

Exhibit EE-1: Engineering Statement in support of  
FCC FORM 349  
APPLICATION FOR AUTHORITY TO CONSTRUCT OR MAKE CHANGES IN AN FM TRANSLATOR OR FM BOOSTER STATION  
(For an Existing FM Translator)

This engineering exhibit supports as minor modification to the construction permit of FM translator W225CF (Facility ID 155464), Denver, PA. We are requesting a change of the City of license to Reading, PA. W225CF will be used as a fill-in facility for HD-2 FM station, WLEV (Fac. ID # 39875) This application proposes to change the antenna location, height and type. The CP for W225CF expires on 18 June 2017 which is less than 90 days so we respectfully request expeditious handling of this application.

The proposed W225CF 100dB $\mu$  contour is within the protected contour of the 3<sup>rd</sup> adjacent W222BY (FID# 138520). A D/U analysis, using a 2-bay antenna with 0.7 spacing, shows that no interference reaches or approaches the ground nor any occupied structure or elevated roadway. Therefore this proposal should be acceptable under 74.1204(d) and a "Living Way" waiver is hereby requested.

The proposed facility is in compliance with 47 C.F.R. Section 1.1306 with regards to radio-frequency electromagnetic exposure in that the contribution to the rf environment is less than 5% of the maximum public exposure. FM Study shows that less than 1.0  $\mu$ W will reach the ground.

This application was prepared using FCC 30-arc-second terrain data.

This translator will operate as a fill-in facility for HD-2 FM station WLEV, an FM radio station licensed to Allentown, PA. The maximum ERP is limited by interference, the WLEV 0.50mV contour and the 250W class limit.

Attached as Figure 1 is a color coded map showing the protected contours and interfering contours of all relevant FM facilities.

Figure 2 shows the proposed 1.0 mV service contour of this application compared with the 0.50 mV service contour of WLEV.

Figure 3 shows overlap of the original *authorized* 60dB $\mu$  contour of W225CF with its *proposed* 60dB $\mu$  contour, thus making this application a minor change.

Figure 4, Study 1 and Table 1 demonstrate that no harmful interference will occur to adjacent stations W222BY.

The proposal is sufficiently distant from all facilities mentioned in 73.1030(a), (b) & (c) so that notification under 73.1030 is not required.

Respectfully submitted

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## Analysis:

W225CF is a construction permit inside the Reading, PA radio market. This application changes the location, antenna height and antenna type of the facility.

Figure 1: Contour analysis of Ch225, Reading, PA. Colors are referenced to W225CF proposed. Other facilities' colors should not overlap the same colors from W225CF. Overlapping colors from one affected station to another is okay.

Key:

Amber = Interfering 40dBμ vs Protected (Co-chan)  
Blue or cyan = Interfering 54dBμ vs Protected (1<sup>st</sup> Adj)  
Violet = Interfering 100dBμ vs Protected (2<sup>nd</sup>/3<sup>rd</sup> adj)

W225CF proposed power = 0.099kW (99 Watts).

