

ENGINEERING EXHIBIT

Incentive Auction Channel Reassignment

Application for Modification of Digital Television Station Construction Permit

prepared for

CBS Television Licenses LLC

WBZ-TV Boston, MA

Facility ID 25456

Ch. 20 922 kW 388 m

CBS Television Licenses LLC (“CBS”) is the licensee of digital television station WBZ-TV, Channel 30, Facility ID 25456, Boston, MA. Reassignment of WBZ-TV from Channel 30 to Channel 20 was specified in the *Incentive Auction Closing and Channel Reassignment Public Notice (“CCRPN”*, DA 17-317, released April 13, 2017). *CBS* herein proposes modification of the WBZ-TV Channel 20 Construction Permit (“CP”, file# 0000024681). This application is intended to be filed during the second filing window.¹ The CP authorizes operation at 740 kW effective radiated power (“ERP”) at 388 meters antenna height above average terrain. *CBS* proposes herein to increase the ERP to 922 kW.

WBZ-TV currently utilizes an antenna which is shared with several other television stations. As with the current authorization, the shared antenna will be replaced to accommodate the channel reassignments involving all television stations at this site.

The proposed antenna is an elliptically polarized nondirectional Dielectric model TUM-AP-O4-14/56H-2-T. *CBS* will employ 25 percent vertical polarization for WBZ-TV, such that the horizontally polarized ERP is 922 kW and the vertically polarized ERP is 230.5 kW.²

¹Public Notice “*Incentive Auction Task Force and Media Bureau Announce the Opening of the Second Filing Window for Eligible Full Power and Class A Television Station—October 3 Through November 2, 2017*” DA 17-911, released September 20, 2017.

²The proposed antenna provides for adjustable vertical polarization. The antenna provides separate inputs for horizontally polarized and vertically polarized radiators, which permits each of the television stations that share the antenna to individually choose how much vertical polarization to utilize. Following construction and licensing, any subsequent changes to the vertically polarized ERP will be described in a license modification application as necessary to show the revised system gains, losses, and transmitter power output. The horizontally polarized ERP

The existing tower structure corresponds to FCC Antenna Structure Registration number 1003433. No change to the overall structure height will result.

Figure 1 supplies a map that demonstrates compliance with §73.625(a)(1) regarding coverage of the entire principal community. The proposed facility's predicted population exceeds 95 percent of the *CCRPN* baseline facility's population.

Interference study per FCC OET Bulletin 69³ shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby post-auction full service and Class A television stations and reassignments as required by §73.616. **FCC processing of this proposal is requested using a 2 km cell size and 0.5 km terrain profile increment.** The interference study output report is provided as Table 1.

The site location is 301 km to the U.S. – Canada border, within the international coordination zone. There are no Canada television stations or allotments on relevant channels located within the pertinent culling distances for interference analysis consideration, based on current FCC LMS data and “TVStudy” analysis.

The nearest FCC monitoring station is 294 km distant at Belfast, ME. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The site is not located within the areas requiring coordination with “quiet” zones specified in §73.1030(a) and (b). There are no authorized AM stations within 3 kilometers of the site.

will be maintained at 922 kW and the vertically polarized ERP will not exceed the horizontally polarized ERP.

³FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 (“OET-69”). This analysis employed the FCC's current “TVStudy” software with the default application processing template settings, 2 km cell size, and **0.5 km terrain profile increment**. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation. In order to allow the upload of elevation pattern data, a response of “Yes” is provided in the accompanying Form 2100 Antenna Technical Data section question regarding whether the elevation pattern varies for reasons other than the use of mechanical beamtilt.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10), and considering 10 percent antenna relative field in downward elevations, the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is $2.6 \mu\text{W}/\text{cm}^2$, which is 0.8 percent of the general population/uncontrolled maximum permitted exposure limit. This is well below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

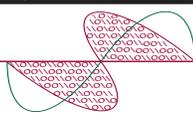
The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from RF electromagnetic field exposure in excess of FCC guidelines. This exhibit is limited to the evaluation of exposure to RF electromagnetic field.

