

**TECHNICAL STATEMENT
AUXILIARY ANTENNA AUTHORIZATION
WTIU 360kW (H) 177.5kW (V) ERP 153M HAAT CH. 33
BLOOMINGTON, INDIANA**

INTRODUCTION

The Trustees of Indiana University (the “Applicant”), licensee of digital television station WTIU, Facility ID No. 66536, request authority to operate an auxiliary antenna in connection with WTIU’s post-auction channel assignment. WTIU is a reassigned station that is scheduled to cut over to Channel 33 in Phase 6. Although the Applicant intends to complete this change in channel by the end of the designated testing period, it will be necessary for WTIU to utilize the proposed auxiliary antenna to help facilitate the transition on schedule.¹ The technical operating parameters for the proposed auxiliary facility are described in detail below.

AUXILIARY ANTENNA AND OPERATING PARAMETERS

As stated above, the proposed auxiliary antenna will enable WTIU to commence operations on Channel 33 by the Phase 6 deadline. The antenna to be employed is an elliptically polarized directional ERI Model i230ECW-16-14/33 with 1.0 degrees electrical beam tilt. This auxiliary antenna will be designed to operate such that the horizontally polarized effective radiated power (ERP) will be 360 kW and the vertically polarized ERP will be 177.5 kW. A composite of the horizontal and vertical azimuth patterns are shown in Figure 1.

The height of the antenna radiation center will be 125.0 meters above ground level (AGL) or 370.7 meters above mean sea level (AMSL).² The resulting height above average terrain (HAAT) will be 153 meters. Because the technical parameters for the proposed auxiliary antenna are less than the associated main facility authorization, the auxiliary service

¹ The Phase 6 testing period ends October 18, 2019.

² Antenna Structure Registration No. 1234684 specifies a site elevation of 245.7 meters AMSL.



contour will not extend beyond the main contour in any direction as the contour map of Figure 2 demonstrates.³ Accordingly, this application complies with the no contour extension requirement in 47 C.F.R. Section 73.1675(a).

A copy of the *TVStudy* analysis summary is provided in Figure 3. This summary indicates that no interference check failures were found and therefore the proposal is not predicted to cause new interference beyond the normal tolerance to any other post-auction full-service or Class A TV stations.⁴ This analysis was performed using the following permissible OET-69 settings:

Study cell size:	2.0 kilometer
Profile point spacing:	1.0 kilometer

ENVIRONMENTAL IMPACT

This application specifies an existing FCC registered structure that is exempt from Section 106 review.⁵ Because the proposed antenna collocation does not result in a substantial increase in the size of the existing antenna-supporting structure, the criteria outlined in 47 CFR § 1.1307(a) for certain types of facilities that may significantly affect the environment do not apply.⁶ With regard to the rules for limiting human exposure to radio-frequency (RF) energy in

³ WTIU's main facility is authorized to operate post-auction on Channel 33 with a maximum ERP of 797 kW at a radiation center height above mean sea level (AMSL) of 436.8 meters. The authorized site coordinates are 39-08-31.0 N, 86-29-42.9 W (Antenna Structure Registration Number 1234684).

⁴ *TVStudy* Program, Version 2.2.5.

⁵ The existing antenna structure is the replacement tower for ASRN 1029007, which was constructed in 1969 and subsequently dismantled on September 29, 2002. The Nationwide Programmatic Agreement permits tower replacements without NHPA Section 106 review so long as the original tower was constructed on or before March 16, 2001. This provision is spelled out in the Commission's Report & Order in WT Docket 03-128 (FCC 04-222), Paragraph 46, "Thus, it serves the public interest to allow such replacements without review for towers constructed on or before March 16, 2001". Accordingly, the replacement tower that was built on August 14, 2002 is excluded from Section 106 review. Because the replacement of the original antenna structure also did not involve a substantial increase in size as defined in 47 CFR Part 1, App. B, § 1.C, an Environment Assessment concerning the protection of migratory birds was not required. See the note to 47 CFR § 1.1307(d).

⁶ 47 CFR Part 1, App. B, § 1.C. A substantial increase in size means: "(1) The mounting of the proposed antenna on the tower would increase the existing height of the tower by more than 10%, or by the height of one additional antenna array with separation from the nearest existing antenna not to exceed twenty feet, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to avoid interference with existing antennas; or (2) The mounting of the proposed antenna would involve the installation of more than the standard number of new



47 CFR § 1.1307(b), this application seeks authority to operate a television broadcast antenna in full compliance with those guidelines as described in detail below.

