

# ENGINEERING REPORT

## -14 dBc Digital Notification(s) Radio Frequency (RF) Protection Study

WOXL-FM - Biltmore Forest, NC  
Facility ID No. 37242  
(Analog & HD/IBOC)

WTMT(FM) - Weaverville, NC  
Facility ID No. 72070  
(Analog & HD/IBOC)

**September, 2016**

### **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.

September 26, 2016

385 Airport Drive, PO Box 220  
Coldwater, Michigan 49036

Telephone: 517-278-7339

By

  
Justin W. Asher, Project Engineer



# Form 335-FM Digital Notification

## Compliance with Radiofrequency Radiation Guidelines

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The potential for human exposure to non-ionizing radiofrequency radiation at the proposed transmitter site has been evaluated for compliance with the FCC's guidelines concerning human exposure to radiofrequency radiation. The standards employed are detailed in OET Bulletin No. 65 (Edition 97-01). There are multiple known FM or DTV facilities broadcasting within 315 meters of the shared transmitter site which operate with a power greater than 99 watts ERP.

The WOXL-FM - Biltmore Forest, NC analog FM station (Facility ID: 37242) operates on CH243C2 (96.5 MHz) with 9.5 kW ERP circular polarization (H&V). The FM facility broadcasts from an antenna COR mounted 54 meters above ground level (AGL). The FM facility operates with a three bay, Shively (SHI) Model 6014-3/3-0.5-SS, "Three Face Panel" antenna employing EPA Type 1 approved elements as defined by FM Model - Appendix B issued March 31, 2016. The elements are spaced one half (0.5) wavelength ( $\lambda$ ) apart. The WOXL-FM HD/IBOC facility operates on CH243C2 (96.5 MHz) with -14 dBc power or 0.380 kW ERP circular polarization (H&V) (or  $\text{Log}[0.04]*10 = -14$  dBc). The HD/IBOC facility broadcasts a diplexed signal from the main antenna mounted 54 meters above ground level (AGL). Therefore, the sum contribution for this facility consists of the analog and HD/IBOC operations or 9.880 kW ERP circular polarization for the WOXL-FM contribution.

The WTMT(FM) - Weaverville, NC analog FM station (Facility ID: 72070) operates on CH290C2 (105.9 MHz) with 9.5 kW ERP circular polarization (H&V). The FM facility broadcasts from an antenna COR mounted 54 meters above ground level (AGL). The FM facility operates with a three bay, Shively (SHI) Model 6014-3/3-0.5-SS, "Three Face Panel" antenna employing EPA Type 1 approved elements as defined by FM Model - Appendix B issued March 31, 2016. The elements are spaced one half (0.5) wavelength ( $\lambda$ ) apart. The WTMT(FM) HD/IBOC facility operates on CH290C2 (105.9 MHz) with -14 dBc power or 0.380 kW ERP circular polarization (H&V) (or  $\text{Log}[0.04]*10 = -14$  dBc). The HD/IBOC facility broadcasts a diplexed signal from the main antenna mounted 54 meters above ground level (AGL). Therefore, the sum contribution for this facility consists of the analog and HD/IBOC operations or 9.880 kW ERP circular polarization for the WTMT(FM) contribution.

The W220CD - Enka, NC analog FM Translator (Facility ID: 90071) operates on CH220D (91.9 MHz) with 0.010 kW ERP circular polarization (H&V). The Translator broadcasts with an antenna COR mounted 41 meters above ground level (AGL). The facility operates into a one (1) bay, SWR FMEC-1 "Opposed V Dipole" antenna employing an EPA Type 2 approved element as defined by *FM Model - Appendix B* issued March 31, 2016. The element is spaced one (1) wavelength ( $\lambda$ ) apart. This Translator will not operate with HD/IBOC facilities at this time.

