

# ENGINEERING EXHIBIT

## Application for Digital Television Station Construction Permit

prepared for

**Kentucky Authority for Educational TV**  
WKPI-TV Pikeville, Kentucky  
Facility ID 34200  
Ch. 24 (Digital) 44.9 kW (MAX-DA) 433 m

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FCC Form 340, Section VII - DTV Engineering

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*This material supplies a "hard copy" of the engineering portions of this application as entered November 27, 2013 for filing electronically. Since the FCC's electronic filing system may be accessed by anyone with the applicant's name and password, and electronic data may otherwise be altered in an unauthorized fashion, we cannot be responsible for changes made subsequent to our entry of this data and related attachments.*

Exhibit 37 - Statement A  
**COMPREHENSIVE ENGINEERING STATEMENT**  
prepared for  
**Kentucky Authority for Educational TV**  
WKPI-TV Pikeville, Kentucky  
Facility ID 34200  
Ch. 24 (Digital) 44.9 kW (MAX-DA) 433 m

*Kentucky Authority for Educational TV* (“*KET*”) is the licensee of full service digital television station WKPI-TV, Channel 24, Pikeville, Kentucky, Facility ID 34200 (BLEDT-20020313ABL). *KET* herein proposes to modify the existing facility to replace the unused top-mounted analog television antenna with a new antenna utilizing the same tower and antenna pattern as the licensed digital facility. A reduction in operating power commensurate with an increase in antenna height is also proposed to avoid contour extension in compliance with the FCC’s *Public Notice*<sup>1</sup> Limitations on Full Power Modification Applications.

### **Nature of the Proposal**

The proposed replacement antenna system utilizes the same directional antenna pattern as the licensed WKPI-TV facility. The proposed antenna is a Dielectric model number TFU-20JTH-R S210 which will be top-mounted on an existing tower structure with the Antenna Structure Registration Number 1044045. As a result in the antenna change, the overall height of the tower will be reduced. The structure is located atop Flatwoods Mountain, is less than 200 feet in overall height above ground, and has no FAA marking or lighting requirements. The FCC ASR record will be updated to reflect the proposed change however it is believed no notification to the FAA is required for this modification.

The proposed digital facility will operate on Channel 24 with a maximum effective radiated power of 44.9 kW and an antenna height of 900.3 meters AMSL. **Exhibit 37 - Figure 1** depicts the dipole adjusted service contour of the proposed facilities. The proposed service contour is in essentially the same location as the existing licensed service contour; therefore the licensed contour is not shown on this coverage map. The attached **Exhibit 37 - Table I** compares the licensed and

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<sup>1</sup> See Public Notice *Media Bureau Announces Limitations on the Filing and Processing of Full Power and Class A Television Station Modification Applications, Effective Immediately, and Reminds Stations of Spectrum Act Preservation Mandate* (DA-13-618) released April 5, 2013 (“*Public Notice*”).

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**COMPREHENSIVE ENGINEERING STATEMENT**  
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proposed distances to contour showing there is no extension of the coverage in accordance with the *Public Notice*.

### **Allocation Considerations**

The instant proposal complies with the Commission's interference protection requirements toward all DTV, television translator, LPTV, and Class A stations. A detailed interference study was conducted in accordance with the terrain dependent Longley-Rice point-to-point propagation model, per the Commission's Office of Engineering and Technology Bulletin No. 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69").<sup>2</sup> The interference study examined the change in interference as experienced by nearby pertinent stations that would result from the proposed facility.

The interference study results, summarized in **Exhibit 37 - Table II**, show that any new interference does not exceed the Commission's interference limits (0.5 percent to full service and Class A stations, and 2.0 percent to secondary stations). Accordingly, the instant proposal complies with the FCC Rules regarding interference protection to analog and digital television, low power television, television translator, and Class A television facilities.

### **Other Allocation Considerations**

The nearest FCC monitoring station is at Powder Springs, GA, a distance of 429 km from the proposed site. This exceeds by a great margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The proposed site is also located outside the areas specified in §73.1030(a)(1). Thus, notification of the instant proposal to the National Radio Astronomy Observatory at Green Bank, West Virginia, is not required. There are no AM broadcast stations located within 3.2 km (2 miles) of the proposed site, according to information extracted from the Commission's engineering database.

