

Challenges and Opportunities for Antennas in Cognitive Radio

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Emerging models for cognitive and software-defined radio often rely solely on abilities to sense and/or adjust operating frequencies. These approaches envision antennas in a very traditional way, assuming either broadband or, perhaps, tunable frequency operation, but nothing more. However, if included early in the system concept and design cycle, new kinds of advanced antennas, including reconfigurable antennas and antenna arrays, promise to deliver a much deeper knowledge of the electromagnetic environment than traditional antenna solutions, as well as a much broader range of capabilities with which to use and leverage this environment to greater effect.

This presentation will first discuss in detail the prevalent assumptions made about antenna capabilities in cognitive and software-defined radio system concepts, including both frequency and radiation characteristics. Some current system concepts in the published literature will be highlighted as examples. Next, some of the ideal kinds of functionality for cognitive and software-defined radios are considered that could greatly expand electromagnetic environment awareness that can be useful in maintaining robust wireless communication connections with these new systems. These include not only frequency operation or tuning over large bandwidths, but also radiation pattern reconfiguration, flexible multiple-input multiple-output antenna configuration, and compact direction finding.



Biography - Jennifer T. Bernhard

Prof. Jennifer Bernhard has been a faculty member in the Electromagnetics Laboratory in the Department of Electrical and Computer Engineering at the University of Illinois since 1999. Her research group focuses on the development and analysis of multifunctional reconfigurable antennas and their system-level benefits as well as the development of antenna synthesis and packaging techniques for electrically small, planar, and integrated antennas for wireless sensor and communication systems. She and her students have published over 200 articles and conference papers in these areas. In addition to the NSF CAREER Award, the IEEE Antennas and Propagation Society H. A. Wheeler Prize Paper Award and other research recognitions, she has been honored with a number of teaching and advising awards. She is a Fellow of the IEEE, and in 2008, she served as the President of the IEEE Antennas and Propagation Society.