Defense Announcement

Utilizing Full Duplex Multiple Antenna in Heterogeneous Networks

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Committee Chair: Dr. Zhu Han

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We study the FD transmission in small cell networks. First, we propose a power allocation problem to maximize the downlink capacity and define when the FD transmission outperforms the half-duplex (HD) transmission. Second, we derive theoretical thresholds expressions for the self-interference cancellation, the mutual distance between users and the spatial correlation coefficient between antennas that dominate the switching between the FD transmission and the HD transmission. Third, we study the FD transmission in orthogonal frequency division multiple access (OFDMA) heterogeneous networks. We propose a joint mode selection, user pairing, subcarrier and power allocation problem to maximize the sum capacity. Fourth, we propose a low complexity algorithm to derive the crystallized rate regions in a two-node FD enabled small cell network. Then, we study the FD communication in the massive MIMO networks. First, we propose an optimization problem that determines the optimum users' biasing value that maximizes the sum capacity. Second, we determine the necessary conditions to be satisfied for the FD mode to outperform the HD mode in a massive MIMO setting. Third, we study the trade-off between the DL transmission gain and self-interference cancellation via transmit beamforming. We formulate two rate-maximization problems to optimize both the ratio between transmit and receive antennas as well as the ratio of receive antennas at which the self-interference is cancelled. Finally, In this dissertation, we optimize the performance of the FD communications towards the 5G networks and we validate the performance of the proposed algorithms to define the gains of the FD transmission.