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<sup>2</sup> The implementation of OET-69 for this study (*tv\_process*) followed the guidelines of OET-69 as specified therein. Comparisons of various results of this computer program (run on a Sun processor) to the Commission's implementation of OET-69 show excellent correlation.

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**Environmental Considerations**

The instant proposal is not believed to have a significant environmental impact as defined under §1.1306 of the Commission's Rules. Consequently, preparation of an Environmental Assessment is not required.

The use of existing tower structure has been characterized as being environmentally preferable by the Commission, according to Note 1 of §1.1306 of the FCC Rules. A reduction in overall structure height is proposed, however no change in current structure marking and lighting requirements is anticipated. Therefore, it is believed that this application may be categorically excluded from environmental processing pursuant to §1.1306 of the Commission's rules.

**Human Exposure to Radiofrequency Electromagnetic Field**

The proposed operation was evaluated for human exposure to radiofrequency electromagnetic field using the procedures outlined in the Commission's OET Bulletin 65 ("OET 65"). OET 65 describes a means of determining whether a proposed facility exceeds the radiofrequency exposure guidelines adopted in §1.1310. Under present Commission policy, a facility may be presumed to comply with the limits specified in §1.1310 if it satisfies the exposure criteria set forth in OET 65. Based upon that methodology, and as demonstrated in the following, the proposed transmitting system will comply with the cited adopted guidelines.

The proposed antenna center of radiation will be 36.8 meters above ground level. An effective radiated power of 44.9 kilowatts, horizontally polarized, will be employed utilizing a Dielectric model TFU-20JTH-R S210 directional antenna. According to information provided by the manufacturer, the "worst-case" relative field value from 15° to 90° below the horizontal is 12 percent. That value is used herein for purposes of the calculation. The "uncontrolled/general population" limit specified in §1.1310 for Channel 24 (center frequency 533 MHz) is 355.3  $\mu\text{W}/\text{cm}^2$ .

OET 65's formula for television transmitting antennas is based on the NTSC transmission standards, where the average power is normally much less than the peak power. For the DTV facility in the instant proposal, the peak-to-average ratio is different than the NTSC ratio. The DTV ERP

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figure herein refers to the average power level. The formula used for calculating DTV signal density in this analysis is essentially the same as equation (10) in OET 65.

$$S = (33.4098) (F^2) (ERP) / D^2$$

Where:

- S = power density in microwatts/cm<sup>2</sup>
- ERP = total (average) ERP in Watts
- F = relative field factor
- D = distance in meters

Using this formula and the above assumptions, the proposed facility would contribute a power density of 17.84  $\mu$ W/cm<sup>2</sup> at two meters above ground level near the antenna support structure, or 5.0 percent of the general population/uncontrolled limit.

§1.1307(b)(3) states that facilities are categorically excluded from responsibility for taking any corrective action in the areas where their contribution does not exceed five percent of the exposure limit. Since the instant situation meets the five percent exclusion test at all ground level areas, the impact of any other facilities near this site may be considered independently from this proposal. Accordingly, it is believed that the impact of the proposed operation should not be considered to be a factor at or near ground level as defined under §1.1307(b).

### **Safety of Tower Workers and the General Public**

As demonstrated herein, excessive levels of RF energy attributable to the proposal will not be caused at publicly accessible areas at ground level or near the base of the antenna supporting structure. Consequently, members of the general public will not be exposed to RF levels in excess of the Commission's guidelines. Nevertheless, tower access will be restricted and controlled through the use of a gated and locked fence. Additionally, appropriate RF exposure warning signs will be posted.

With respect to worker safety, it is believed that based on the preceding analysis, excessive exposure would not occur in areas at ground level or at the base of the top mounted tower structure. A site exposure policy will be employed protecting maintenance workers from excessive exposure

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protective measures may include, but will not be limited to, restriction of access to areas where levels in excess of the guidelines may be expected, power reduction, or the complete shutdown of facilities when work or inspections must be performed in areas where the exposure guidelines would otherwise be exceeded. On-site RF exposure measurements may also be undertaken to establish the bounds of safe working areas. The applicant will coordinate exposure procedures with all pertinent stations.

