

ENGINEERING EXHIBIT

Application for Digital Television Station Construction Permit

prepared for

Kentucky Authority for Educational TV
WKHA(TV) Hazard, Kentucky
Facility ID 34196
Ch. 16 (Digital) 38.2 kW (MAX-DA) 384.8 m

Table of Contents

FCC Form 340, Section VII - DTV Engineering

Exhibit 37

Statement A	Comprehensive Engineering Statement
Figure 1	Coverage Contour
Figure 2	Antenna Relative Field Pattern
Figure 3	Antenna Relative Field Pattern Tabulation
Table I	Coverage Contour Comparison
Table II	Interference Analysis Results Summary

This material supplies a "hard copy" of the engineering portions of this application as entered December 4, 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
WKHA(TV) Hazard, Kentucky
Facility ID 34196
Ch. 16 (Digital) 38.2 kW (MAX-DA) 384.8 m

Kentucky Authority for Educational TV (“KET”) is the licensee of full service digital television station WKHA(TV), Channel 16, Hazard, Kentucky, Facility ID 34196 (BLEDT-20020205AAW). *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*¹ Limitations on Full Power Modification Applications.

Nature of the Proposal

The proposed replacement antenna system utilizes the same directional antenna pattern as the licensed WKHA(TV) facility. The proposed antenna is a Dielectric model number TFU-20JTH-R S170 which will be top-mounted on an existing tower structure with the Antenna Structure Registration Number 1044020. No change in the overall height of the tower is proposed as a result of this construction. It is believed that no change in the FAA marking and lighting is required for this modification.

The proposed digital facility will operate on Channel 16 with a maximum effective radiated power of 38.2 kW and an antenna height of 785.8 meters AMSL. **Exhibit 37 - Figure 1** depicts the dipole adjusted service contour of the proposed facility. 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 proposed distances to contour showing there is no extension of the coverage in accordance with the *Public Notice*.

¹ 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*”).

Exhibit 37 - Statement A
COMPREHENSIVE ENGINEERING STATEMENT
(Page 2 of 5)

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").² 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 full service 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 395 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.

² 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.

Exhibit 37 - Statement A
COMPREHENSIVE ENGINEERING STATEMENT
(Page 3 of 5)

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 177.1 meters above ground level. An effective radiated power of 38.2 kilowatts, horizontally polarized, will be employed utilizing a Dielectric model TFU-20JTH-R S170 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 16 (center frequency 485 MHz) is $323.3 \mu\text{W}/\text{cm}^2$.

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

Exhibit 37 - Statement A
COMPREHENSIVE ENGINEERING STATEMENT
(Page 4 of 5)

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/cm²
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 0.60 μ W/cm² at two meters above ground level near the antenna support structure, or 0.2 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

Exhibit 37 - Statement A
COMPREHENSIVE ENGINEERING STATEMENT
(Page 5 of 5)

when work must be performed on the tower or in areas where high RF levels may be present. Such 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 December 2013 for

Kentucky Authority for Educational TV

WKHA(TV) Hazard, Kentucky
Ch 16 38.2 kW (MAX-DA) 384.8 m

Cavell Mertz & Associates, Inc.
Manassas, VA

Hazard, Kentucky

WKHA(TV) Site

Proposed WKHA(TV) Facility
Ch. 16 38.2 kW (MAX-DA) 384.8 m

48 dBμ F(50,90) Principal Community
Coverage Contour

41 dBμ F(50,90) Service Contour
(adjusted to dipole factor)