Using the methodology for predicting power density levels for television broadcast antennas outlined in *FCC OET Bulletin No. 65, Edition 97-01*, (OET-65), the proposed facility is calculated to produce a maximum power density of $43.8 \mu\text{W}/\text{cm}^2$ at points 2 meters above ground (approximate human head height). This maximum ground-level exposure value was predicted at a horizontal distance of 146 meters from the tower base. In addition to the tabulation of antenna relative field values provided in [Figure 4](#), the following parameters were used to calculate the above worst-case exposure level:

Frequency :	584 - 590 MHz (UHF Channel 33)
Effective Radiated Power:	360 kW (H); 177.5 kW (V)
Antenna Type:	ERI Model i230ECW-16-14/33
Antenna Polarization:	Elliptical
Antenna Height:	125.0 meters AGL
Location coordinates:	39-08-31.0 N, 86-29-42.9 W (NAD83)
Site elevation:	245.7 meters AMSL
Overall tower height:	196.9 meters AGL
FCC ASRN:	1234684; Replacement tower constructed 8/14/2002

The maximum exposure limits applicable to Channel 33, as determined in accordance with 47 CFR § 1.1310 for uncontrolled and controlled environments, are $389 \mu\text{W}/\text{cm}^2$ and $1,947 \mu\text{W}/\text{cm}^2$ respectively. There are two other non-exempt broadcast facilities at the site, FM station WFIU Channel 103.7 MHz (Facility ID No. 68269) and FM Translator W270BH 101.9 MHz (Facility ID No. 150676). These stations are predicted to contribute to the ground-level exposure situation at the site as shown in [Figure 5](#).⁷ The exposure limits in the FM band are

equipment cabinets for the technology involved, not to exceed four, or more than one new equipment shelter; or (3) The mounting of the proposed antenna would involve adding an appurtenance to the body of the tower that would protrude from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to shelter the antenna from inclement weather or to connect the antenna to the tower via cable; or (4) The mounting of the proposed antenna would involve excavation outside the current tower site, defined as the current boundaries of the leased or owned property surrounding the tower and any access or utility easements currently related to the site.”

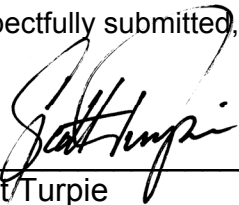
⁷ Power density vs distance for the proposed auxiliary antenna was determined in accordance with the methodology in OET-65 based on the relative field values tabulated in Figure 4. WFIU employs a Dielectric Model DCR-C8CRP antenna, which is an 8-bay EPA Type 4 radiator with 1.0 wavelength spacing. The power density contributions from this station were determined using the FM Model



200 $\mu\text{W}/\text{cm}^2$ for uncontrolled situations and 1,000 $\mu\text{W}/\text{cm}^2$ controlled. Because the combined effect is estimated to be less than 12 percent of the uncontrolled limit and not more than 5 percent of the controlled, no further showing of compliance is necessary. With regard to the transmitter site, standard techniques for controlling access to the antenna structure are in practice, which includes the use of fencing and warning signs. Accordingly, this application complies with the RF exposure limits and is categorically excluded from environmental processing by 47 CFR § 1.1306.

Preventative steps to limit exposure to persons authorized to access the transmitter site will be consistent with the appropriate recommendations in OET-65. Such steps shall include reducing power or shutting down the facility. In addition, the Applicant will coordinate all maintenance and other related work to be performed at elevations above ground level with other site users. The Applicant will also ensure that suitable signs are posted to establish awareness of the potential for exposure.

Respectfully submitted,



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October 14, 2019

Attachments:

- Figure 1 – Composite Azimuth Pattern
- Figure 2 – Main & Auxiliary Service Contours
- Figure 3 – TVStudy Analysis Summary
- Figure 4 – Antenna Elevation Pattern Tabulation
- Figure 5 – Co-located RF Sources – Ground-level Exposure

software. W270BH uses a 3-bay antenna with 0.75 wavelength spacing, PSI Model FML-3A 0.75WS. Contributions from this FM translator were calculated using a worst-case relative field value of 1.0 for all downward directions.