The W247BV - Asheville, NC analog FM Translator (Facility ID: 141108) operates on CH247D (97.3 MHz) with 0.099 kW ERP vertical only polarization (V). The Translator broadcasts with an antenna COR mounted 18 meters above ground level (AGL). The facility operates into a one (1) bay, Scala (SCA) CL-FM "Log Periodic" antenna employing an EPA Type 1 approved element as defined by *FM Model - Appendix B* issued March 31, 2016. The element is spaced one (1) wavelength ( $\lambda$ ) apart. This Translator will not operate with HD/IBOC facilities at this time.

The W251AO - Asheville, NC analog FM Translator (Facility ID: 137991) operates on CH251D (98.1 MHz) with 0.250 kW ERP circular polarization (H&V). The Translator broadcasts with an antenna COR mounted 24 meters above ground level (AGL). The facility operates into a one (1) bay, Scala (SCA) CL-FM(Slant45) "Log Periodic" antenna employing an EPA Type 1 approved element as defined by *FM Model - Appendix B* issued March 31, 2016. The element is spaced one (1) wavelength ( $\lambda$ ) apart. This Translator will not operate with HD/IBOC facilities at this time.

The W258CA - West Asheville, NC analog FM Translator (Facility ID: 147817) operates on CH258D (99.5 MHz) with 0.010 kW ERP circular polarization (H&V). The Translator broadcasts with an antenna COR mounted 9 meters above ground level (AGL). The facility operates into a one (1) bay, Dielectric (DIE) DCR-L1 antenna employing an EPA Type 1 approved element as defined by *FM Model - Appendix B* issued March 31, 2016. The element is spaced one (1) wavelength ( $\lambda$ ) apart. This Translator will not operate with HD/IBOC facilities at this time.

The W288CQ - Asheville, NC analog FM Translator (Facility ID: 155786) operates on CH288D (105.5 MHz) with 0.250 kW ERP circular polarization (H&V). The Translator broadcasts with an antenna COR mounted 24 meters above ground level (AGL). The facility operates into a one (1) bay, Nicom (NIC) BKY3/P-1DA(Slant45) "Yagi" antenna employing an EPA Type 1 approved element as defined by *FM Model - Appendix B* issued March 31, 2016. The element is spaced one (1) wavelength ( $\lambda$ ) apart. This Translator will not operate with HD/IBOC facilities at this time.

# Form 335-FM Digital Notification

## Compliance with Radiofrequency Radiation Guidelines

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The WLFA(FM) - Asheville, NC analog facility (Facility ID: 2922) operates on CH217A (91.3 MHz) with 0.440 kW ERP circular polarization (H&V). The facility broadcasts with an antenna COR mounted 8 meters above ground level (AGL). No antenna make and model could be located, therefore a worst case one bay EPA Type 1 element as defined by *FM Model - Appendix B* issued March 31, 2016 was employed for the purpose of this study. This facility will not operate with HD/IBOC facilities at this time. It was noted that the WLFA(FM) contribution exceeds the uncontrolled limit guidelines by itself. It was also noted that WLFA(FM) specifies operation from coordinates located 0.061 km (61 meters) away from this WOXL-FM proposal. *Therefore, for purposes of this study, the WLFA(FM) contribution has been analyzed at the 61 meter mark; or the WLFA(FM) contribution at the base of the WOXL-FM tower.*

The W41BQ.L - Asheville, NC, CH41-T (File No. BLTTL-19950626IG) facility specifies analog operation on TV Channel 41-T with a maximum effective radiated power (ERP) of 37.2 kW horizontal only polarization with a COR mounted 30 meters AGL. The operational antenna is listed as an Andrew ALP16L2-HSMR. Based on manufacturer's data, an aural power of 22% at a 0.3 field has been assumed. This W41BQ.L - Asheville, NC, CH41-T (File No. BLTTL-19950626IG) contribution has been calculated to be the greater of the W41BQ facilities contributions, therefore this contribution has been used as the worst cast W41BQ facility contribution. (See individual W41BQ facilities studies at the end of this report.)