**Conclusion**

Based on the preceding, it is believed that the instant proposal complies with all Commission Rules and policies.

# EXHIBIT 37 - FIGURE 1 COVERAGE CONTOURS

prepared November 2013 for

## Kentucky Authority for Educational TV

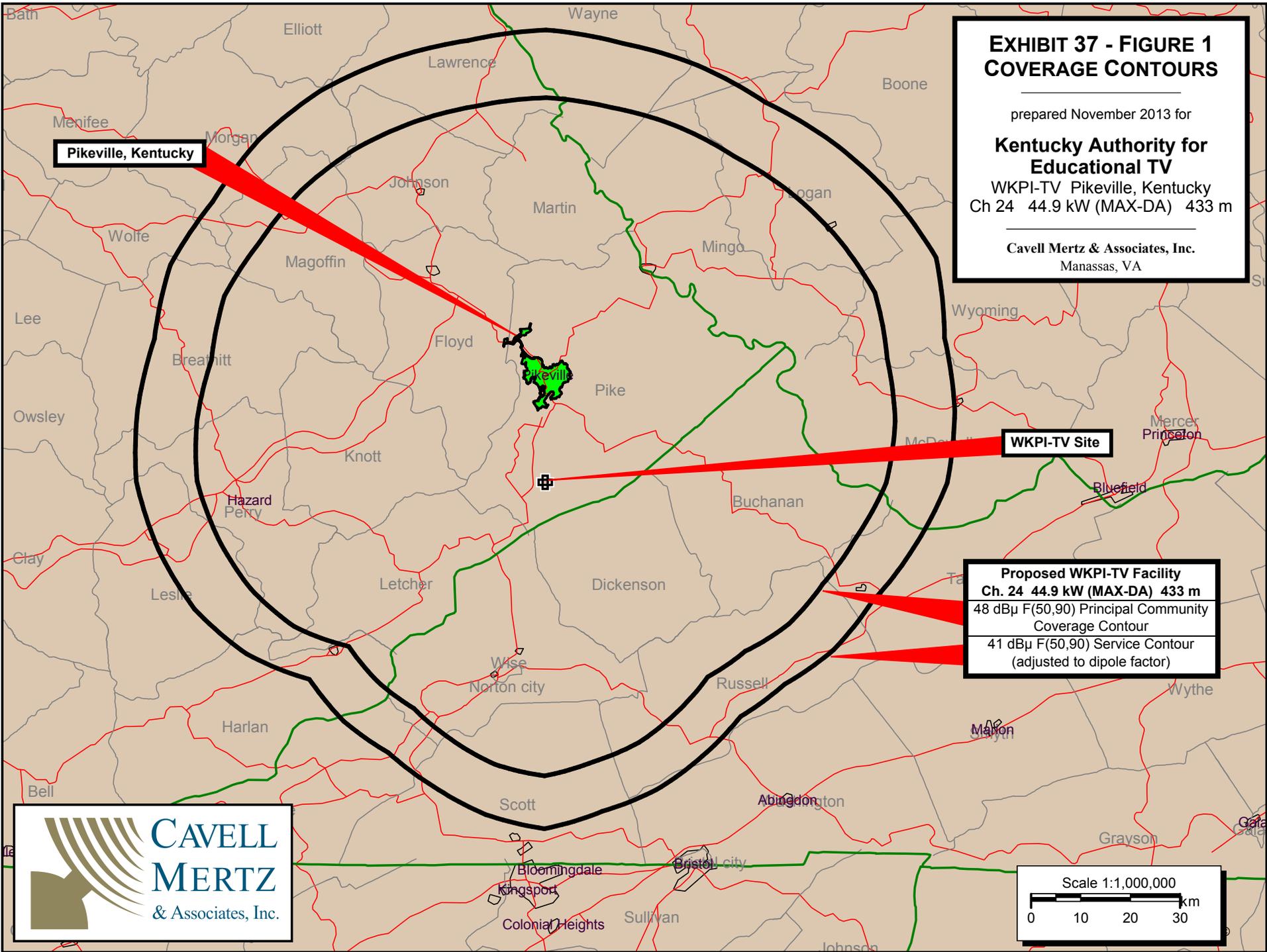
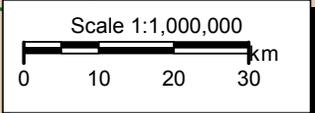
WKPI-TV Pikeville, Kentucky  
Ch 24 44.9 kW (MAX-DA) 433 m

