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WFTV Antenna Pattern Shift with Frequency

In the Construction Permit Certifications section of the construction permit application to which this document is attached, it has been indicated that the proposed WFTV DTV facility does not comply with the condition that it will “not expand the noise-limited service contour in any direction beyond that established by the post-incentive auction channel reassignment public notice.” This document explains the cause for that outcome and also demonstrates that the application does comply with the condition that it does not expand the noise-limited service contour by more than one percent in any direction, as permitted by FCC rules §73.3700(b)(1)(ii)(B).

To enable its change from Channel 39 to Channel 35, WFTV will be using its existing broadband panel antenna on a different frequency than it has used and licensed in the past. It is the nature of broadband panel array antennas that their radiation patterns vary in shape by a moderate amount across the frequency spectrum for which they are designed. Consequently, it can be expected that the radiation patterns of such antennas will differ from one channel to another. That is the case with the antenna used by WFTV and shared with another station. It turns out that operation of the existing WFTV antenna on its new channel using the parameters specified for the station by the FCC in the post-incentive auction channel reassignment public notice results in increases in the contour distances in some directions but never by more than the one-percent expansion in any direction permitted by §73.3700(b)(1)(ii)(B). This document and the accompanying Excel spreadsheet workbook file demonstrate that result. The remaining discussion herein refers to the spreadsheet workbook.

In the spreadsheet workbook, the first tab contains a chart that compares the radiation patterns of the WFTV antenna on Channel 39 (currently licensed and specified in the FCC channel reassignment parameters) and Channel 35 (the channel to which WFTV actually was reassigned). The plot in blue represents the current WFTV radiation pattern on Channel 39. The plot in brown represents the radiation pattern on Channel 35. The differences between the two patterns are most evident in the peaks and nulls associated with the secondary (lower level) peaks that occur between the primary (higher level) peaks in the directions toward which the physical panels are pointed.

The next tab provides comparisons of the contour distances from the transmitter. On the sheet, there are three sets of data, each grouped into four columns. Each column has 360 rows, representing compass bearings every one degree in azimuth. The first group of columns shows the contour distance results from the current Channel 39 operation using the radiation pattern shown in blue on the chart on the first tab. The second group of columns shows the contour distance results from the Channel 35 operation using the radiation pattern shown in brown on the chart on the first tab in combination with the parameters included in the Commission's post-incentive auction channel reassignment public notice.

The third group of columns provides comparisons of the distances to the contour created by the blue pattern and its associated parameters with the distances to the contour created by the brown pattern and its associated parameters at the same azimuthal bearings. The value above the right-hand end of the group is the maximum extension value in percent at any bearing in the comparison. As can be seen, its value is less than one percent at every bearing, meaning that the requirement of the rule limiting contour extensions to one percent in all directions is met by the set of parameters provided by the FCC for WFTV in the channel reassignment public notice.

Given the results just described, it has been shown that the naturally occurring changes in radiation pattern shape between Channels 39 and 35 of the broadband panel antenna used by WFTV will result in some small extensions of the station's contour using the set of parameters given by the FCC for WFTV in the post-incentive auction channel reassignment public notice. It also has been shown, however, that the ensuing shape change of the contour and the corresponding contour extensions meet the requirements of the relevant rules. The construction permit requested based on these considerations therefore should be approved.

(Please note that, for reference, the raw data used in preparation of the chart and the comparisons on the first two tabs are provided on the remaining tabs of the workbook. The antenna pattern relative field data given on the third tab and plotted on the first tab was provided by the antenna's manufacturer – Dielectric. All contour data was obtained using EDX SignalPro software to generate the contour distances based on the charts in §73.699 and the Commission's TVFMFS routine.)