List of Attachments

Figure 1	Proposed Coverage Contours
Table 1	OET Bulletin 69 Interference Study
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E.	November 1, 2017	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

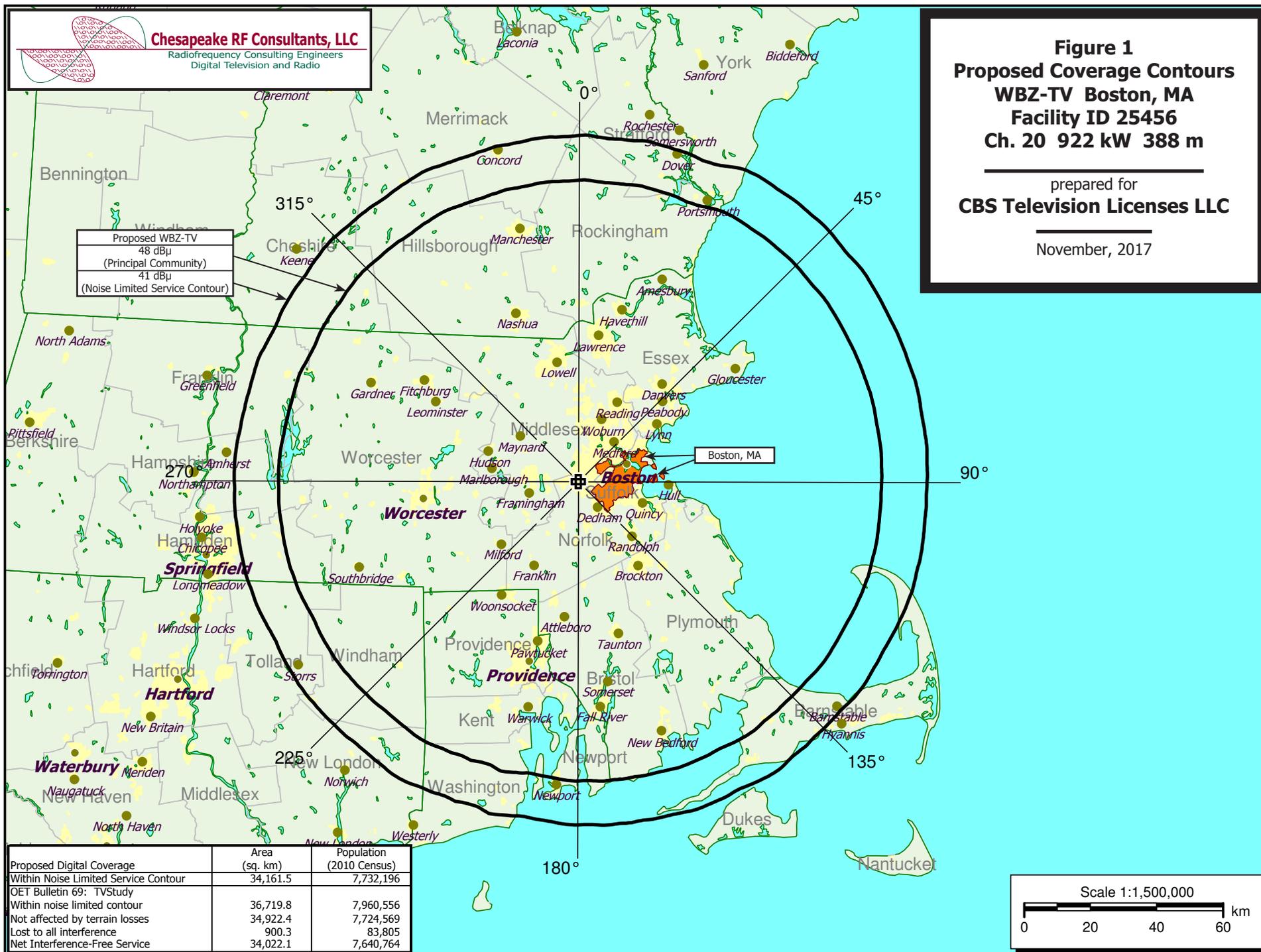


Chesapeake RF Consultants, LLC
 Radiofrequency Consulting Engineers
 Digital Television and Radio