Cavell Mertz & Associates, Inc.  
Manassas, VA

Pikeville, Kentucky

WKPI-TV Site

**Proposed WKPI-TV Facility**  
**Ch. 24 44.9 kW (MAX-DA) 433 m**  
48 dBμ F(50,90) Principal Community  
Coverage Contour  
41 dBμ F(50,90) Service Contour  
(adjusted to dipole factor)

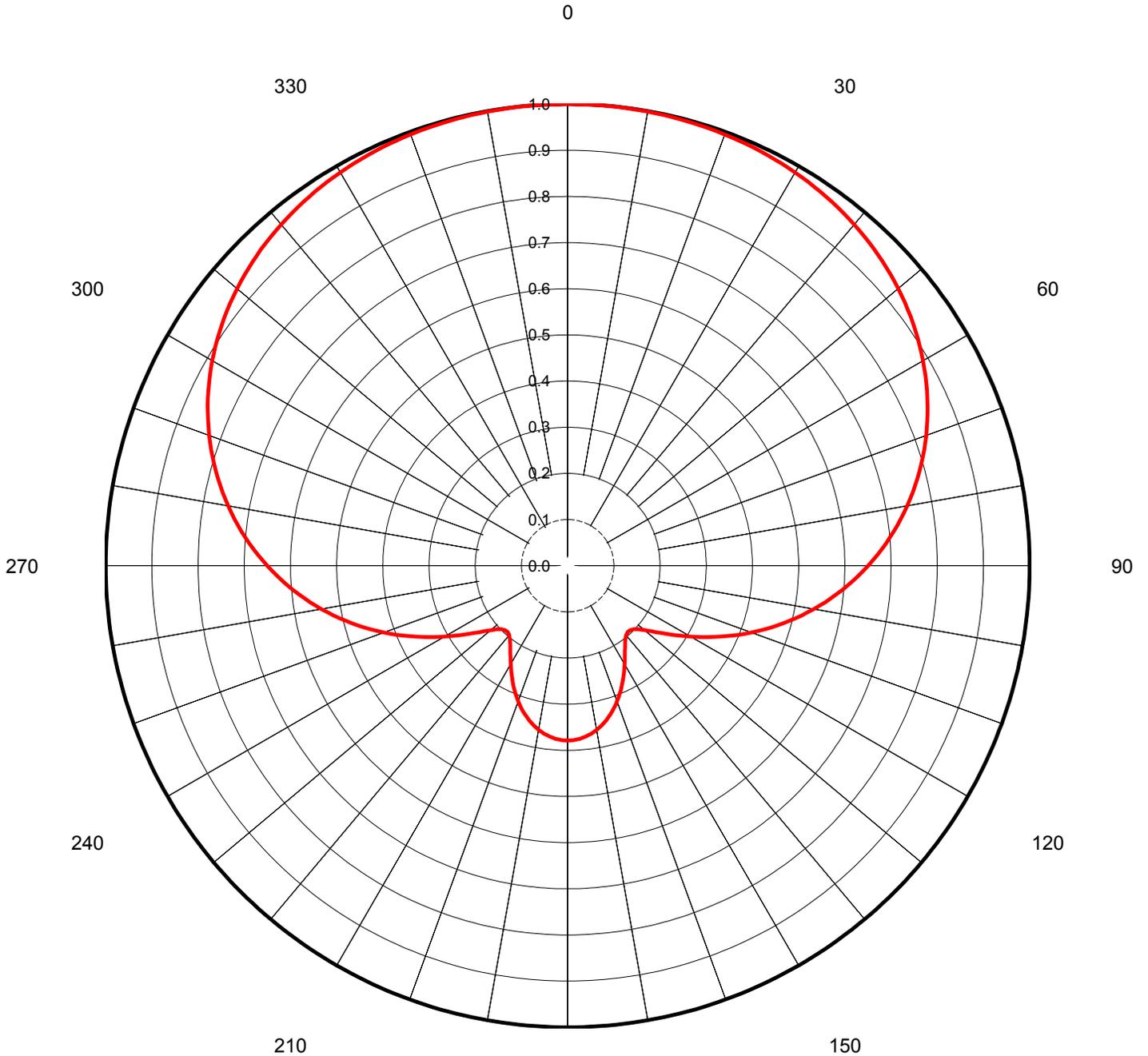


**EXHIBIT 37 - FIGURE 2  
ANTENNA RELATIVE FIELD PATTERN**

WKPI-TV Pikeville, Kentucky  
Ch 24 44.9 kW (MAX-DA) 433 m

**AZIMUTH PATTERN**

Gain	2.10	( 3.22 dB)	Frequency	533.00 MHz
Calculated / Measured		Calculated	Drawing #	TLP-C210SP-24