The W41BQ.C - Asheville, NC, CH04-LD (File No. BDISDVL-20091015AAC) facility specifies digital operation on TV Channel 04-T with a maximum effective radiated power (ERP) of 0.3 kW horizontal only polarization with a COR mounted 30 meters AGL. The operational antenna is listed as a Scala DRV Panel Antenna. Based on manufacturer's data, a full 1.0 field has been assumed. This W41BQ.C - Asheville, NC, CH04-LD (File No. BDISDVL-20091015AAC) contribution has been calculated to be the lesser of the W41BQ facilities contributions, therefore this contribution has been omitted in favor of the worst cast W41BQ facility contribution. (See individual W41BQ facilities studies at the end of this report.)

The W41BQ.C - Asheville, NC, CH22-LD (File No. BDISDTL-20120119ABD) facility specifies digital operation on TV Channel 022-T with a maximum effective radiated power (ERP) of 2.5 kW horizontal only polarization with a COR mounted 30 meters AGL. The operational antenna is listed as a Jampro JASS-LOBE-22 Antenna. Based on manufacturer's data, a full 1.0 field has been assumed. This W41BQ.C - Asheville, NC, CH22-LD (File No. BDISDTL-20120119ABD) ALP16L2-HSMR

FCC supplied software was used to determine the individual contribution of each FM station. The current *FM Model* web-based software application employs the standards as detailed in OET Bulletin No. 65 (Edition 97-01). FM radiofrequency radiation levels have been predicted using both the array pattern, the calculations of which are based on the number of bays in the antenna and wavelength spacing between the bays, and the element pattern. The element pattern has been determined by using measured element data prepared by the EPA and published in "An Engineering Assessment of the Potential Impact of Federal Radiation Protection Guidance on the AM, FM and TV Services," by Paul C. Gailey and Richard Tell - April 1985, U.S. Environmental Protection Agency. The results of the evaluation for the FM station have been shown at the end of this RF compliance discussion. Unless otherwise stated, the maximum FM contribution has been assumed without regard to distance from the tower.

Equation 10 of OET Bulletin No. 65 was used to determine the individual contribution of each DTV station. Equation 10 predicts the potential exposure to radiofrequency radiation for human observers on the ground as indicated by total power density expressed in units of  $\mu\text{W}/\text{cm}^2$ . Equation 10 uses vertical plane pattern data from the manufacturer including relative field values throughout the range of depression angles that would place an observer within 315 meters of the tower.

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.

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## Compliance with Radiofrequency Radiation Guidelines

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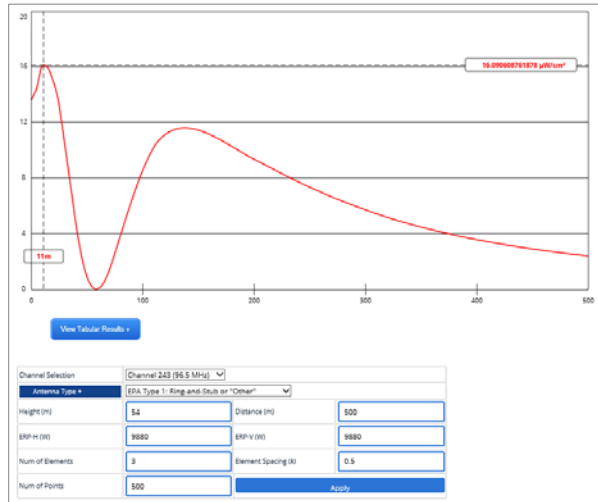
<u>Contributing Station</u>	<u>Maximum Contribution</u>	<u>Uncontrolled Environment Limit</u>	<u>Decimal Fraction of Limit</u>
WOXL-FM (analog & HD/IBOC)	16.0906 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.08045
WTMT(FM)(analog & HD/IBOC)	16.0818 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.08041
W220CD (analog)	0.1209 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.00006
W247BV (analog)	12.3096 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.06155
W251AO (analog)	20.7702 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.10385
W258CA (analog)	8.2028 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.04101
W288CQ (analog)	20.7702 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.10385
WLFA(FM) (analog)	7.7000 $\mu\text{W}/\text{cm}^2$	200 $\mu\text{W}/\text{cm}^2$	0.03850
W41BQ (analog TV)	165.4189 $\mu\text{W}/\text{cm}^2$	423 $\mu\text{W}/\text{cm}^2$	<u>0.39106</u>
<b>Total Decimal Fraction:</b>			<b>0.90074</b>

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.

