

Electromagnetic Interference to Radar Receivers due to OFDM Communications Systems

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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. The general focus in spectrum engineering in the last couple of decades has been on reducing radar interference with communication systems. Research has explored design modifications of the radar transmitter and transmitted waveforms to be more spectrally efficient. Techniques such as power amplifier pre-distortion have been explored to minimize out-of-band emissions. However, little insight has been gained on the interoperability between radars and communication systems, specifically mitigating emissions at their receivers other than with simple analog solutions such as filtering. A full complement of solutions and a thorough investigation of the difficulties associated with interoperation must be explored to accommodate problems at both the receiver and the transmitter.

Spectral crowding is acutely problematic in S-Band (2000-4000 MHz), where favorable propagation characteristics make the 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 pressure is mounting to open up new spectrum for commercial development and 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.

This paper will focus on examining the performance degradation to radar system receivers from OFDM communication signals such as WiMAX and LTE. Specifically, a simulated S-Band long range weather radar will be subjected to OFDM interference and the performance degradation measured. Notional radar systems using both incoherent and coherent radar processing techniques will be examined.