Opportunistic Broadcast Cognitive Radio: Asymptotic Performance

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Abstract

We consider a cognitive radio system where a single secondary transmitter opportunistically broadcasts to n secondary receivers. Asymptotically tight bounds for the secondary throughput are found subject to an interference constraint on the primary. For any finite interference constraint, no matter how small, the secondary throughput scales as $O(\log \log n)$, which is the same as ordinary opportunistic broadcast with no interference constraints. Furthermore, it is shown that the interference may be forced asymptotically to zero while maintaining nontrivial secondary rates. Specifically, for an arbitrary $0 < q < 1$, the interference on the primary can be made as small as $O((\log n)^{-q})$ while the secondary throughput scales as $O((1-q) \log \log n)$.