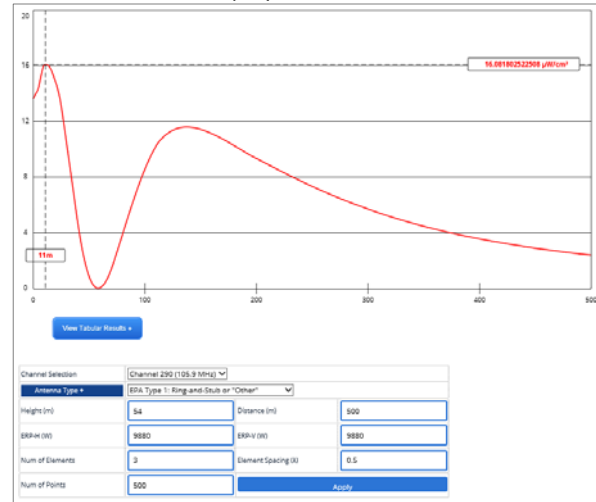
In the event work would be required in proximity to the antenna such that the person or persons working in the area would be potentially exposed to fields in excess of FCC guidelines, an agreement, signed by all broadcast parties at the site, is in effect for the offending transmitter(s) to reduce power,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

# Form 335-FM Digital Notification Compliance with Radiofrequency Radiation Guidelines

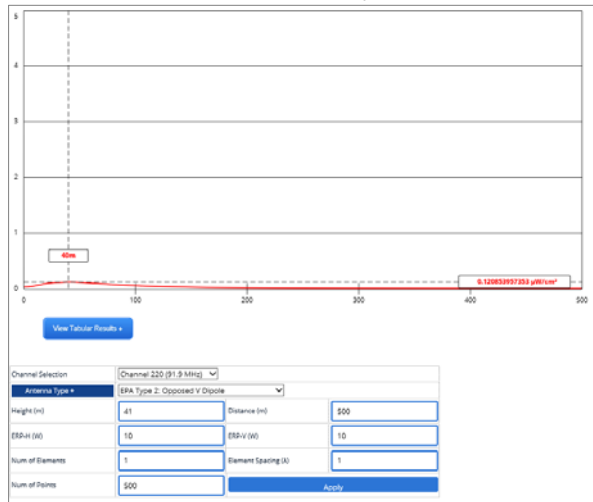
PLOT OF TOTAL POWER DENSITY FOR  
WOXL-FM - Biltmore Forest, NC



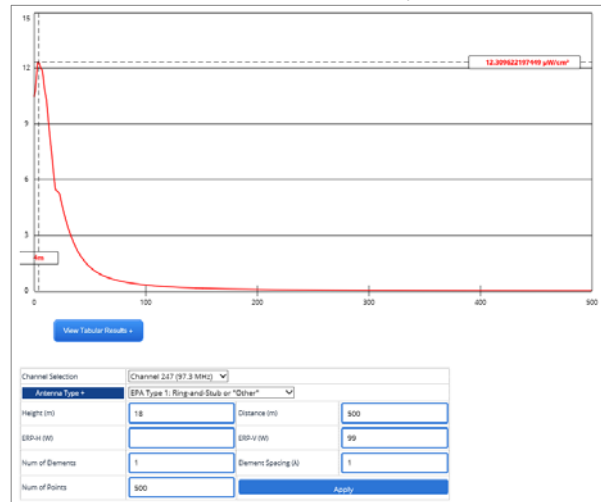
PLOT OF TOTAL POWER DENSITY FOR  
WTMT(FM) - Weaverville, NC