**CAVELL
MERTZ**
& Associates, Inc.

Scale 1:1,000,000

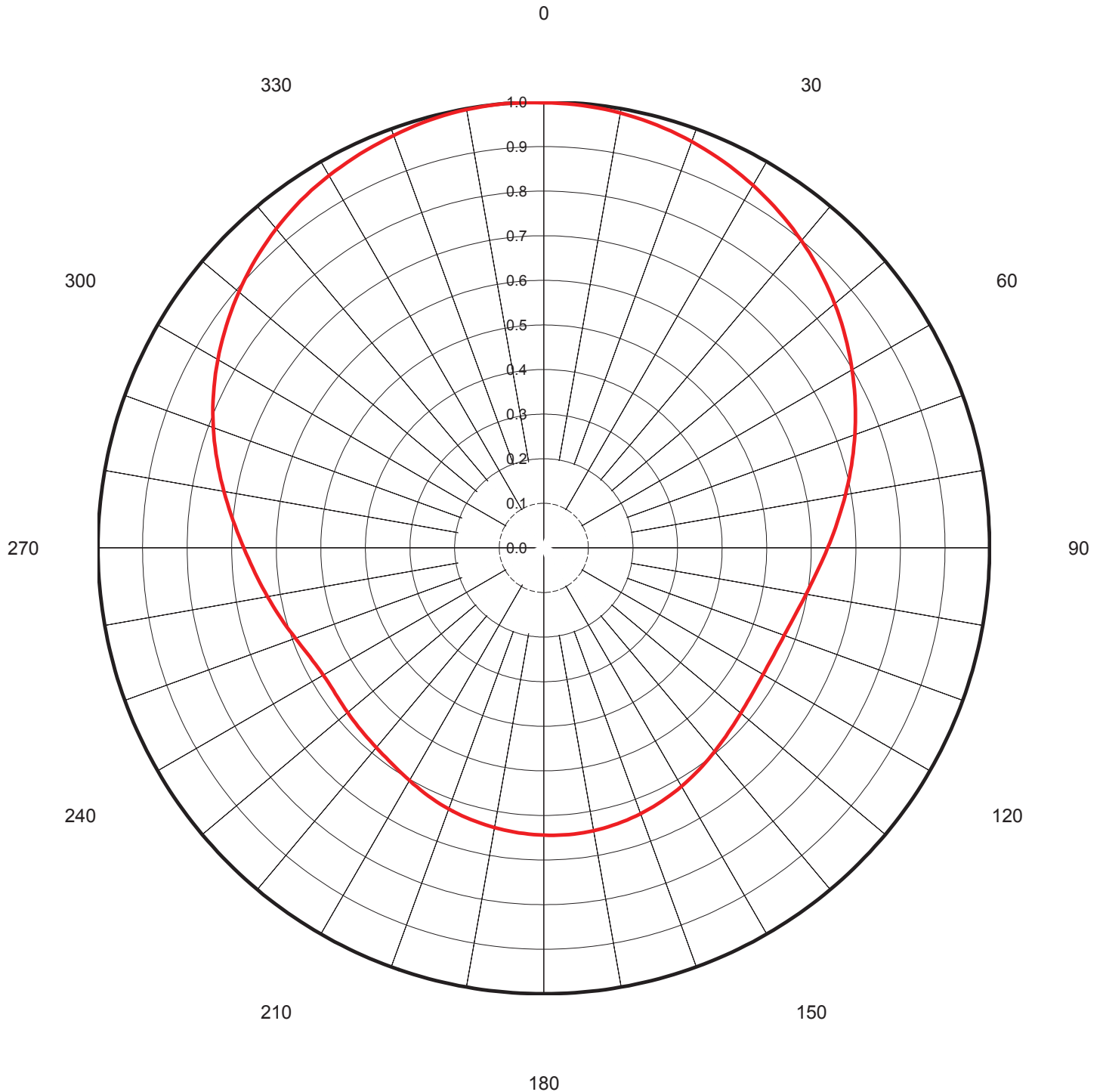


WKHA(TV) Hazard, Kentucky
Ch 16 38.2 kW (MAX-DA) 384.8 m

AZIMUTH PATTERN

Gain 1.70 (2.30 dB)
Calculated / Measured Calculated

Frequency 485.00 MHz
Drawing # DSB-B



TABULATION OF AZIMUTH PATTERN

Azimuth Pattern Drawing #: DSB-B

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
0	0.998	45	0.876	90	0.637	135	0.586	180	0.644	225	0.579	270	0.673	315	0.914
1	0.998	46	0.872	91	0.632	136	0.588	181	0.644	226	0.578	271	0.678	316	0.919
2	0.998	47	0.867	92	0.628	137	0.590	182	0.643	227	0.577	272	0.683	317	0.923
3	0.997	48	0.862	93	0.624	138	0.592	183	0.643	228	0.576	273	0.688	318	0.927
4	0.996	49	0.857	94	0.619	139	0.594	184	0.642	229	0.575	274	0.694	319	0.930
5	0.996	50	0.852	95	0.615	140	0.596	185	0.641	230	0.574	275	0.699	320	0.934
6	0.995	51	0.847	96	0.612	141	0.598	186	0.640	231	0.573	276	0.705	321	0.938
7	0.994	52	0.842	97	0.608	142	0.600	187	0.640	232	0.572	277	0.711	322	0.941
8	0.993	53	0.836	98	0.604	143	0.603	188	0.639	233	0.572	278	0.716	323	0.944
9	0.992	54	0.831	99	0.601	144	0.605	189	0.638	234	0.571	279	0.722	324	0.948
10	0.990	55	0.826	100	0.597	145	0.607	190	0.637	235	0.570	280	0.728	325	0.951
11	0.989	56	0.820	101	0.594	146	0.609	191	0.636	236	0.570	281	0.734	326	0.954
12	0.987	57	0.815	102	0.591	147	0.611	192	0.634	237	0.570	282	0.740	327	0.956
13	0.985	58	0.810	103	0.589	148	0.614	193	0.633	238	0.570	283	0.747	328	0.959
14	0.983	59	0.804	104	0.586	149	0.616	194	0.632	239	0.570	284	0.753	329	0.962
15	0.981	60	0.799	105	0.583	150	0.618	195	0.631	240	0.571	285	0.759	330	0.964
16	0.979	61	0.793	106	0.581	151	0.619	196	0.629	241	0.572	286	0.765	331	0.966
17	0.977	62	0.787	107	0.579	152	0.621	197	0.628	242	0.573	287	0.771	332	0.968
18	0.975	63	0.782	108	0.577	153	0.623	198	0.626	243	0.575	288	0.777	333	0.971
19	0.972	64	0.776	109	0.575	154	0.625	199	0.625	244	0.577	289	0.783	334	0.973