Figure 1
Proposed Coverage Contours
WBZ-TV Boston, MA
Facility ID 25456
Ch. 20 922 kW 388 m

prepared for
CBS Television Licenses LLC

November, 2017



Proposed WBZ-TV
 48 dBu
 (Principal Community)
 41 dBu
 (Noise Limited Service Contour)

Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	34,161.5	7,732,196
OET Bulletin 69: TVStudy		
Within noise limited contour	36,719.8	7,960,556
Not affected by terrain losses	34,922.4	7,724,569
Lost to all interference	900.3	83,805
Net Interference-Free Service	34,022.1	7,640,764

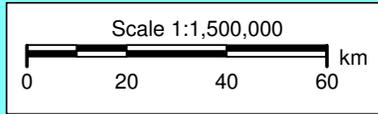


Table 1 WBZ-TV OET Bulletin 69 Interference Study
 (page 1 of 3)



tvstudy v2.2.3 (6K70F1)
 Database: localhost, Study: WBZ-TV 922 KW 14U280075 2.0-0.5, Model: Longley-Rice
 Start: 2017.10.14 08:11:36

Study created: 2017.10.14 08:11:10

Study build station data: LMS TV 2017-10-07 LMSTV

Proposal: WBZ-TV D20 DT APP BOSTON, MA
 File number: WBZ-TV 922 KW 14U280075
 Facility ID: 25456
 Station data: User record
 Record ID: 1358
 Country: U.S.

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
Yes	WUNI	D19	DT	CP	WORCESTER, MA	BLANK0000028427	39.4 km
No	WYPX-TV	D19	DT	CP	AMSTERDAM, NY	BLANK0000026966	252.1
No	WCNY-TV	D20	DT	CP	SYRACUSE, NY	BLANK0000028027	405.4
Yes	WCAX-TV	D20	DT	CP	BURLINGTON, VT	BLANK0000024928	277.3
No	WEDW	D21	DT	BL	BRIDGEPORT, CT	DTVBL13594	198.0
Yes	WSBK-TV	D21	DT	APP	BOSTON, MA	BLANK0000024678	0.0
Yes	WSBK-TV	D21	DT	BL	BOSTON, MA	DTVBL73982	0.0
No	WFXQ-CD	D21	DC	CP	SPRINGFIELD, MA	BLANK0000027611	116.0

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D20
 Latitude: 42 18 37.00 N (NAD83)
 Longitude: 71 14 12.00 W
 Height AMSL: 431.9 m
 HAAT: 388.3 m
 Peak ERP: 922 kW
 Antenna: Omnidirectional
 Elev Pattn: 14U280075-509
 Elec Tilt: 0.75

39.4 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	922 kW	386.1 m	107.9 km
45.0	922	414.3	110.6
90.0	922	394.6	108.7
135.0	922	391.9	108.4
180.0	922	375.2	106.8
225.0	922	380.1	107.3
270.0	922	380.2	107.3
315.0	922	383.7	107.6

**Proposal service area extends beyond baseline plus 1.0%
 Proposal service area population is more than 95.0% of baseline

**Proposal is within coordination distance of Canadian border
 Distance to Canadian border: 293.0 km

Distance to Mexican border: 2959.8 km

Conditions at FCC monitoring station: Belfast ME
 Bearing: 35.5 degrees Distance: 294.3 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
 Bearing: 276.7 degrees Distance: 2832.3 km

No land mobile station failures found

Table 1 WBZ-TV OET Bulletin 69 Interference Study
 (page 2 of 3)



