

In this paper, we consider the multiuser multiple-input single-output (MISO) interference channel where the received signal is divided into two parts for information decoding and energy harvesting (EH), respectively. The transmit beamforming vectors and receive power splitting (PS) ratios are jointly designed in order to minimize the total transmission power subject to both signal-to-interference-plus-noise ratio (SINR) and EH constraints. Most joint beamforming and power splitting (JBPS) designs assume that perfect channel state information (CSI) is available; however CSI errors are inevitable in practice. To overcome this limitation, we study the robust JBPS design problem assuming a norm-bounded error (NBE) model for the CSI. Three different solution approaches are proposed for the robust JBPS problem, each one leading to a different computational algorithm. Firstly, an efficient semidefinite relaxation (SDR)-based approach is presented to solve the highly non-convex JBPS problem, where the latter can be formulated as a semidefinite programming (SDP) problem. A rank-one recovery method is provided to recover a robust feasible solution to the original problem. Secondly, based on second order cone programming (SOCP) relaxation, we propose a low complexity approach with the aid of a closed-form robust solution recovery method. Thirdly, a new iterative method is also provided which can achieve near-optimal performance when the SDR-based algorithm results in a higher-rank solution. We prove that this iterative algorithm monotonically converges to a Karush-Kuhn-Tucker (KKT) solution of the robust JBPS problem. Finally, simulation results are presented to validate the robustness and efficiency of the proposed algorithms.