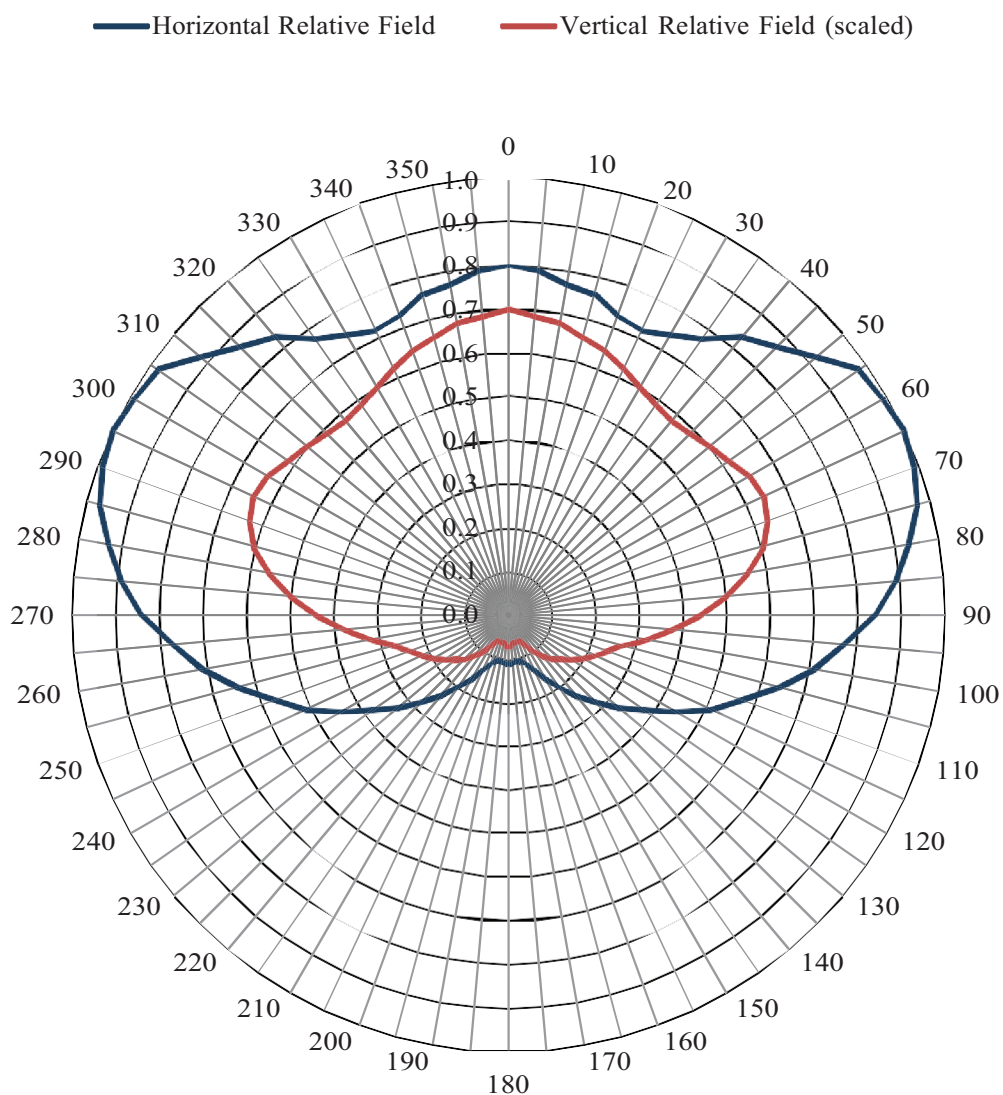
Composite Azimuth Patterns

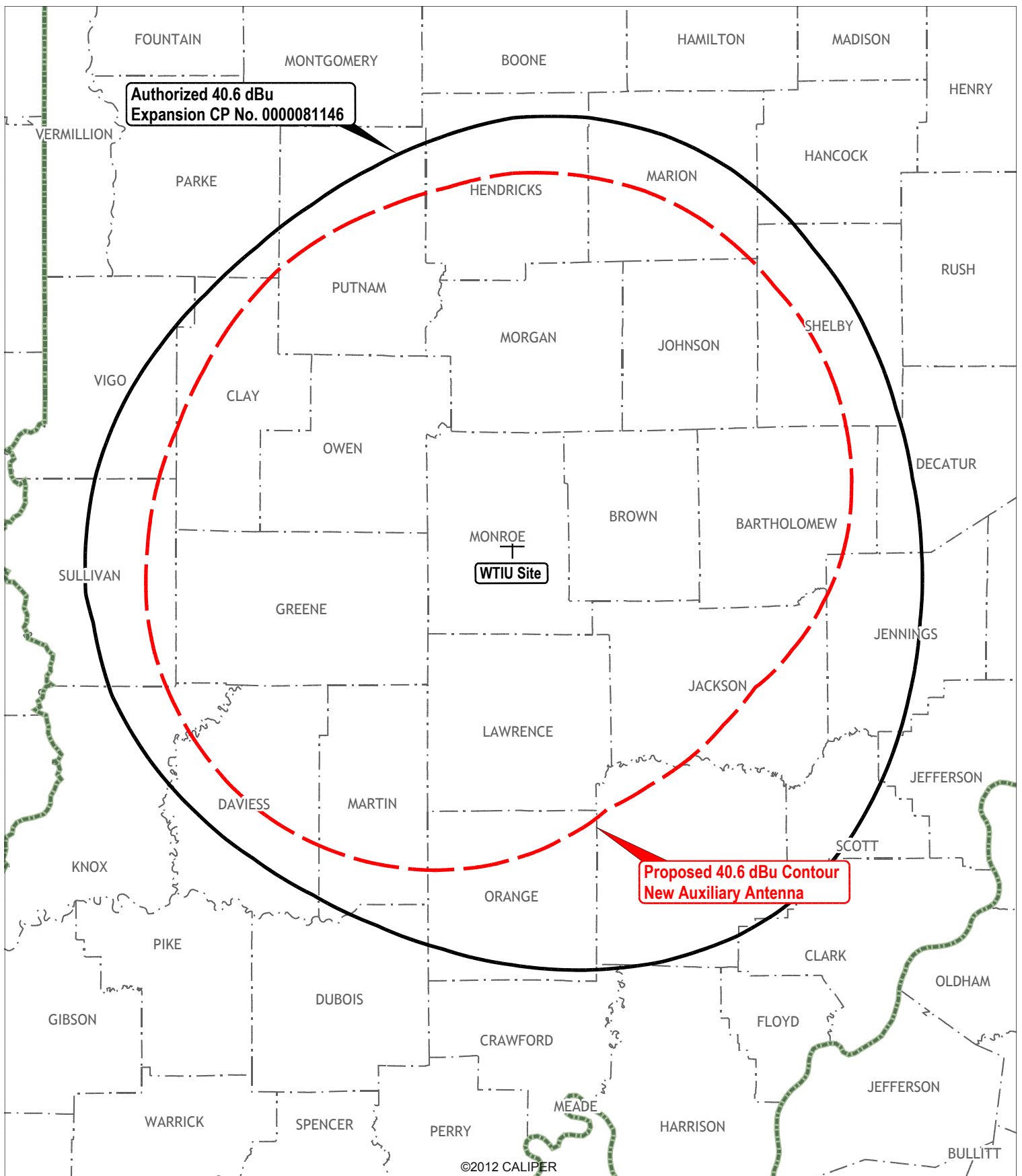
Type: i230W C-H-33 Polarization: Elliptical Directivity (H-Pol): 2.16 numeric (3.16 dB) Frequency: 33 (ATSC) Directivity (V-Pol): 2.37 numeric (3.67 dB) Location: WTIU

Percent Horizontal: 68.92% NOTE: Pattern shape and directivity may vary with channel and mounting

Percent Vertical: 31.08%

Power Ratio: 45.10%





Study created: 2019.10.14 21:33:00

Study build station data: LMS TV 2019-10-10

Proposal: WTIU D33 DT APP BLOOMINGTON, IN
 File number: WTIU33 AUX 20191012
 Facility ID: 66536
 Station data: User record
 Record ID: 577
 Country: U.S.
 Zone: I