W225CF Proposed Height AMSL = 372m

W225CF Proposed antenna type: 2-bay .76-wave spaced

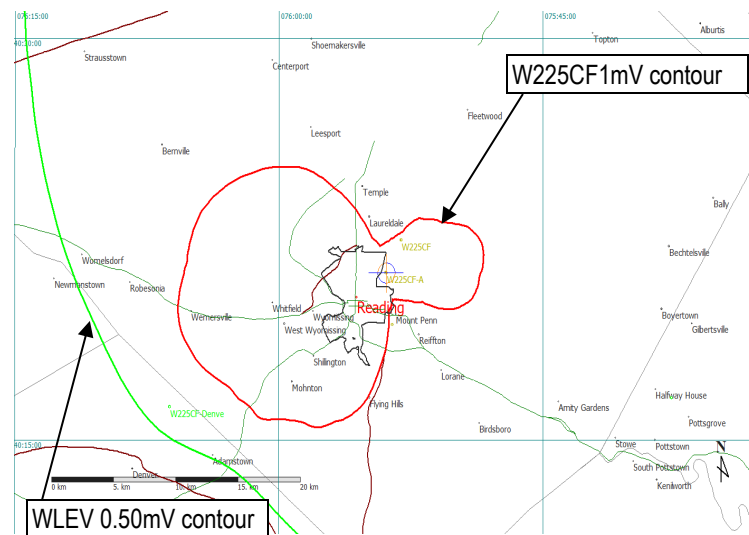
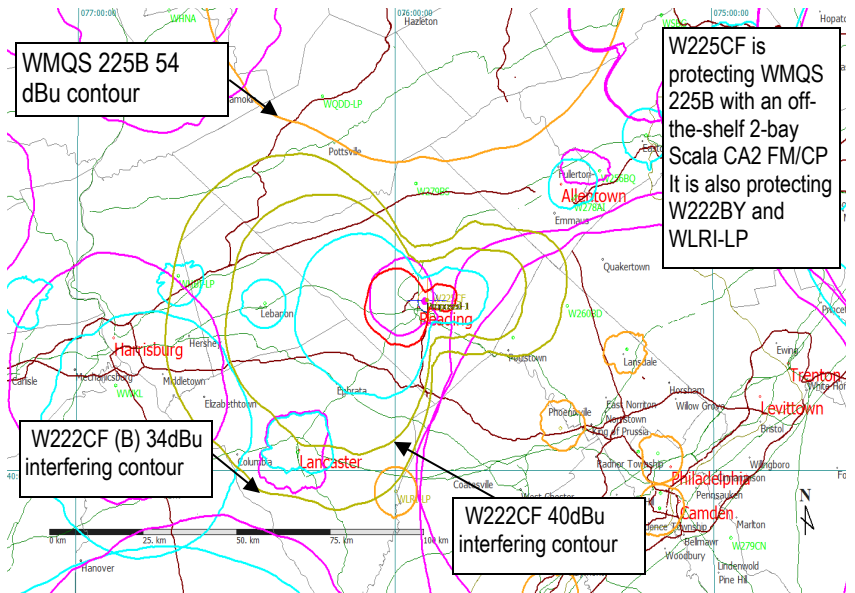
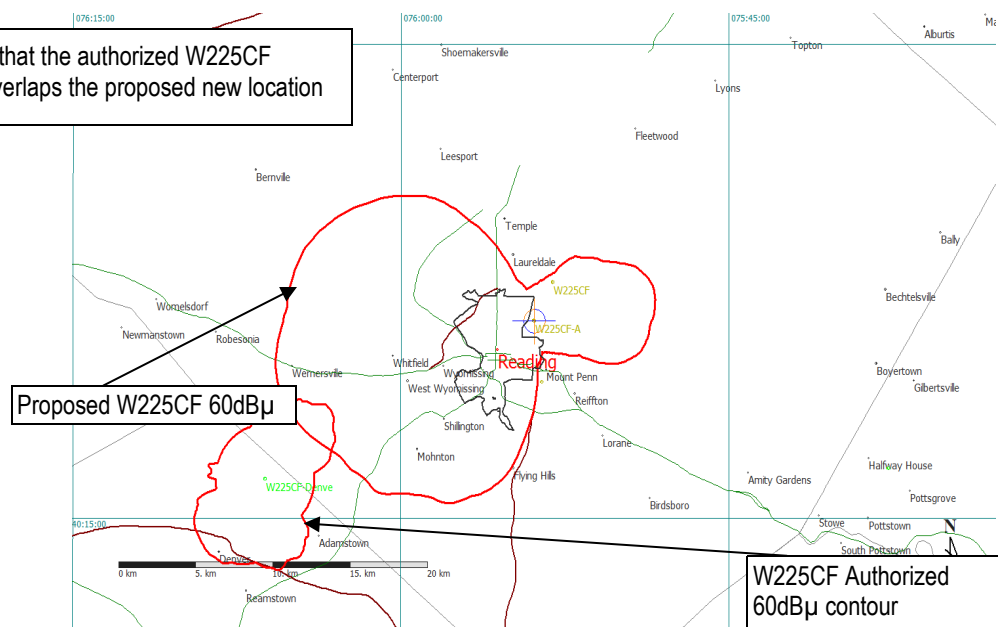


Figure 2: W225CF 1mV service contour vs WLEV 0.50mV service Contour.