Study cell size: 2.00 km
 Profile point spacing: 0.50 km

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

 Interference to BLANK0000028427 CP, scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: WUNI	D19	DT	CP	WORCESTER, MA	BLANK0000028427	
Undesireds: WBZ-TV	D20	DT	BL	BOSTON, MA	DTVBL25456	39.4 km
WBZ-TV	D20	DT	APP	BOSTON, MA	WBZ-TV 922 KW 14U28007	39.4
WEKW-TV	D18	DT	CP	KEENE, NH	BLANK0000027337	94.1
WYPX-TV	D19	DT	CP	AMSTERDAM, NY	BLANK0000026966	214.1
Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX		
32097.3 8,559,295	30308.3 8,224,958	27332.0 7,529,941	26939.8 7,492,308	1.44 0.50		
Undesired	Total IX	Unique IX, before	Unique IX, after			
WBZ-TV D20 DT BL	2684.4 657,159	2680.4 657,159				
WBZ-TV D20 DT APP	3076.7 694,792		3072.7 694,792			
WEKW-TV D18 DT CP	211.6 11,248	187.6 10,928	187.6 10,928			
WYPX-TV D19 DT CP	108.3 26,930	80.3 26,610	80.3 26,610			

 Interference to BLANK0000024928 CP, scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: WCAX-TV	D20	DT	CP	BURLINGTON, VT	BLANK0000024928	
Undesireds: WBZ-TV	D20	DT	BL	BOSTON, MA	DTVBL25456	277.3 km
WBZ-TV	D20	DT	APP	BOSTON, MA	WBZ-TV 922 KW 14U28007	277.3
WCNY-TV	D20	DT	CP	SYRACUSE, NY	BLANK0000028027	318.1
Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX		
38475.1 784,748	33327.1 676,694	33110.9 674,453	33079.1 674,307	0.10 0.02		
11839.8 2,366,568	11266.5 2,274,048	11266.5 2,274,048	11266.5 2,274,048	0.00 0.00		
(in Canada)						
Undesired	Total IX	Unique IX, before	Unique IX, after			
WBZ-TV D20 DT BL	160.3 1,896	160.3 1,896				
WBZ-TV D20 DT APP	192.1 2,042		192.1 2,042			
WCNY-TV D20 DT CP	55.9 345	55.9 345	55.9 345			

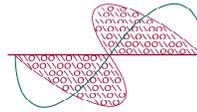
 Interference to BLANK0000024678 APP, scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: WSBK-TV	D21	DT	APP	BOSTON, MA	BLANK0000024678	
Undesireds: WBZ-TV	D20	DT	BL	BOSTON, MA	DTVBL25456	0.0 km
WBZ-TV	D20	DT	APP	BOSTON, MA	WBZ-TV 922 KW 14U28007	0.0
WEDW	D21	DT	BL	BRIDGEPORT, CT	DTVBL13594	198.0
WFXQ-CD	D21	DC	CP	SPRINGFIELD, MA	BLANK0000027611	116.0
Service area	Terrain-limited	IX-free, before	IX-free, after	Percent New IX		
25165.3 7,189,917	24460.4 7,133,228	24283.8 7,120,658	24299.8 7,123,868	-0.07 -0.05		
Undesired	Total IX	Unique IX, before	Unique IX, after			
WBZ-TV D20 DT BL	16.1 3,210	16.1 3,210				
WBZ-TV D20 DT APP	0.0 0		0.0 0			
WEDW D21 DT BL	148.6 9,068	144.6 8,725	144.6 8,725			
WFXQ-CD D21 DC CP	16.0 635	12.0 292	12.0 292			

 Interference to DTVBL73982 BL, scenario 1

Call	Chan	Svc	Status	City, State	File Number	Distance
Desired: WSBK-TV	D21	DT	BL	BOSTON, MA	DTVBL73982	

Table 1 WBZ-TV OET Bulletin 69 Interference Study
 (page 3 of 3)