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	WICD	D32	DT	LIC	CHAMPAIGN, IL	BLANK0000059351	159.3 km
No	WANE-TV	D32	DT	CP	FORT WAYNE, IN	BLANK0000034806	244.1
No	WANE-TV	D32	DT	BL	FORT WAYNE, IN	DTVBL39270	244.1
Yes	WDRB	D32	DT	CP	LOUISVILLE, KY	BLANK0000060325	104.3
Yes	WDRB	D32	DT	BL	LOUISVILLE, KY	DTVBL28476	104.3
No	WMAQ-TV	D33	DT	CP	CHICAGO, IL	BLANK0000080396	319.1
No	WMAQ-TV	D33	DT	BL	CHICAGO, IL	DTVBL47905	319.1
No	WAOE	D33	DT	BL	PEORIA, IL	DTVBL52280	308.4
No	WKHA	D33	DT	LIC	HAZARD, KY	BLANK0000075043	361.1
No	WKAR-TV	D33	DT	LIC	EAST LANSING, MI	BLANK0000054990	432.6
No	WOKZ-CD	D33	DC	LIC	KALAMAZOO, MI	BLANK0000084116	357.9
No	WOKZ-CD	D33	DC	CP	KALAMAZOO, MI	BLANK0000027731	357.9
No	KTVI	D33	DT	CP	ST. LOUIS, MO	BLANK0000034468	342.4
No	KTVI	D33	DT	BL	ST. LOUIS, MO	DTVBL35693	342.4
Yes	WHIO-TV	D33	DT	CP	DAYTON, OH	BLANK0000025295	203.8
Yes	WHIO-TV	D33	DT	BL	DAYTON, OH	DTVBL41458	203.8
Yes	WPGD-TV	D33	DT	LIC	HENDERSONVILLE, TN	BMLCDT20131125BGF	320.5
No	WCIA	D34	DT	CP	CHAMPAIGN, IL	BLANK0000072063	198.7
No	WCIA	D34	DT	BL	CHAMPAIGN, IL	DTVBL42124	198.7
No	WSIL-TV	D34	DT	LIC	HARRISBURG, IL	BLCDT20080718AAR	267.8
No	WISE-TV	D34	DT	LIC	FORT WAYNE, IN	BLANK0000064330	244.7
Yes	WKMJ-TV	D34	DT	CP	LOUISVILLE, KY	BLANK0000034636	103.6
Yes	WKMJ-TV	D34	DT	BL	LOUISVILLE, KY	DTVBL34195	103.6
No	WKEF	D34	DT	CP	DAYTON, OH	BLANK0000034522	202.9
No	WKEF	D34	DT	BL	DAYTON, OH	DTVBL73155	202.9

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D33
 Latitude: 39 8 31.00 N (NAD83)
 Longitude: 86 29 42.90 W
 Height AMSL: 370.7 m
 HAAT: 152.7 m
 Peak ERP: 360 kw
 Antenna: ERI-i230ECW-16-14/33 320.0 deg
 Elev Pattn: Generic
 Elec Tilt: 1.00

40.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	248 kw	158.8 m	72.6 km
45.0	282	139.0	71.6
90.0	39.2	173.9	64.6
135.0	4.36	176.4	54.2
180.0	20.7	165.3	60.9
225.0	216	150.5	71.2
270.0	305	125.1	70.8
315.0	222	133.0	69.8

Distance to Canadian border: 418.7 km

Distance to Mexican border: 1710.3 km

Conditions at FCC monitoring station: Allegan MI
 Bearing: 6.5 degrees Distance: 387.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
 Bearing: 280.0 degrees Distance: 1603.9 km

Study cell size: 2.00 km
 Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%
 Maximum new IX to LPTV: 2.00%

---- Below is IX received by proposal WTIU33 AUX 20191012 ----

Proposal receives 10.52% interference from scenario 1
 Proposal receives 10.52% interference from scenario 2
 Proposal receives 10.52% interference from scenario 3
 Proposal receives 10.52% interference from scenario 4
 Proposal receives 10.47% interference from scenario 5
 Proposal receives 10.47% interference from scenario 6
 Proposal receives 10.47% interference from scenario 7
 Proposal receives 10.47% interference from scenario 8
 Proposal receives 10.52% interference from scenario 9
 Proposal receives 10.52% interference from scenario 10
 Proposal receives 10.52% interference from scenario 11
 Proposal receives 10.52% interference from scenario 12
 Proposal receives 10.47% interference from scenario 13
 Proposal receives 10.47% interference from scenario 14
 Proposal receives 10.47% interference from scenario 15
 Proposal receives 10.47% interference from scenario 16
 No IX check failures found.

