

Increasing spectrum-efficiency (SE) as well as energy-efficiency (EE) has attracted much attention recently due to the fact that the future wireless networks need to address the issues of high throughput and low power consumption. However, the objective for optimizing SE sometimes conflicts with the one for optimizing EE, and the methods for improving EE may result in a decrease in SE. In this paper, we consider the SE-EE tradeoff for cognitive radio (CR) networks with cooperative spectrum sensing (CSS). First, we formulate the general problem, and analyze two special cases: the SE maximization problem and the EE maximization problem. The SE and EE are optimized separately via joint optimization of sensing duration and final decision threshold in CSS. Based on the solutions of the two special cases, the general problem for SE-EE tradeoff is solved. Then, we consider the tradeoff of SE and EE from two perspectives: (1) maximizing EE while satisfying SE requirement; and (2) maximizing SE while satisfying EE requirement. Efficient algorithms for sensing strategy design are proposed for each scenario. Finally, we demonstrate the effectiveness of the proposed sensing strategies and illustrate the tradeoff between SE and EE via simulations.