## A Survey of Research and Development to Enhance the Use of Spectrum

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The past 15 years have ushered in a number of activities by industry, government, and academia to find better ways of using spectrum. An area of contention, for example, has been spectrum sharing between radar and wireless. A number of military air defense and military and civilian air traffic control radars operate in S band (2000-4000 MHz). Within the last 15 years the out of band spectrum splatter by high power radars using cross field tubes, for example has raised concern within the wireless community just above 3500 MHz. What used to be the prevue of spectrum management has now evolved into spectrum engineering, research and development. A 2012 White House spectrum initiative, *"Report to The President Realizing The Full Potential of Government-Held Spectrum to Spur Economic Growth"* has required the Secretary of the US Department of Commerce to immediately identify 1,000 MHz of Federal spectrum in which to implement the new architecture and thereby create the first shared-use spectrum superhighways. Some of this 1000 MHz will come from spectrum that ranges from 3500-3650 MHz where radar has had the primary frequency allocation in the US.

The presentation will discuss the various entities, government, academic and industry, with activities in spectrum research and development. Within the US government a number of spectrum related management and research initiatives have occurred within the last 5 years. For example, a multitude of activities have evolved within the US Department of Defense. Phase I of the DARPA SSPARC involved fundamental research into facilitating sharing among radar and wireless in S band. A summary of that work will be addressed, what was accomplished and what will take place in Phase 2 of SSPARC effort. Academic institutions, such as Baylor and the University of Colorado, have made significant progress in the design of RF power amplifiers that contribute less adjacent channel interference. The progress with these efforts will be discussed and what the future holds. Finally, industry has also had significant involvement. Their efforts to support better spectrum sharing between radar and wireless will be discussed in terms of new components such as RF power amplifiers and supporting solid state devices, filters, measurement systems and equipment as well as smarter antenna systems.