Figure 3: Shows that the authorized W225CF 60dBμ contour overlaps the proposed new location



W225CF is protecting WMQS 225B with an off-the-shelf 2-bay Scala CA2 FM/CP. It is also protecting W222BY and WLRI-LP.

WMQS 225B 54 dBu contour

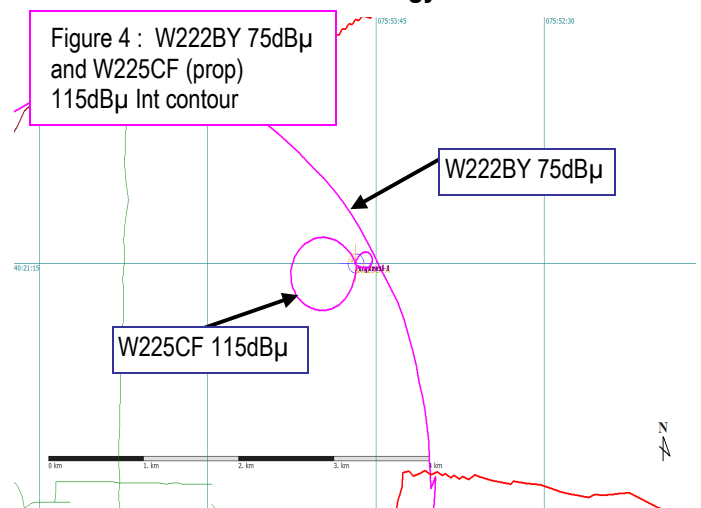
W222CF (B) 34dBu interfering contour

W222CF 40dBu interfering contour

## Desired to Undesired ratio (D/U) studies of W225CF vs W222BY Methodology:

The W222BY 75 dBμ contour encompasses the proposed W225CF location. As shown in Figure 4, the W225CF 115dBμ contour is completely contained within the W222BY 75 dBμ contour. Therefore the worst case scenario for interference is 75 dBμ + 40dBμ =115dBμ.

A spreadsheet was used to calculate the distance to the interfering contour and show the margin of clearance (in dB) at a point two meters AGL. Where the interfering contour reaches near the ground, the table indicates how far from the tower the interference will reach. In the case of W225CF, a two bay, approx 3/4-wave spaced antenna will be employed. The result is that the interfering contour is clear of the ground area with approximately 2 dB to spare. The spreadsheet output is presented as Table 1 (attached).



## Interference Study:

### Terms and Methodology

Max ERP: The power specified in the application, expressed in kW.

Angle below the Horizon: The radiation angle below the antenna's horizontal plane.

Field at Angle: The field supplied by the antenna manufacturer for each Angle below the

ERP at Angle: The ERP for an Angle given Max ERP & Field:

$$\text{ERP@Angle} = \text{Max ERP} * \text{Field}^2$$

Signal at Point: The predicted signal level assuming Free Space attenuation at a point:

$$\text{Signal} = 106.92 - (20 * \text{Log}(\text{Dist}(\text{km}))) + (10 * \text{Log}(\text{ERP@Angle}(\text{kW})))$$

Distance to Point: The radiation path distance from the antenna to a point.

$$\text{DistToPoint} = \text{Antenna Rad Center in meters AGL} / (\text{Cos}(90^\circ - \text{Angle}^\circ))$$

Distance From Tower: The distance from the tower base to a point.

