Improved Self-Interference Suppression in Wideband STAR

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Due to increased consumer demand for higher data rates, additional but discontinuous frequency bands will be allocated for commercial use. As a result, only a small percentage of the RF spectrum will be assigned to US departments and agencies. Therefore, communication systems are dependent on these frequencies must be both bandwidth efficient and interference resistant. A well-known technique to better utilize the additional bandwidth is that of using Same Frequency Simultaneous Transmit and Receive (SF-STaR).

SF-STaR allows concurrent use of the transmit and receive to double throughput. However, implementation of SF-STaR requires significant isolation of 90 dB to 120 dB between the transmit and receive signals. To do so, we must 1) cancel interference caused by the transmitter itself that is collocated with the receiving antenna; 2) remove multipath transmitted signals; 3) suppress spurious signals nearby interferers, and 4) cancel noise from the transmit chain via self-interference cancellation (SIC). Notably, SIC must be carried out in the propagation domain, RF and baseband analog domains, and digital domain.

In this paper, we present the *STaRwAARS* (Simultaneous Transmit and Receive with Agile Adjustable Response System) technology to achieve high transmitter to receiver isolation in a full duplex wireless transceiver. All four stages of cancellation will be discussed. The first stage relies on compact dual-polarized antennas that achieve 50 dB isolation across a 1-to-6 GHz frequency band between the collocated transmit and receive ports. To further improve interference mitigation, a multi-pole N-path filter is proposed. This provides an additional 30 dB cancellation by injecting captured transmit signal through N-path filter for cancellation.

Initial prototypes show >70 dB of transmit-to-receive isolation with low cost fabrication. Overall, the architecture is poised to achieve a total >100 dB receive-transmit isolation in a small form factor. The proposed solution realizes a more practical, frequency-tunable, full-duplex radio as compared to conventional N-path circulator systems. Complete system measurements will be presented at the conference.