

This paper proposes a novel multiantenna relay-aided interference management technique that requires limited channel knowledge for interference relay channels, which is referred to as relay-aided space-time beamforming (r-STBF). Using the proposed method, it is shown that $KM/(K+M)$ -multiplexing gain is achievable in a K -user multiple-input single-output (MISO) interference relay channel when the relay has M antennas with a certain type of limited channel knowledge. By leveraging this result, it is demonstrated that the interference-free multiplexing gain of K is asymptotically achievable as M approaches infinity. Furthermore, the proposed r-STBF method is shown to achieve the optimal multiplexing gain of $KL/(K+L-1)$ for a $K \times L$ single-input single-output (SISO) X channel with an M -antenna relay. One major implication of these results is that the use of a relay is beneficial in obtaining the optimal multiplexing gains for relay-aided interference networks even with limited channel knowledge, which bridges the theory-practice gap by implementing advanced interference management methods with less overhead for practical wireless systems.