Undesireds:	WBZ-TV	D20	DT	BL	BOSTON, MA	DTVBL25456		0.0	km		
	WBZ-TV	D20	DT	APP	BOSTON, MA	WBZ-TV 922 KW 14U28007		0.0			
	WEDW	D21	DT	BL	BRIDGEPORT, CT	DTVBL13594		198.0			
	WFXQ-CD	D21	DC	CP	SPRINGFIELD, MA	BLANK0000027611		116.0			
	Service area				Terrain-limited			IX-free, before	IX-free, after	Percent New IX	
	24656.3	7,161,406			24019.5	7,111,624		23858.9	7,101,756	0.08	0.09
Undesired					Total IX			Unique IX, before		Unique IX, after	
WBZ-TV D20 DT BL					0.0	0		0.0	0		
WBZ-TV D20 DT APP					20.0	6,559		20.0	6,559		
WEDW D21 DT BL					148.6	9,576		148.6	9,576		
WFXQ-CD D21 DC CP					12.0	292		12.0	292		

 Interference to proposal, scenario 1
 1.08% interference

Desired:	Call	Chan	Svc	Status	City, State	File Number		Distance		
	WBZ-TV	D20	DT	APP	BOSTON, MA	WBZ-TV 922 KW 14U28007				
Undesireds:	WUNI	D19	DT	CP	WORCESTER, MA	BLANK0000028427		39.4		
	WCAX-TV	D20	DT	CP	BURLINGTON, VT	BLANK0000024928		277.3		
	WSBK-TV	D21	DT	APP	BOSTON, MA	BLANK0000024678		0.0		
	Service area				Terrain-limited			IX-free	Percent IX	
	36719.8	7,960,556			34922.4	7,724,569	34022.1	7,640,764	2.58	1.08
Undesired					Total IX			Unique IX	Prct Unique IX	
WUNI D19 DT CP					636.8	60,301	592.8	57,940	1.70	0.75
WCAX-TV D20 DT CP					307.5	25,865	263.5	23,504	0.75	0.30

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	25456
	State	Massachusetts
	City	BOSTON
	DTV Channel	20
Facility Type	Facility Type	Commercial
	Station Type	Main
Zone	Zone	1

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1003433
Coordinates (NAD83)	Latitude	42° 18' 37.0" N+
	Longitude	071° 14' 12.0" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	395.1 meters
	Support Structure Height	363.4 meters
	Ground Elevation (AMSL)	46.6 meters
Antenna Data	Height of Radiation Center Above Ground Level	385.3 meters
	Height of Radiation Center Above Average Terrain	388.3 meters
	Height of Radiation Center Above Mean Sea Level	431.9 meters
	Effective Radiated Power	922 kW

**Antenna
Technical Data**

Section	Question	Response
Antenna Type	Antenna Type	Non-Directional
	Do you have an Antenna ID?	
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	DIE
	Model	TUM-AP-O4-14/56H-2-T
	Rotation	
	Electrical Beam Tilt	0.75
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
DTV and DTS: Elevation Pattern	Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt?	Yes
	Uploaded file for elevation antenna (or radiation) pattern data	WBZ-TV EL pat 14U280075-509.xml

**Construction
Permit
Certifications**

Section	Question	Response
Post-Incentive Auction Expedited Processing	It will operate on the DTV channel for this station as established in the post-incentive auction channel reassignment public notice.	Yes
	It will operate post-incentive auction facilities that do not expand the noise-limited service contour in any direction beyond that established by the post-incentive auction channel reassignment public notice.	No
	It will operate post-incentive auction facilities that match or reduce by no more than five percent with respect to predicted population from those defined in the post-incentive auction channel reassignment public notice.	Yes
	The antenna structure to be used by this facility has been registered by the Commission and will not require re-registration to support the proposed antenna, OR the FAA has previously determined that the proposed structure will not adversely affect safety in air navigation and this structure qualifies for later registration under the Commission's phased registration plan, OR the proposed installation on this structure does not require notification to the FAA pursuant to 47 C.F.R. Section 17.7.	Yes
Environmental Effect	Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? (See Section 1.1306 of 47 C.F.R.)	No
Broadcast Facility	The proposed facility complies with the applicable engineering standards and assignment requirements of 47 C.F.R. Sections 73.616, 73.622(j), 73.623(e), 73.625, 73.1030, and 73.1125.	Yes