 Note: Graph resolution is 500 points.

PLOT OF TOTAL POWER DENSITY
WHQG(FM) Auxiliary (Analog)
Channel 275B – Milwaukee, WI



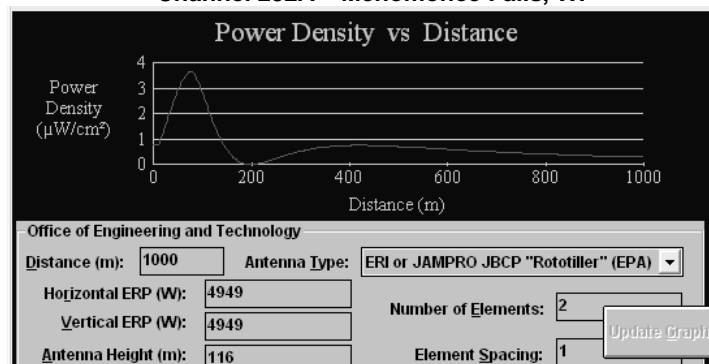
The Max Power Density was found to be 16.4333800615118 $\mu\text{W}/\text{cm}^2$ at 102 meters.
 Note: Graph resolution is 500 points.

PLOT OF TOTAL POWER DENSITY
WHQG(FM) (Analog & HD/IBOC)
Channel 275B – Milwaukee, WI



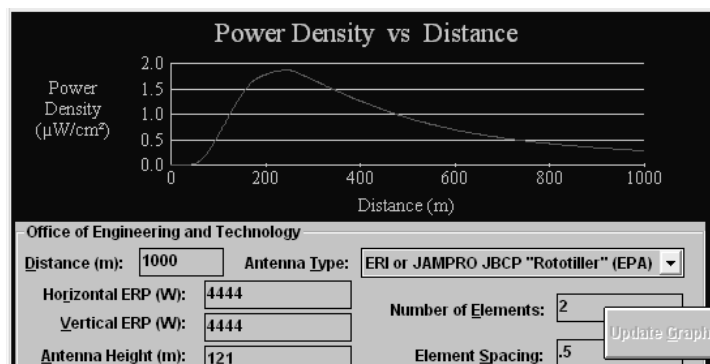
The Max Power Density was found to be 17.0351309147996 $\mu\text{W}/\text{cm}^2$ at 54 meters.
 Note: Graph resolution is 500 points.

PLOT OF TOTAL POWER DENSITY
WJMR-FM (Analog & HD/IBOC)
Channel 252A – Menomonee Falls, WI



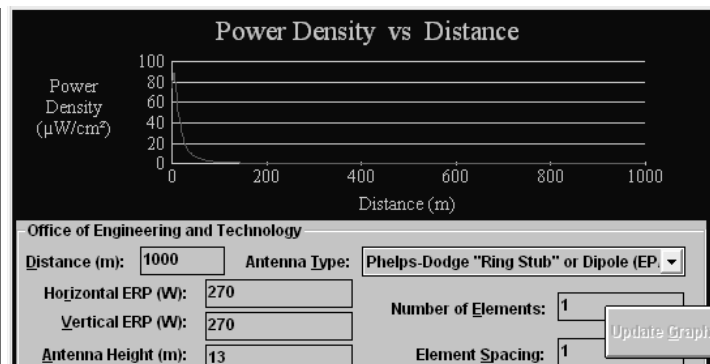
The Max Power Density was found to be 3.65413692301525 $\mu\text{W}/\text{cm}^2$ at 76 meters.
 Note: Graph resolution is 500 points.

PLOT OF TOTAL POWER DENSITY
WZBK-FM (Analog & HD/IBOC)
Channel 295A – Brookfield, WI



The Max Power Density was found to be 1.86473795224433 $\mu\text{W}/\text{cm}^2$ at 242 meters.
 Note: Graph resolution is 500 points.

