

## ENGINEERING STATEMENT

Application for Use of Formerly Licensed Main  
Facility as an Auxiliary Facility  
Station WBUR-FM  
BLED-20170802AEJ  
Channel 215B  
Boston, Massachusetts

FACILITY ID: 68241

This Engineering Statement supports the application filed by Trustees of Boston University (WBUR) for use of a formerly licensed main facility as a licensed auxiliary facility. Both use directional array antenna systems.

WBUR proposes a slight reduction in ERP at the formerly licensed site from 12 kW to 11 kW as part of this application, in order to keep the predicted contour at that site within the contour of the currently licensed site, per 73.1675 (c) (1).

**Current Licensed Facilities:** 8.6 kW  
HAAT: 358 meters  
N 42 18 36.99, W 071 14 12.00 (NAD83)

**Proposed Auxiliary:** 11 kW circular polarization  
HAAT: 305 meters  
N 42 18 27.3, W 071 13 24.9 (NAD83)

### I. ENGINEERING CALCULATIONS

FM coverage contours for this study were obtained using a total of 8 evenly spaced radials to determine the Height Above Average Terrain. The average terrain height of each radial was determined using the USGS 3 arc-second terrain elevation database between 3 and 16 km. The resulting average radial heights were employed using the Commission's TVFMINT algorithm to project distances to signal reception and interference contours.

Longitude and latitude coordinates have been converted to NAD 83 from NAD 27.

Directional arrays were evaluated on 36 evenly spaced contours as below.

## II. APPLICATION DETAILS

WBUR proposes to use a formerly licensed main transmitter site as a licensed auxiliary. The former site was licensed as BLED20050812AGN. There will be no change in antenna, the mechanical mount of the antenna, the center of radiation, or the DA pattern for the use of this site in auxiliary operation. A slight reduction in the formerly licensed ERP is proposed to prevent any extension of the auxiliary contour outside the licensed contour. See Map 1 for a comparison of the 60 dBu service contours.

## III. TECHNICAL DETAILS

Overall Tower Height Above Ground Level: 381 meters  
Height of Radiation Center Above Mean Sea Level: 349.2 meters (H and V)  
Height of Radiation Center Above Ground Level: 319 meters (H and V)  
Height of Radiation Center Above Average Terrain: 305 meters (H and V)

Directional antenna relative field values:

Degrees	Value	Degrees	Value	Degrees	Value
0	1.000	10	1.000	20	1.000
30	1.000	40	1.000	50	1.000
60	1.000	70	1.000	80	1.000
90	1.000	100	1.000	110	1.000
120	1.000	130	1.000	140	0.794
150	0.631	160	0.501	170	0.501
180	0.631	190	0.759	200	0.891
210	0.708	220	0.603	230	0.603
240	0.676	250	0.708	260	0.562
270	0.447	280	0.447	290	0.562
300	0.708	310	0.891	320	1.000
330	0.871	340	0.891	350	1.000

Additional azimuths:

Degrees	Value
197	0.891
217	0.603
235	0.603
246	0.776
335	0.871

#### IV. Environmental

The proposed auxiliary is already in place and no changes are proposed from its previous use as the main transmitter site for WBUR-FM. The antenna is on an existing registered tower (ASR 1004623) that is operated by American Tower. The tower has a total height of 381 meters AGL. The base of the tower is fully fenced to prevent public access and signed with appropriate RF hazard signs. Current tenants on the tower are multiple RF emitters, including a master FM antenna for 8 stations. The site is currently in compliance with the Rules on radio frequency radiation exposure and was in compliance when in use as a main site for WBUR-FM until 2017.

The proposed auxiliary FM antenna is a two-bay directional array at a height of 319 meters AGL Center of Radiation. There will be no changes to the existing tower height, structure, or lighting requirements to accommodate the proposed auxiliary FM antenna and therefore the environmental concerns listed in Section 1.1307(a) of the Commission's Rules are not pertinent.

A detailed mathematical analysis was undertaken to determine compliance with the specific standards for human exposure to RF fields as set forth in OET 65, Edition 97-01 with supplements A, B and C.

The proposed tower is a multi-user and multi-transmitter site which disallows the use of the FCC worksheets to show compliance with the Rules concerning exposure to RFR. To analyze this proposal, the guidelines provided in Section 2: Prediction Methods, subsection "Multiple Transmitter Sites and Complex Environments" were followed.

#### **Mathematical Analysis**

The proposed antenna for WBUR-FM's auxiliary is analyzed for a worst case condition of ground level radiofrequency radiation per the recommendations of OET65 to determine if it exceeds the 5% level for Uncontrolled Exposure at the base of the tower. The free space equation, with modifications recommended by the EPA, is used for these calculations (these modifications take into account the increase in power density due to ground level reflection). The height of the center of radiation is reduced by two meters to account for the typical human height. The antenna is treated as a point source of radiation to consider worst case conditions, even though the vertical plane pattern of radiation would likely show a substantially smaller value of ground level energy near the tower base.

The EPA recommended formula is:

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

Where: S = power density in uW/cm<sup>2</sup>  
ERP= power in watts  
R= distance in meters

For the above equation, the proposed ERP is 11,000 W (times 2 for circular polarization) and the distance from center of radiation to ground level at head height is 317 meters. The value of S then equals 7.3122  $\mu\text{W}/\text{cm}^2$ . This is 3.656 percent of the 200  $\mu\text{W}/\text{cm}^2$  maximum for an uncontrolled environment. Since this value is less than 5% of the uncontrolled maximum, no further analysis is necessary.

### **Conclusion**

The proposed minor modification is therefore in compliance with 47 CFR 1.1307 (b) (3) and excluded from the requirement of an Environmental Assessment.

WBUR certifies that it will reduce power or cease operations in coordination with other users of the site to protect persons requiring access to the tower or antenna for required maintenance or repair work.