Radar Performance Degradation with In-Band OFDM Communications System Interference

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New technology and innovations are giving rise to novel and diverse wireless systems. Unfortunately, as these systems come to fruition worldwide, the already crowded spectrum becomes even more congested due to the high-speed data links offered by systems like WiMAX and LTE. Spectral crowding is acutely problematic in S-Band (2000-4000 MHz), where favorable propagation characteristics make spectrum attractive to both long-range radar and communication systems. The widespread deployment of 4G cellular systems (for example LTE) has the potential to cause widespread interference with existing radar systems, such as those used for weather surveillance. Ideally, these two systems would peacefully coexist in adjacent bands, but the non-constant modulus nature of 4G OFDM waveforms and the relatively high peak-to-average power ratios can lead to intermittent transmitter saturation, resulting in both in-band and adjacent-band interference to a radar receiver. Their intermittent nature and wide bandwidth make interfering OFDM waveforms difficult to eliminate at the radar receiver. The first instinct when dealing with an interfering signal is often to apply a notch filter in an attempt to mitigate the interfering signal's impact on the system. This talk assesses the effectiveness of this instinctive solution. The impact of OFDM interference on a simulated weather radar system is presented, as well as an assessment of the effectiveness of applying a notch filter to mitigate an interfering OFDM signal. As part of this assessment, radar performance data, probability of detection statistics, and receiver operating characteristic (ROC) curves are presented. This type of assessment will help quantify this first instinct solution and help define the trade space for radar system engineers and spectrum managers when considering interference mitigation techniques. Successful mitigation of both in-band and adjacent-channel OFDM interference should not only improve current radar system performance, but it will also allow mission requirements to be met in a crowded spectrum.