**TABULATION OF AZIMUTH PATTERN**

Azimuth Pattern Drawing #: TLP-C210SP-24

Angle	Field														
0	1.000	45	0.951	90	0.651	135	0.196	180	0.379	225	0.196	270	0.651	315	0.951
1	1.000	46	0.948	91	0.640	136	0.194	181	0.378	226	0.198	271	0.661	316	0.954
2	1.000	47	0.945	92	0.630	137	0.194	182	0.378	227	0.202	272	0.671	317	0.957
3	1.000	48	0.941	93	0.619	138	0.194	183	0.377	228	0.206	273	0.681	318	0.960
4	1.000	49	0.938	94	0.608	139	0.195	184	0.376	229	0.212	274	0.691	319	0.962
5	1.000	50	0.934	95	0.597	140	0.197	185	0.374	230	0.217	275	0.700	320	0.965
6	1.000	51	0.930	96	0.586	141	0.200	186	0.372	231	0.224	276	0.710	321	0.967
7	0.999	52	0.926	97	0.575	142	0.203	187	0.370	232	0.231	277	0.719	322	0.970
8	0.999	53	0.922	98	0.564	143	0.207	188	0.367	233	0.239	278	0.728	323	0.972
9	0.999	54	0.918	99	0.552	144	0.211	189	0.364	234	0.248	279	0.737	324	0.974
10	0.999	55	0.913	100	0.541	145	0.216	190	0.361	235	0.257	280	0.746	325	0.976
11	0.998	56	0.908	101	0.529	146	0.222	191	0.358	236	0.266	281	0.755	326	0.978
12	0.998	57	0.904	102	0.518	147	0.228	192	0.354	237	0.276	282	0.764	327	0.979
13	0.998	58	0.899	103	0.506	148	0.234	193	0.349	238	0.286	283	0.772	328	0.981
14	0.997	59	0.893	104	0.494	149	0.240	194	0.345	239	0.296	284	0.780	329	0.982
15	0.997	60	0.888	105	0.483	150	0.247	195	0.340	240	0.307	285	0.788	330	0.984
16	0.997	61	0.883	106	0.471	151	0.253	196	0.335	241	0.318	286	0.796	331	0.985
17	0.996	62	0.877	107	0.459	152	0.260	197	0.330	242	0.329	287	0.804	332	0.987
18	0.995	63	0.871	108	0.447	153	0.267	198	0.324	243	0.341	288	0.811	333	0.988
19	0.995	64	0.865	109	0.435	154	0.274	199	0.319	244	0.352	289	0.819	334	0.989
20	0.994	65	0.859	110	0.423	155	0.280	200	0.313	245	0.364	290	0.826	335	0.990
21	0.993	66	0.853	111	0.411	156	0.287	201	0.306	246	0.376	291	0.833	336	0.991
22	0.993	67	0.846	112	0.399	157	0.294	202	0.300	247	0.387	292	0.840	337	0.992