Tabulated Data for Elevation Pattern

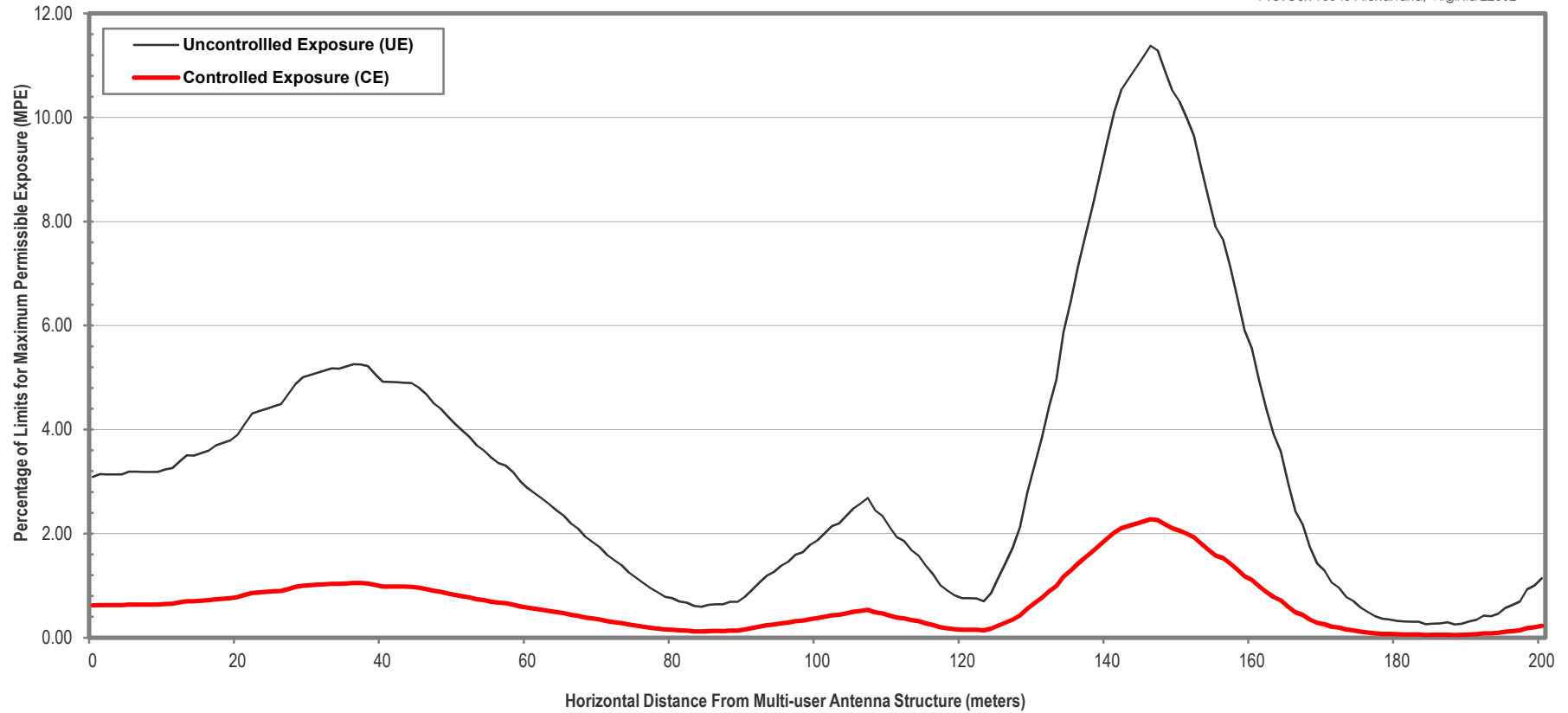
Type: i230W C-16-33

-5 to 10 degrees in 0.25 degree increments.

10 to 90 degrees in 0.50 degree increments.

