Can Radar and Communication Systems Harmoniously Co-exist?

Eric L. Mokole,* Consultant
Shannon D. Blunt, University of Kansas

A précis of spectrum congestion among radio-frequency (RF) users will be given, with a focus on the feasibility of harmonious radar-communication co-existence. The RF spectrum, extending from below 1 MHz to above 100 GHz, is a very precious and highly sought resource that is used for a wide range of purposes including communications, radio and television broadcasting, radio navigation, sensing, and countermeasures. Vitally important radar applications include air traffic control, geophysical monitoring of Earth resources from space, automotive safety, severe weather tracking, and surveillance for defense and security. Despite the importance of such radars, spectrum that traditionally has been the almost exclusive province of radars as primary legal users is being fiercely contested worldwide by very lucrative communication systems (especially commercial cellular systems), which provide a tremendous number of services to all strata of society. The incredible proliferation of cellular systems is causing extremely spectrally dense environments.

Some low-level efforts of the past fifteen years to mitigate radar-communication interference will be briefly discussed, and intimations of requisite research and possible ways to achieve spectral harmony are postulated. For example, to mitigate power-amplifier-induced adjacent-band interference, spectrally confined transmit waveforms and hardware for power-amplifier circuits to implement such waveforms were developed in a laboratory setting at the US Naval Research Laboratory. To realize even better interference reduction, efforts at jointly optimizing the physical transmitter and driving waveforms have been investigated in the last five years by Baylor University and the University of Kansas. Very recently, a DARPA program on Shared Spectrum Access for Radar and Communications (SSPARC) has been attempting to achieve harmonious co-existence between these modalities. In addition, NATO's Sensors & Electronics Technology (SET) Panel just completed the four-year Task Group, SET-182 "Radar Spectrum Engineering and Management." The Task Group developed experiments and models that exploit transmitter, receiver, and waveform designs toward more optimal spectrum use.