23	0.992	68	0.840	113	0.387	158	0.300	203	0.294	248	0.399	293	0.846	338	0.993
24	0.991	69	0.833	114	0.376	159	0.306	204	0.287	249	0.411	294	0.853	339	0.993
25	0.990	70	0.826	115	0.364	160	0.313	205	0.280	250	0.423	295	0.859	340	0.994
26	0.989	71	0.819	116	0.352	161	0.319	206	0.274	251	0.435	296	0.865	341	0.995
27	0.988	72	0.811	117	0.341	162	0.324	207	0.267	252	0.447	297	0.871	342	0.995
28	0.987	73	0.804	118	0.329	163	0.330	208	0.260	253	0.459	298	0.877	343	0.996
29	0.985	74	0.796	119	0.318	164	0.335	209	0.253	254	0.471	299	0.883	344	0.997
30	0.984	75	0.788	120	0.307	165	0.340	210	0.247	255	0.483	300	0.888	345	0.997
31	0.982	76	0.780	121	0.296	166	0.345	211	0.240	256	0.494	301	0.893	346	0.997
32	0.981	77	0.772	122	0.286	167	0.349	212	0.234	257	0.506	302	0.899	347	0.998
33	0.979	78	0.764	123	0.276	168	0.354	213	0.228	258	0.518	303	0.904	348	0.998
34	0.978	79	0.755	124	0.266	169	0.358	214	0.222	259	0.529	304	0.909	349	0.998
35	0.976	80	0.746	125	0.257	170	0.361	215	0.216	260	0.541	305	0.913	350	0.999
36	0.974	81	0.737	126	0.248	171	0.364	216	0.211	261	0.552	306	0.918	351	0.999
37	0.972	82	0.728	127	0.239	172	0.367	217	0.207	262	0.564	307	0.922	352	0.999
38	0.970	83	0.719	128	0.231	173	0.370	218	0.203	263	0.575	308	0.926	353	0.999
39	0.967	84	0.710	129	0.224	174	0.372	219	0.200	264	0.586	309	0.930	354	1.000
40	0.965	85	0.700	130	0.217	175	0.374	220	0.197	265	0.597	310	0.934	355	1.000
41	0.962	86	0.691	131	0.212	176	0.376	221	0.195	266	0.608	311	0.938	356	1.000
42	0.960	87	0.681	132	0.206	177	0.377	222	0.194	267	0.619	312	0.941	357	1.000
43	0.957	88	0.671	133	0.202	178	0.378	223	0.194	268	0.630	313	0.945	358	1.000
44	0.954	89	0.661	134	0.198	179	0.378	224	0.194	269	0.640	314	0.948	359	1.000

Exhibit 37 - Table I  
**COVERAGE CONTOUR COMPARISON**

prepared for

**Kentucky Authority for Educational TV**

WKPI-TV Pikeville, Kentucky

Facility ID 34200

Ch. 24 (Digital) 44.9 kW (MAX-DA)