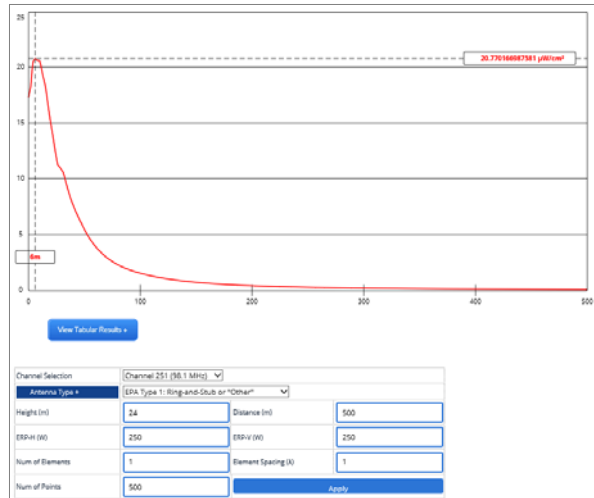
PLOT OF TOTAL POWER DENSITY FOR  
W220CD - Enka, NC



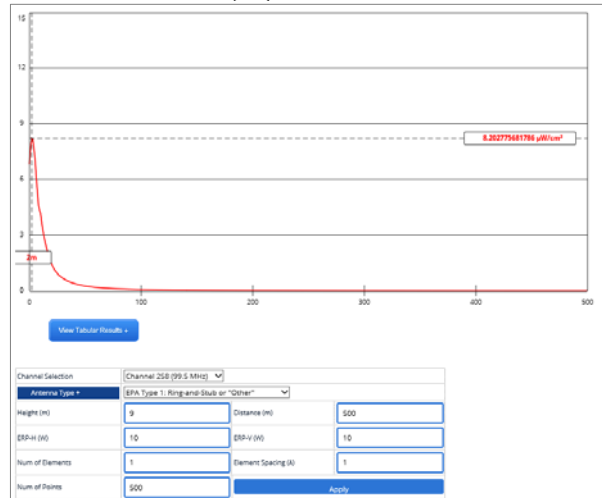
PLOT OF TOTAL POWER DENSITY FOR  
W247BV - Asheville, NC



PLOT OF TOTAL POWER DENSITY FOR  
W251AO - Asheville, NC



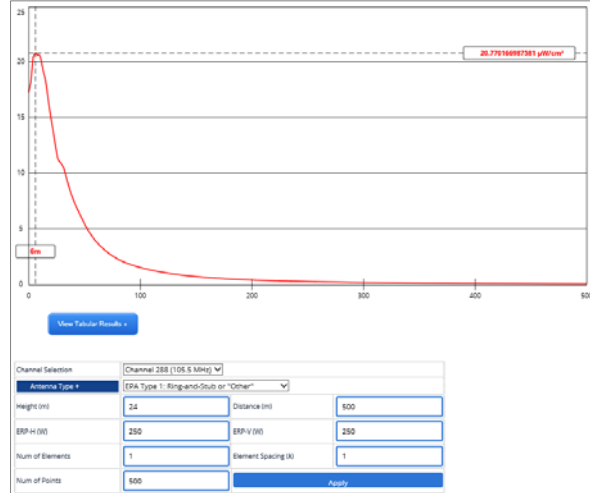
PLOT OF TOTAL POWER DENSITY FOR  
W258CA(FM) - West Asheville, NC



