Interference-aware random beam selection schemes for spectrum sharing systems

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Spectrum sharing systems have been recently introduced to alleviate the problem of spectrum scarcity by allowing secondary unlicensed networks to share the spectrum with primary licensed networks under acceptable interference levels to the primary users. In this work, we develop interference-aware random beam selection schemes that provide enhanced performance for the secondary network under the condition that the interference observed by the receivers of the primary network is below a predetermined/acceptable value. We consider a secondary link composed of a transmitter equipped with multiple antennas and a single-antenna receiver sharing the same spectrum with a primary link composed of a single-antenna transmitter and a single-antenna receiver. The proposed schemes select a beam, among a set of power-optimized random beams, that maximizes the signal-to-interference-plus-noise ratio (SINR) of the secondary link while satisfying the primary interference constraint for different levels of feedback information describing the interference level at the primary receiver. For the proposed schemes, we develop a statistical analysis for the SINR statistics as well as the capacity and bit error rate (BER) of the secondary link.