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-10.00	0.120	-18.42	2.25	0.890	-1.01	19.00	0.070	-23.10	43.50	0.140	-17.08	68.00	0.040	-27.96
-9.75	0.115	-18.79	2.50	0.830	-1.62	19.50	0.040	-27.96	44.00	0.100	-20.00	68.50	0.050	-26.02
-9.50	0.110	-19.17	2.75	0.775	-2.21	20.00	0.020	-33.98	44.50	0.070	-23.10	69.00	0.050	-26.02
-9.25	0.100	-20.00	3.00	0.710	-2.97	20.50	0.050	-26.02	45.00	0.030	-30.46	69.50	0.050	-26.02
-9.00	0.090	-20.92	3.25	0.645	-3.81	21.00	0.080	-21.94	45.50	0.000	---	70.00	0.060	-24.44
-8.75	0.085	-21.41	3.50	0.560	-5.04	21.50	0.090	-20.92	46.00	0.030	-30.46	70.50	0.060	-24.44
-8.50	0.080	-21.94	3.75	0.485	-6.29	22.00	0.100	-20.00	46.50	0.050	-26.02	71.00	0.060	-24.44
-8.25	0.065	-23.74	4.00	0.400	-7.96	22.50	0.080	-21.94	47.00	0.070	-23.10	71.50	0.060	-24.44
-8.00	0.060	-24.44	4.25	0.320	-9.90	23.00	0.060	-24.44	47.50	0.080	-21.94	72.00	0.060	-24.44
-7.75	0.070	-23.10	4.50	0.230	-12.77	23.50	0.020	-33.98	48.00	0.090	-20.92	72.50	0.070	-23.10
-7.50	0.080	-21.94	4.75	0.145	-16.77	24.00	0.030	-30.46	48.50	0.100	-20.00	73.00	0.070	-23.10
-7.25	0.090	-20.92	5.00	0.060	-24.44	24.50	0.080	-21.94	49.00	0.110	-19.17	73.50	0.070	-23.10
-7.00	0.100	-20.00	5.25	0.015	-36.48	25.00	0.140	-17.08	49.50	0.110	-19.17	74.00	0.070	-23.10
-6.75	0.120	-18.42	5.50	0.090	-20.92	25.50	0.200	-13.98	50.00	0.100	-20.00	74.50	0.070	-23.10
-6.50	0.140	-17.08	5.75	0.145	-16.77	26.00	0.250	-12.04	50.50	0.100	-20.00	75.00	0.070	-23.10
-6.25	0.150	-16.48	6.00	0.210	-13.56	26.50	0.290	-10.75	51.00	0.090	-20.92	75.50	0.070	-23.10
-6.00	0.160	-15.92	6.25	0.270	-11.37	27.00	0.320	-9.90	51.50	0.090	-20.92	76.00	0.070	-23.10
-5.75	0.160	-15.92	6.50	0.310	-10.17	27.50	0.340	-9.37	52.00	0.080	-21.94	76.50	0.070	-23.10
-5.50	0.160	-15.92	6.75	0.350	-9.12	28.00	0.340	-9.37	52.50	0.070	-23.10	77.00	0.070	-23.10
-5.25	0.160	-15.92	7.00	0.380	-8.40	28.50	0.330	-9.63	53.00	0.070	-23.10	77.50	0.070	-23.10
-5.00	0.150	-16.48	7.25	0.405	-7.85	29.00	0.310	-10.17	53.50	0.060	-24.44	78.00	0.060	-24.44
-4.75	0.130	-17.72	7.50	0.410	-7.74	29.50	0.280	-11.06	54.00	0.050	-26.02	78.50	0.060	-24.44
-4.50	0.110	-19.17	7.75	0.420	-7.54	30.00	0.240	-12.40	54.50	0.050	-26.02	79.00	0.060	-24.44
-4.25	0.080	-21.94	8.00	0.410	-7.74	30.50	0.200	-13.98	55.00	0.040	-27.96	79.50	0.060	-24.44
-4.00	0.050	-26.02	8.25	0.405	-7.85	31.00	0.160	-15.92	55.50	0.040	-27.96	80.00	0.060	-24.44
-3.75	0.005	-46.02	8.50	0.390	-8.18	31.50	0.120	-18.42	56.00	0.030	-30.46	80.50	0.060	-24.44
-3.50	0.040	-27.96	8.75	0.365	-8.75	32.00	0.080	-21.94	56.50	0.030	-30.46	81.00	0.050	-26.02
-3.25	0.095	-20.45	9.00	0.340	-9.37	32.50	0.050	-26.02	57.00	0.020	-33.98	81.50	0.050	-26.02
