ATDI

LMCC Derated Interference Contours:

Updating Interference Criteria for Greater Spectrum Efficiency

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Software Solutions in Radio Communications

A General Lack of Available Spectrum

It is no secret that the amount of obtainable wireless spectrum in the United States for communications is small and shrinking. As additional services and types of wireless equipment and technologies are brought on-line daily, a premium is placed on the airwaves available for reliable wireless communications.

Two courses of action are currently being employed with the overall goal of greater spectrum availability and efficiency; narrowbanding and updating of overly conservative interference criteria. While narrowbanding is a nationwide initiative heralded by the Federal Communications Commission, the latter course of action, that of updating overly conservative interference criteria, is a course less traveled.

Derating Interference Contours

In June 2012, the Land Mobile Communications Council, or LMCC, approved a set of tables for the generation of adjacent channel interference and service contours with derated values for trunked radio systems in the 150-512 MHz band. The goal of this initiative is to reduce the size of interference contours generated in contour-based analysis when checked for overlap of adjacent channel incumbent station service contours.

The FCC-mandated contour-based interference analysis originally calls for 19 dBµ F(50,10) interference contours for proposed stations and 37 dBµ F(50,50) service contours for licensed stations in the VHF band and 21 dBµ F(50,10) interference contours for proposed stations and 39 dBµ F(50,50) service contours for licensed stations in the UHF band for both co- and adjacent channel interference cases. While the co-channel interference contour values are maintained (19 dBµ and 21 dBµ for VHF and UHF, respectively) in the updated LMCC derated contour procedure, the adjacent channel interference contour values have been modified, yielding smaller contours that more accurately represent the amount of interference possible between different types of radio systems (and thus different emission types) on neighboring channels.

The tables were derived with the assistance of TIA TSB-88.C adjacent channel coupling power rejection values that use common emission designators to calculate the amount of frequency dependent rejection for adjacent channel interference scenarios. The amount of adjacent channel power rejection yields the derated interference contour values that can be seen in the tables that follow:

Table 1: When an applicant seeks a 7Kxx, 8Kxx, or 11Kx emission, the F(50,10) interference contour values to be generated for the proposed station are (values in dBμ):

	6.25 kHz	7.5 kHz	12.5 kHz	15 kHz
4Kxx	49	57	n/a	n/a
7Kxx	36	42	n/a	n/a
8Kxx	41	48	n/a	n/a
11Kx	36	44	n/a	n/a
22Kx	21	19	38	55

Table 2: When an applicant seeks a 4Kxx emission, the F(50,10) interference contour values to be generated for the proposed station are (values in dBμ):

	6.25 kHz	7.5 kHz	12.5 kHz	15 kHz
4Kxx	n/r	n/r	n/a	n/a
7Kxx	59	82	n/a	n/a
8Kxx	75	n/r	n/a	n/a
11Kx	51	73	n/a	n/a
22Kx	28	27	60	n/r

Table 3: When an applicant seeks a 22Kx emission, the F(50,10) interference contour values to be generated for the proposed station are (values in dBμ):

	6.25 kHz	7.5 kHz	12.5 kHz	15 kHz
4Kxx	28	27	46	n/r
7Kxx	21	19	36	50
8Kxx	21	19	40	62
11Kx	21	19	37	46
22Kx	21	19	26	27

The derated interference contour values in the tables above are shown for various combinations, depending on the emission of the proposed station (represented by each row of each table) and on the frequency band and distance of adjacent channel from the channel of interest (represented by each column of each table). VHF channel spacings are 7.5 kHz and 15 kHz while UHF channel spacings are 6.25 kHz and 12.5 kHz. As seen from the tables, the contour-based adjacent channel analysis becomes more granular, but also more complex, yielding a much greater amount of possible F(50,10) interference contour values for a proposed station than the standard FCC rules of 19 dBμ in the VHF band and 37 dBμ in the UHF band.

Contour Generation Tools

Due to the increased amount of combinations and extra degree of complexity in such a derated interference contour analysis, the use of dedicated analysis functions is beneficial to a spectrum engineer or regulator seeking to perform the analysis. The image below displays an example of a LMCC derated interference contour analysis using the ATDI Spectrum-E web application. The function is run after two mouse clicks (selection of interferer and then clicking on the function itself) and only takes several seconds to complete. In this example, all possible interference v. service contour scenarios are shown for a VHF band 22K0 proposed station:

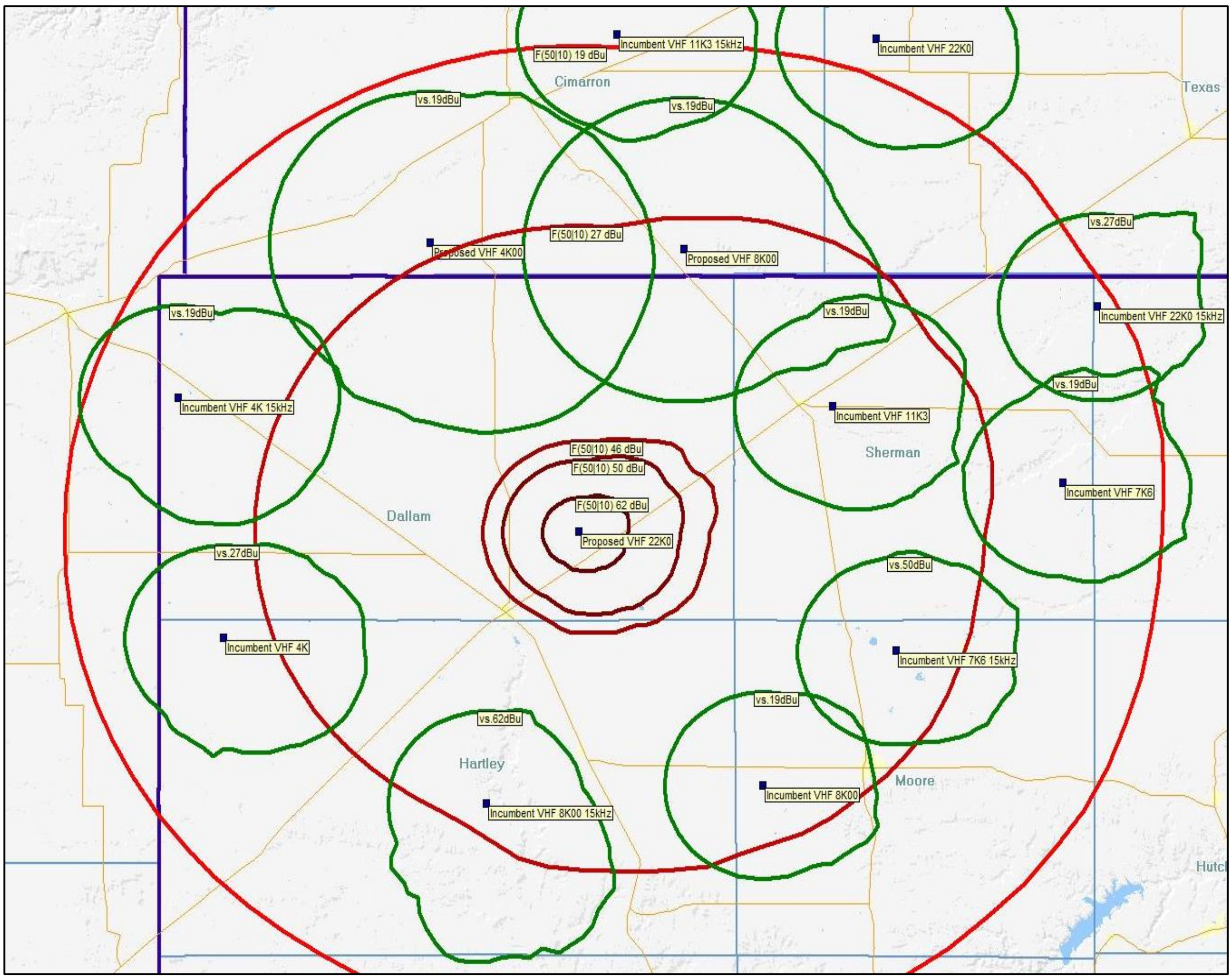

Figure 1: Results of LMCC derated contours function using ATDI Spectrum-E web application

The size of the service contours for the licensed stations is unaltered; they remain at 37 dBµ as is required by the FCC for VHF band F(50,50) service contours. What does change is the interference contours. All possible interference contour values are shown in the figure, along with a label that displays the value used to create that contour. Subsequently, each licensed station service contour has a label displaying which of the interference contours to compare to for overlap.

From the figure above it is apparent that the derated F(50,10) interference contours tend to be many times smaller in size than the standard 19 dBµ F(50,10) interference contour. These derated contours, due to their reduced size, are thus less likely to overlap with the service contours of existing stations. In the example scenario shown, the 19 dBµ F(50,10) interference contour overlaps with all service contours. While the derated 27 dBµ F(50,10) interference contour still overlaps with many of the licensed station F(50,50) service contours, the even smaller F(50,10) interference contours do not.

The smaller interference contours lead to a lesser chance of overlap of the interference contour of a proposed station and the service contour of an adjacent channel incumbent station. Thus, the distances between adjacent channel stations can be smaller allowing for greater efficiency in the use of obtainable spectrum in a region as a greater number of proposed stations can be authorized for operation.

It is in this manner that the LMCC derated interference contours tables aim to update otherwise overly conservative adjacent channel interference criteria at the expense of extra complexity. Dedicated tools and functions may be used to overcome this added complexity.

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