

A multiple-antenna amplify-and-forward (AF) two-hop interference network with multiple links and multiple relays is considered. In this paper, we optimize the transmit precoders, the receiver decoders, and the relay AF matrices to maximize the achievable sum rate. First, the total signal to total interference plus noise ratio (TSTINR) maximization approach is proposed to approximate the sum rate maximization problem as a lower bound. Under individual user and individual relay transmit power constraints, an efficient alternating direction algorithm is proposed to maximize the TSTINR. Then, we modify our TSTINR model as well as the algorithm to guarantee multiple data stream transmission, by requiring the precoding matrices to have a certain number of orthogonal columns. We propose the stream selection for preprocessing, and prove that the stream selection problem to maximize the sum rate is NP-hard. Simulation results show that our proposed stream selection TSTINR model achieves much higher sum rate compared to the existing model with the same computational cost; the proposed algorithm solves the problems efficiently, and the computation time is significantly reduced.