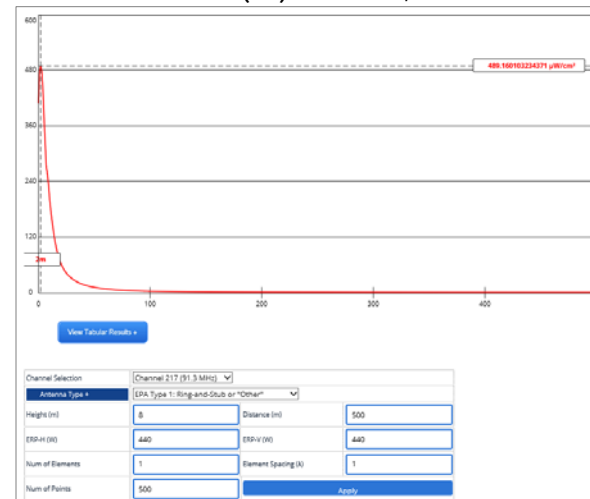
# Form 335-FM Digital Notification

## Compliance with Radiofrequency Radiation Guidelines

PLOT OF TOTAL POWER DENSITY FOR  
W288CQ - Asheville, NC



PLOT OF TOTAL POWER DENSITY FOR  
WLFA(FM) - Asheville, NC



Distance (meter)	Pwr Dens. ( $\mu\text{W}/\text{cm}^2$ )	Distance (meter)	Pwr Dens. ( $\mu\text{W}/\text{cm}^2$ )	Distance (meter)	Pwr Dens. ( $\mu\text{W}/\text{cm}^2$ )	Distance (meter)	Pwr Dens. ( $\mu\text{W}/\text{cm}^2$ )	Distance (meter)	Pwr Dens. ( $\mu\text{W}/\text{cm}^2$ )
0	408.3	15	108.6	30	30.3	45	14.0	60	8.0
1	477.6	16	96.4	31	28.5	46	13.4	61	7.7
2	489.2	17	86.2	32	26.9	47	12.9	62	7.5
3	477.7	18	77.5	33	25.4	48	12.4	63	7.3
4	437.9	19	70.0	34	24.0	49	11.9	64	7.0
5	378.4	20	63.5	35	22.8	50	11.4	65	6.8
6	324.6	21	57.9	36	21.6	51	11.0	66	6.6
7	271.9	22	52.9	37	20.5	52	10.6	67	6.4
8	256.2	23	48.8	38	19.4	53	10.2	68	6.2
9	233.4	24	45.3	39	18.5	54	9.8	69	6.1
10	202.6	25	42.1	40	17.6	55	9.5	70	5.9
11	178.0	26	39.3	41	16.8	56	9.1	71	5.7
12	157.9	27	36.7	42	16.0	57	8.8	72	5.6
13	140.4	28	34.3	43	15.3	58	8.5	73	5.4
14	123.0	29	32.2	44	14.6	59	8.3	74	5.3

# Form 335-FM Digital Notification Compliance with Radiofrequency Radiation Guidelines

### CALCULATION OF TOTAL POWER DENSITY FOR W241BQ.L - Asheville, NC (BLTTL-19950626IG)

Equation 10 of OET Bulletin No. 65 can be used to predict the potential exposure to radiofrequency radiation for human observers on the ground as indicated by total power density expressed in units of  $\mu\text{W}/\text{cm}^2$ . Therefore, the TV contribution has been calculated using Equation 10 of OET Bulletin No. 65. Equation 10 uses vertical plane pattern data from the manufacturer including relative field values throughout the range of depression angles that would place an observer within 315 meters of the tower. This equation states:

$$S = \frac{33.4 (F^2) ERP}{R^2}$$

where: S = Total Power Density in units of  $\mu W/cm^2$   
 F = Relative Field of Pattern  
 ERP = Effective Radiated Power in Watts  
 R = Distance in Meters

$$165.4 \mu W/cm^2 = \frac{(33.4)(0.3)^2(37,200 \text{ watts})}{[(28 - 2.0) \text{ meters}]^2}$$

A Summary of the RF Contribution is as follows. Additional manufacturers' antenna data will be supplied upon request