20	0.970	65	0.771	110	0.574	155	0.627	200	0.623	245	0.579	290	0.789	335	0.975
21	0.967	66	0.765	111	0.573	156	0.628	201	0.621	246	0.581	291	0.795	336	0.977
22	0.964	67	0.759	112	0.571	157	0.630	202	0.619	247	0.584	292	0.801	337	0.979
23	0.961	68	0.754	113	0.570	158	0.632	203	0.618	248	0.587	293	0.806	338	0.980
24	0.958	69	0.748	114	0.569	159	0.633	204	0.616	249	0.590	294	0.812	339	0.982
25	0.955	70	0.742	115	0.569	160	0.634	205	0.613	250	0.593	295	0.817	340	0.984
26	0.952	71	0.737	116	0.568	161	0.636	206	0.611	251	0.596	296	0.823	341	0.986
27	0.949	72	0.731	117	0.568	162	0.637	207	0.609	252	0.600	297	0.828	342	0.988
28	0.946	73	0.726	118	0.568	163	0.638	208	0.607	253	0.603	298	0.834	343	0.990
29	0.942	74	0.720	119	0.568	164	0.639	209	0.605	254	0.607	299	0.839	344	0.991
30	0.939	75	0.714	120	0.568	165	0.640	210	0.602	255	0.610	300	0.844	345	0.993
31	0.935	76	0.709	121	0.568	166	0.641	211	0.600	256	0.614	301	0.849	346	0.994
32	0.932	77	0.703	122	0.569	167	0.642	212	0.598	257	0.618	302	0.854	347	0.995
33	0.928	78	0.698	123	0.569	168	0.643	213	0.596	258	0.622	303	0.859	348	0.996
34	0.924	79	0.692	124	0.570	169	0.643	214	0.594	259	0.625	304	0.864	349	0.997
35	0.920	80	0.687	125	0.571	170	0.644	215	0.592	260	0.629	305	0.869	350	0.998
36	0.916	81	0.682	126	0.572	171	0.644	216	0.590	261	0.633	306	0.874	351	0.999
37	0.912	82	0.676	127	0.573	172	0.645	217	0.589	262	0.637	307	0.879	352	0.999
38	0.908	83	0.671	128	0.574	173	0.645	218	0.587	263	0.641	308	0.883	353	0.999
39	0.904	84	0.666	129	0.575	174	0.645	219	0.586	264	0.646	309	0.888	354	1.000
40	0.899	85	0.661	130	0.577	175	0.645	220	0.584	265	0.650	310	0.893	355	1.000
41	0.895	86	0.656	131	0.578	176	0.645	221	0.583	266	0.654	311	0.897	356	1.000
42	0.890	87	0.651	132	0.580	177	0.645	222	0.582	267	0.659	312	0.902	357	0.999
43	0.886	88	0.646	133	0.582	178	0.645	223	0.581	268	0.663	313	0.906	358	0.999
44	0.881	89	0.641	134	0.584	179	0.645	224	0.580	269	0.668	314	0.910	359	0.999

