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DISSERTATION TITLE: Energy-Efficient Dynamic Spectrum Access for The Next Future Wireless Networks

The rapid development of wireless communication technologies has led to novel applications that require higher system capacity, higher data rate and ultra-low latency. In addition, going toward the next generation of green and cost-saving wireless communication networks requires the efficient use of the limited available spectrum resources while minimizing the energy consumption.

This thesis focuses on an energy-efficient dynamic spectrum access for the energy constrained wireless networks. First, this thesis formulates and solves the optimization problems to minimize the total energy consumption for cooperative spectrum sensing. Then, to cope with the challenge in joint optimization of energy consumption and spectrum utilization efficiency, this thesis proposes a multiobjective optimization solution that helps define a Pareto optimal set of spectrum sensing strategy.

The next challenge after spectrum sensing is how to allocate the spectrums among the users while guaranteeing the required level of quality of service. This thesis defines and models a learning-negotiation cooperative game to find a Nash Equilibrium solution that maximizes the spectrum access benefits while guaranteeing the quality of service requirements.

Finally, this thesis explores statistical modeling and simulation to maximize the spectrum utilization by allowing unlicensed system opportunistically accessing the available spectrum capacity. We show that there is a potential for unlicensed systems to coexist with the licensed system to utilize the spectrum white spaces. We argue that the cooperation between the systems is important to maximize spectrum utilization while guaranteeing the required interference constraint.