<u>Bearing</u>	<u>Licensed WKPI-TV</u> 50.2 kW at 423 m HAAT		<u>Proposed WKPI-TV</u> 44.9 kW at 433 m HAAT		<u>Delta</u>
	39.76 dBμ		39.76 dBμ		Proposed DTC - Licensed DTC ≤ 0
	<u>HAAT</u> <u>(m)</u>	<u>Distance to Contour</u> <u>(km)</u>	<u>HAAT</u> <u>(m)</u>	<u>Distance to Contour</u> <u>(km)</u>	
0	499.5	90.1	509.8	89.9	-0.2
10	482.4	89.0	492.7	88.7	-0.3
20	476.1	88.5	486.4	88.3	-0.2
30	463.5	87.6	473.8	87.4	-0.2
40	487.1	88.8	497.4	88.6	-0.2
50	507.2	89.6	517.5	89.4	-0.2
60	521.8	89.9	532.1	89.7	-0.2
70	455.7	84.8	466.0	84.6	-0.2
80	446.6	83.1	456.9	82.8	-0.3
90	423.8	80.3	434.1	80.1	-0.2
100	372.0	74.4	382.3	74.4	<b>0.0</b>
110	344.2	69.2	354.5	69.2	<b>0.0</b>
120	359.5	66.4	369.8	66.4	<b>0.0</b>
130	354.7	62.4	365.0	62.3	-0.1
140	341.9	60.8	352.2	60.7	-0.1
150	337.0	62.9	347.3	62.8	-0.1
160	332.0	65.1	342.3	65.1	<b>0.0</b>
170	329.1	66.5	339.4	66.4	-0.1
180	359.7	68.9	370.0	68.9	<b>0.0</b>
190	340.8	67.2	351.1	67.1	-0.1
200	320.7	64.5	331.0	64.5	<b>0.0</b>
210	323.8	62.2	334.1	62.2	<b>0.0</b>
220	372.1	62.3	382.4	62.1	-0.2
230	329.5	61.2	339.8	61.1	-0.1
240	393.6	68.5	403.9	68.4	-0.1
250	416.7	74.2	427.0	74.1	-0.1
260	431.8	78.3	442.1	78.1	-0.2
270	453.7	81.7	464.0	81.4	-0.3
280	438.1	82.7	448.4	82.4	-0.3
290	419.6	83.1	429.9	82.8	-0.3
300	467.7	86.4	478.0	86.2	-0.2
310	461.6	86.8	471.9	86.6	-0.2
320	490.1	89.0	500.4	88.8	-0.2
330	500.1	89.9	510.4	89.7	-0.2
340	495.4	89.8	505.7	89.6	-0.2
350	488.4	89.4	498.7	89.2	-0.2

**Exhibit 37 - Table II**  
**INTERFERENCE ANALYSIS RESULTS SUMMARY**

prepared for

**Kentucky Authority for Educational TV**

WKPI-TV Pikeville, KY

Facility Id: 34200

Ch. 24 44.9 kW 433 m

<u>Channel</u>	<u>Affected Station</u>	<u>City, State</u>	<u>File Number</u>	<u>Calculated Baseline (2000 Census)</u>	<u>Interference Population without Proposal (2000 Census)</u>	<u>Interference Population with Proposal (2000 Census)</u>	<u>New Interference</u>	
							<u>Population</u>	<u>Percentage</u>
23	WPXK-TV	Jellico, TN	BPCDT-20120323AGX			---	No Interference	---
23	WPXK-TV	Jellico, TN	BLCDT-20020510AAJ			---	No Interference	---
23	WSAZ-TV	Huntington, WV	BLCDT-20090514AAT	1,118,723	6,931	6,931	0	0.000 %
23	WSAZ-TV	Huntington, WV	BPCDT-20121227AAH	1,119,114	8,259	7,960	-299	-0.027 %
24	WUGA-TV	Toccoa, GA	BLEDT-20130114AAV			---	No Interference	---
24	WCVN-TV	Covington, KY	BLEDT-20020201ABJ			---	No Interference	---
24	WKYI-CD	Louisville, KY	BLDTA-20091030AGQ			---	No Interference	---
24	WLNN-LP	Boone, NC	BLTTL-19970516JB	67,952	396	396	0	0.000 %
24	WSFJ-TV	Newark, OH	BLCDT-20060620ABC	1,936,070	4,112	4,112	0	0.000 %
24	WEFC-TV	Danville, VA	BPCDT-20080317AIL	853,700	841	841	0	0.000 %
24	WAZH-CA	Harrisonburg, VA	BLTTL-19960823JC			---	No Interference	---
25	WUNF-TV	Asheville, NC	BLEDT-20030401BAI			---	No Interference	---
25	WUNF-TV	Asheville, NC	BLEDT-20120615ACE	1,865,627	56,736	56,736	0	0.000 %
25	WKPT-CD	Kingsport, TN	BLTT-19871119IB			---	No Interference	---
31	WAPW-CA	Abingdon, VA	BLTTA-20030618AAZ			---	No Interference	---