$$\text{DistToPoint} * \text{Sin}(90^\circ - \text{Angle}^\circ)$$

Interference Threshold = Protected station's predicted contour value at a point +40dBμ

Over Threshold: The amount that the Proposal's signal exceeds the interference threshc

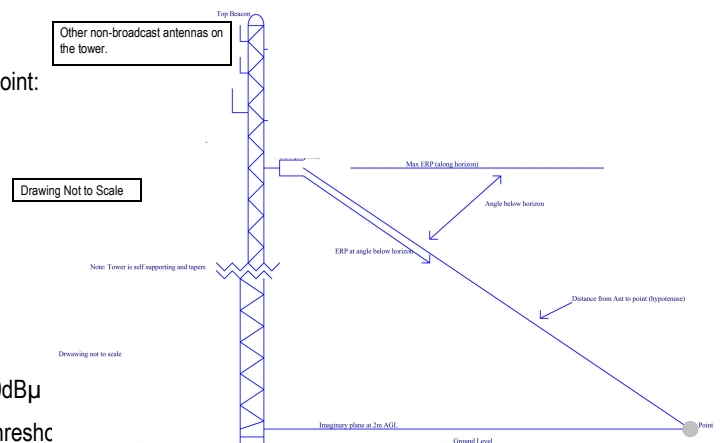
$$\text{OverThresh} = \text{Signal} - \text{Interference Threshold value}$$

**A negative Over Threshold value indicates no interference.**

Notes:

When finding a value for a point two meters above ground, then:  $\text{DistToPoint} = \text{Antenna Rad Center in meters above the plane, not ground} / (\text{Cos}(90^\circ - \text{Angle}^\circ))$ . Subtracting 2 meters from the antenna RC produces the desired result.

Exhibit EE-1, Study 1, tower sketch



**Results:**

Table 1 (separately attached to this application) shows the angle and distance to a point 2meters AGL from the proposed antenna. Table 1 also shows the distance to the interfering contour at 99W.

The field strength is calculated at each end point and compared to the worst case protected contour of W222BY (75dB $\mu$ ). Using the manufacturer's specified field elevation data, Table 1 shows that, at 2 meters above the ground, the interference threshold of 115 dB $\mu$  will not reach any occupied structure or roadway and is clear of the ground by approximately 2 decibels. The interfering contour does not approach the ground at any point. No elevated public roads nor occupied multi-story buildings extend into the zone of interference on any radial. It can be concluded that no interference is predicted to occur to W222BY as a result of this proposal.

## Section VII Engineering Data:

Tech Box Data:

1. Channel: **225**

Primary Station: **FID: 39875**  
**WLEV**  
**Allentown, PA**  
**100.7MHz**

Delivery Method: **Other**

Antenna Location Coordinates: (NAD27):  
**40° 21' 16" N**  
**75° 53' 55" W**

Antenna Structure Registration: **1223885**

Antenna Location Site Elevation Above Mean Sea Level: **335.4 meters**

Overall Tower Height Above Ground Level: **52.5 meters**

Height of Radiation Center Above Ground Level: **37 meters**

ERP:  
**0.099 kW (H)**  
**0.099 kW (V)**

Transmitting Antenna: **Sca CA2 FM/CP or equiv: 2bay, .76 wave spaced.**

Fill-in Translator: **Yes** (see EE-1, Figure 2)

Interference: **Yes**  
Section 74.1204, **Checked**. See EE-1, Figure 1  
Section 74.1205, **Not Checked**.

Unattended operation: **Yes**

Multiple Translators: **Yes**

NEPA: **Yes**. This proposal is excluded from environmental processing: The rf exposure was modeled using "FM Model" for windows (from the FCC website) using a 2-element antenna at a height of 37m. The modeled maximum rf near the base of the tower is 0.33999 $\mu$ W/cm<sup>2</sup>. This is far below 1% of the uncontrolled public exposure limit, so no further processing is required. No changes to structure, lighting, land or water are proposed. Applicant will cease radiating if workers are near the antenna.

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