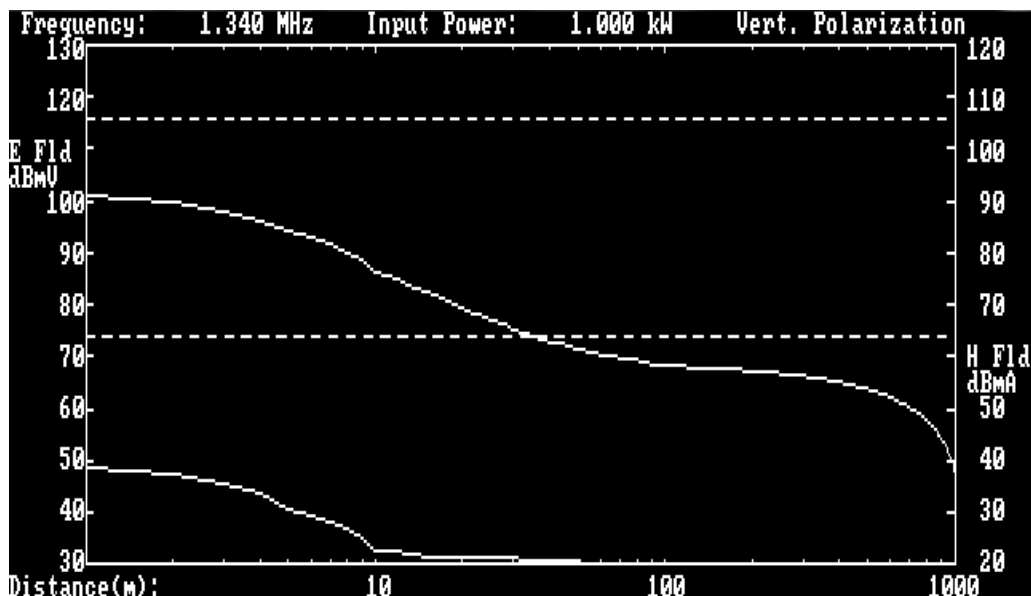
PLOT OF TOTAL POWER DENSITY
APP260D (Analog) – Wauwatosa, WI
APP267D (Analog) – Milwaukee, WI



The Max Power Density was found to be 88.8750807303609 $\mu\text{W}/\text{cm}^2$ at 4 meters.
 Note: Graph resolution is 500 points.

PLOT AND TAB OF ELECTRIC AND MAGNETIC FIELD STRENGTHS

WJYI(AM) (Analog) - 1340 kHz – Milwaukee, OH



Summary of Input Data: WJYI(AM) Frequency: 1.340 MHz
Horizontal Input Power : .000 kW Vertical Input Power : 1.000 kW
Antenna Type: AM NON-D Vertical Element Type Number: 1
Height of observer above reference plane: 2.0 Meters

Element Data: Vertical Number of elements: 1
Distance from analysis reference point: .0 meters
Azimuth from analysis reference point: N .0 E
Height of tower above reference plane: 180.0 Degrees

Element Number	Distance From Center (wavelengths)	Relative Power	Relative Phase
1.	.00	1.000	.0

Calculated Results:

* - indicates computed value exceeds ANSI guideline.

Distance (meters)	Horizontal Polarization		Vertical Polarization		Total Power Density (mW/cm2)
	E2 Field (V2/m2)	H2 Field (A2/m2)	E2 Field (V2/m2)	H2 Field (A2/m2)	
1.00	0.	.0000	12087.	.0078	.9730
2.00	0.	.0000	9033.	.0056	.7126
3.00	0.	.0000	6423.	.0038	.4925
4.00	0.	.0000	4257.	.0023	.3127
5.00	0.	.0000	2535.	.0012	.1732
6.00	0.	.0000	1966.	.0009	.1345
7.00	0.	.0000	1469.	.0007	.1007
8.00	0.	.0000	1044.	.0005	.0718
9.00	0.	.0000	691.	.0003	.0477
10.00	0.	.0000	411.	.0002	.0286
11.00	0.	.0000	354.	.0002	.0257
12.00	0.	.0000	302.	.0002	.0230
13.00	0.	.0000	253.	.0002	.0204
14.00	0.	.0000	209.	.0002	.0179
15.00	0.	.0000	169.	.0001	.0156
16.00	0.	.0000	150.	.0001	.0146
17.00	0.	.0000	132.	.0001	.0137
18.00	0.	.0000	115.	.0001	.0128
19.00	0.	.0000	100.	.0001	.0118
20.00	0.	.0000	86.	.0001	.0109
21.00	0.	.0000	78.	.0001	.0104
22.00	0.	.0000	71.	.0001	.0098
23.00	0.	.0000	64.	.0001	.0093
24.00	0.	.0000	57.	.0001	.0087
25.00	0.	.0000	51.	.0001	.0082

MUNN-REESE, INC.

Broadcast Engineering Consultants
Coldwater, MI 49036