

Abstract For Proposed Paper To The 2003 International Symposium On Advanced Radio Technologies

Proposed Paper Title: Adaptive Spectrum Radio: A Feasibility Platform on the Path to Dynamic Spectrum Access

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Extended Abstract

A new paradigm for managing and allocating the electromagnetic spectrum is now possible due to advances in technology and a receptive environment within regulatory agencies. New radiocommunication technology provides a key component to this possibility as it increases the flexibility for radio transmissions to dynamically adapt and access the spectrum. Such dynamic spectrum access, however, requires revised policies and regulations since traditional spectrum management allocates a band of frequencies to specific services and assigns a single frequency or group of frequencies to specific radios.

In order for the policy community to gain confidence in the possibilities of the new paradigms, the technology developers need to demonstrate the capabilities of the systems that enable dynamic spectrum access. The MITRE Corporation has developed a feasibility radio platform that demonstrates the principles for dynamically accessing the spectrum as it adapts its frequency and modulation to exploit spectrum gaps both in frequency and time. The proposed paper will discuss both a path to demonstrating the technology for the policy community as well as the MITRE developed Adaptive Spectrum Radio (ASR).

Demonstration Path to a New Spectrum Policy

The time for a spectrum policy overhaul is upon us. Government policy initiatives, such as the FCC’s Spectrum Policy Task Force, and private efforts at various “think tanks” indicate that the government regulatory agencies and private sector advisors are seriously reviewing options for spectrum management reform. While traditional economic arguments have been around since Ronald Coase’s seminal paper in 1959, the key factor impelling this current review is recent technological advances.

The proposed paper will review factors necessary to demonstrate the technical principles for dynamic spectrum access and the interrelationship between technical demonstrations and policy changes. One element of this review is the use of prototype systems to investigate

options under consideration by the policy community. Of course, demonstrations are not intended as final indicators of future capabilities, but they do provide a means to explore policy options.

Adaptive Spectrum Radio

The MITRE Corporation, in partnership with its government sponsors, has developed an Adaptive Spectrum Radio (ASR) that provides several of the key functions necessary for dynamic spectrum access:

- Sensing and measuring the electromagnetic environment;
- Identifying opportunities for communications; and,
- Adapting the transmission waveform exploiting the opportunities.

The MITRE ASR architecture, a Software Defined Radio, uses standard DSP and FPGA components, but with MITRE developed software and firmware. The MITRE ASR uses an adaptive form of Orthogonal Frequency Division Multiplexing (OFDM) that exploits spectrum “gaps” through the use of non-contiguous carriers.

While the MITRE ASR provides a feasibility platform, it is not intended as the only radio architecture or waveform for future systems. Rather, its primary benefits are its ability to demonstrate the feasibility for dynamic spectrum access with non-cooperating systems and its availability as a demonstration platform before more advanced systems are developed in other programs, such as those under development in the DARPA neXt Generation (XG) program.

The proposed paper will discuss the ASR architecture and waveform as well as results and findings from its initial demonstrations and its use in showing the possibilities for dynamic spectrum access.

Finally, the proposed paper will briefly discuss future developments both in the path to adopting new policies and the role that technology development plays.