-3.00	0.150	-16.48	9.25	0.305	-10.31	33.00	0.030	-30.46	57.50	0.020	-33.98	82.00	0.050	-26.02
-2.75	0.215	-13.35	9.50	0.270	-11.37	33.50	0.010	-40.00	58.00	0.010	-40.00	82.50	0.050	-26.02
-2.50	0.280	-11.06	9.75	0.235	-12.58	34.00	0.000	---	58.50	0.010	-40.00	83.00	0.050	-26.02
-2.25	0.345	-9.24	10.00	0.200	-13.98	34.50	0.020	-33.98	59.00	0.010	-40.00	83.50	0.050	-26.02
-2.00	0.420	-7.54	10.50	0.130	-17.72	35.00	0.040	-27.96	59.50	0.000	---	84.00	0.050	-26.02
-1.75	0.485	-6.29	11.00	0.070	-23.10	35.50	0.070	-23.10	60.00	0.000	---	84.50	0.050	-26.02
-1.50	0.560	-5.04	11.50	0.060	-24.44	36.00	0.100	-20.00	60.50	0.000	---	85.00	0.040	-27.96
-1.25	0.625	-4.08	12.00	0.050	-26.02	36.50	0.140	-17.08	61.00	0.000	---	85.50	0.040	-27.96
-1.00	0.700	-3.10	12.50	0.070	-23.10	37.00	0.180	-14.89	61.50	0.000	---	86.00	0.040	-27.96
-0.75	0.760	-2.38	13.00	0.070	-23.10	37.50	0.210	-13.56	62.00	0.000	---	86.50	0.040	-27.96
-0.50	0.820	-1.72	13.50	0.050	-26.02	38.00	0.240	-12.40	62.50	0.010	-40.00	87.00	0.040	-27.96
-0.25	0.870	-1.21	14.00	0.020	-33.98	38.50	0.260	-11.70	63.00	0.010	-40.00	87.50	0.040	-27.96
0.00	0.910	-0.82	14.50	0.020	-33.98	39.00	0.280	-11.06	63.50	0.010	-40.00	88.00	0.040	-27.96
0.25	0.945	-0.49	15.00	0.060	-24.44	39.50	0.290	-10.75	64.00	0.010	-40.00	88.50	0.040	-27.96
0.50	0.970	-0.26	15.50	0.100	-20.00	40.00	0.300	-10.46	64.50	0.010	-40.00	89.00	0.040	-27.96
0.75	0.990	-0.09	16.00	0.130	-17.72	40.50	0.290	-10.75	65.00	0.020	-33.98	89.50	0.040	-27.96
1.00	1.000	0.00	16.50	0.150	-16.48	41.00	0.280	-11.06	65.50	0.020	-33.98	90.00	0.040	-27.96
1.25	0.995	-0.04	17.00	0.160	-15.92	41.50	0.260	-11.70	66.00	0.020	-33.98			
1.50	0.980	-0.18	17.50	0.150	-16.48	42.00	0.230	-12.77	66.50	0.030	-30.46			
1.75	0.965	-0.31	18.00	0.140	-17.08	42.50	0.200	-13.98	67.00	0.030	-30.46			
2.00	0.930	-0.63	18.50	0.110	-19.17	43.00	0.170	-15.39	67.50	0.040	-27.96			

PREDICTED GROUND LEVEL EXPOSURE
(Pursuant to FCC OET Bulletin 65, ed. 97-01)



CO-LOCATED RF SOURCES				ANTENNA TYPES		FACILITIES		COMPLIANCE SUMMARY			
Call sign	City, State	Srv	Ch.	Make & Model or Equivalent	ERP H&V	RCAGL	UE Limit ($\mu\text{W}/\text{cm}^2$)	146.0 m Dist.	CE Limit ($\mu\text{W}/\text{cm}^2$)	146.0 m Dist.	
WTIU (Aux)	Bloomington, IN	DX	33	ERI i230ECW-16-14/33	537.5 kW	125.0 m	389	11.239%	1,947	2.248%	
WFIU	Bloomington, IN	FM	279	EPA Type 4 (8-bay, 1.0) FM-Model	58.0 kW	167.0 m	200	0.000%	1,000	0.000%	
W270BH	Bloomington, IN	FX	270	EPA Type 2 (3-bay, 3/4) Rel-Fld=1.0	0.326 kW	136.0 m	200	0.139%	1,000	0.028%	
All Users	Azimuthal Direction:	All					Worst Case UE:	11.378%	Worst Case CE:	2.276%	