Exhibit 37 - Table I
COVERAGE CONTOUR COMPARISON

prepared for

Kentucky Authority for Educational TV

WKHA(TV) Hazard, Kentucky

Facility ID 34196

Ch. 16 (Digital) 38.2 kW (MAX-DA) 384.8 m HAAT

Bearing	Licsensed WKHA(TV) 53.2 kW at 369 m HAAT		Proposed WKHA(TV) 38.2 kW at 384.8 m HAAT		Delta
	Distance to		Distance to		Proposed DTC -
	HAAT	38.94 dBμ Contour	HAAT	38.94 dBμ Contour	Licensed DTC <= 0
	(m)	(km)	(m)	(km)	(km.)
0	416.0	87.0	439.6	85.9	-1.1
10	410.3	86.6	433.9	85.6	-1.0
20	386.4	84.9	410.0	84.1	-0.8
30	384.2	84.3	407.8	83.6	-0.7
40	360.1	81.8	383.7	81.5	-0.3
50	346.7	79.8	370.3	79.8	0.0
60	349.1	79.2	372.7	79.1	-0.1
70	396.8	82.0	420.4	81.2	-0.8
80	411.8	81.9	435.4	81.0	-0.9
90	354.4	77.0	378.0	76.5	-0.5
100	387.6	79.0	411.2	77.9	-1.1
110	339.2	74.7	362.8	73.9	-0.8
120	383.0	78.4	406.6	76.9	-1.5
130	380.6	78.4	404.2	77.0	-1.4
140	357.8	76.9	381.4	75.8	-1.1
150	358.2	77.4	381.8	76.3	-1.1
160	319.0	74.1	342.6	73.5	-0.6
170	277.6	70.9	301.2	70.4	-0.5
180	303.6	72.9	327.2	72.4	-0.5
190	338.7	75.9	362.3	75.2	-0.7
200	316.4	73.6	340.0	73.0	-0.6
210	316.6	73.3	340.2	72.6	-0.7
220	349.3	75.8	372.9	74.9	-0.9
230	358.4	76.4	382.0	75.4	-1.0
240	355.5	76.1	379.1	75.1	-1.0
250	379.1	78.4	402.7	77.3	-1.1
260	410.6	81.1	434.2	79.8	-1.3
270	391.8	80.8	415.4	79.7	-1.1
280	398.5	82.1	422.1	81.0	-1.1
290	390.5	82.5	414.1	81.7	-0.8
300	408.8	84.4	432.4	83.4	-1.0
310	414.7	85.4	438.3	84.4	-1.0
320	427.6	86.7	451.2	85.6	-1.1
330	407.9	86.1	431.5	85.1	-1.0
340	389.8	85.4	413.4	84.5	-0.9
350	404.7	86.4	428.3	85.4	-1.0

Exhibit 37 - Table II
INTERFERENCE STUDY RESULTS
 prepared for
Kentucky Authority for Educational TV
 WKHA(DT) Hazard, KY
 Facility Id: 34196
 Ch. 16 38.2 kW 384.8 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>
15	WKMR	Morehead, KY	BMLEDT-20120503ADU	340,441	939	939	0	0.000 %
16	WBEK-CA	Augusta, GA	BDFCDTA-20080805AAU			---		
16	WELF-TV	Dalton, GA	BLCDDT-20130610ACF	1,229,325	21,640	21,640	0	0.000 %
16	WJYL-CD	Jeffersonville, IN	BLDDTA-20090630ADK			---		
16	WNKY	Bowling Green, KY	BLCDDT-20071220AAY	331,345	7,391	7,331	-60	-0.018 %
16	WPTD	Dayton, OH	BLEDDT-20090923ACN			---		
16	WGGS-TV	Greenville, SC	BLCDDT-20130925AJI			---		
17	WUNE-TV	Linville, NC	BLEDDT-20091118ADR			---		
17	WQCW	Portsmouth, OH	BLCDDT-20100422ABY			---		
17	WKOP-TV	Knoxville, TN	BLEDDT-20040405ACC	1,226,445	8,137	8,137	0	0.000 %