**Digital Channel:** 41T  
**Frequency Range:** 632 MHz - 638 MHz  
**Center Frequency:** 635 MHz  
**Antenna COR AGL:** 28 meters  
**ERP(Horizontal):** 37 kW  
**Antenna Manufacturer:** Andrew (AND)  
**Antenna Model:** ALP16L2-HSMR  
**Antenna Relative Field (worst case):** 0.3  
**Uncontrolled Limit:** 423  $\mu\text{W}/\text{cm}^2$   
**Equation 10 Contribution:** 165.4189  $\mu\text{W}/\text{cm}^2$   
**% Contribution of Uncontrolled Limit:** 39.0753%

### CALCULATION OF TOTAL POWER DENSITY FOR W241BQ.C - Asheville, NC (BDISDVL-20091015AAC)

Equation 10 of OET Bulletin No. 65 can be used to predict the potential exposure to radiofrequency radiation for human observers on the ground as indicated by total power density expressed in units of  $\mu\text{W}/\text{cm}^2$ . Therefore, the TV contribution has been calculated using Equation 10 of OET Bulletin No. 65. Equation 10 uses vertical plane pattern data from the manufacturer including relative field values throughout the range of depression angles that would place an observer within 315 meters of the tower. This equation states:

$$S = \frac{33.4 (F^2) ERP}{R^2}$$

where: S = Total Power Density in units of  $\mu W/cm^2$   
 F = Relative Field of Pattern  
 ERP = Effective Radiated Power in Watts  
 R = Distance in Meters

A Summary of the RF Contribution is as follows. Additional manufacturers' antenna data will be supplied upon request

**Digital Channel:** 4DT  
**Frequency Range:** 66 MHz - 72 MHz  
**Center Frequency:** 69 MHz  
**Antenna COR AGL:** 30 meters  
**ERP(Horizontal):** 0.3 kW  
**Antenna Manufacturer:** Scala (SCA)  
**Antenna Model:** DRV Panel Antenna  
**Antenna Relative Field (worstcase):** 1.0  
**Uncontrolled Limit:** 46  $\mu\text{W}/\text{cm}^2$   
**Equation 10 Contribution:** 12.7806  $\mu\text{W}/\text{cm}^2$   
**% Contribution of Uncontrolled Limit:** 27.7839%

# Form 335-FM Digital Notification Compliance with Radiofrequency Radiation Guidelines

## CALCULATION OF TOTAL POWER DENSITY FOR W241BQ.C - Asheville, NC (BDISDTL-20120119ABD)

Equation 10 of OET Bulletin No. 65 can be used to predict the potential exposure to radiofrequency radiation for human observers on the ground as indicated by total power density expressed in units of  $\mu\text{W}/\text{cm}^2$ . Therefore, the TV contribution has been calculated using Equation 10 of OET Bulletin No. 65. Equation 10 uses vertical plane pattern data from the manufacturer including relative field values throughout the range of depression angles that would place an observer within 315 meters of the tower. This equation states:

or

$$S = \frac{33.4 (F^2) ERP}{R^2}$$

$$106.5 \mu W/cm^2 = \frac{(33.4)(1.0)^2(2,500 \text{ watts})}{[(30 - 2.0) \text{ meters}]^2}$$

where: S = Total Power Density in units of  $\mu W/cm^2$   
 F = Relative Field of Pattern  
 ERP = Effective Radiated Power in Watts  
 R = Distance in Meters

A Summary of the RF Contribution is as follows. Additional manufacturers' antenna data will be supplied upon request

**Digital Channel:** 22DT  
**Frequency Range:** 518 MHz - 524 MHz  
**Center Frequency:** 521 MHz  
**Antenna COR AGL:** 30 meters  
**ERP(Horizontal):** 3 kW  
**Antenna Manufacturer:** Jampro (JAM)  
**Antenna Model:** JASS-LOBE-22  
**Antenna Relative Field (worst case):** 1.0  
**Uncontrolled Limit:** 347  $\mu\text{W}/\text{cm}^2$   
**Equation 10 Contribution:** 106.5051  $\mu\text{W}/\text{cm}^2$   
**% Contribution of Uncontrolled Limit:** 30.6637%