



Wideband High Isolation Antenna with Self Interference Cancellation (SIC) Filter for Simultaneous Transmit and Receive Radios (STAR)

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Simultaneous transmit and receive (STAR) radios can double spectrum efficiency by allowing transmission and reception of signals across the entire allocated bandwidth to double data rates. The realization of these radios presents challenges as it is necessary to cancel the interference of the coupling between the transmit and receive ports. These may share a single antenna or may have the antennas next to each other. Therefore, it is necessary to cancel the leakage between the ports, and the goal is to mitigate or cancel self-interference by at least 100dB. To achieve this multi-stage high cancellation, we have designed suitable transceiver antennas as well as back-end filters to remove as much as possible the transmitted signal and its harmonics that might have coupled into the receiver circuit paths. Doing so across a narrow bandwidth is straightforward, but achieving the same over a large bandwidth, viz 1GHz, is quite challenging. In this paper, we will present novel antennas and RF filters to achieve ~70dB of cancellation at the RF front end across a 1GHz bandwidth. Further cancellation to reach 100dB can be realized using filtering in the subsequent receiver stages. Notably, the RF cancellations filter serves to generate a copy of the weighted known coupled signal into the receiver and to use it for canceling out from the overall receiver chain [1].

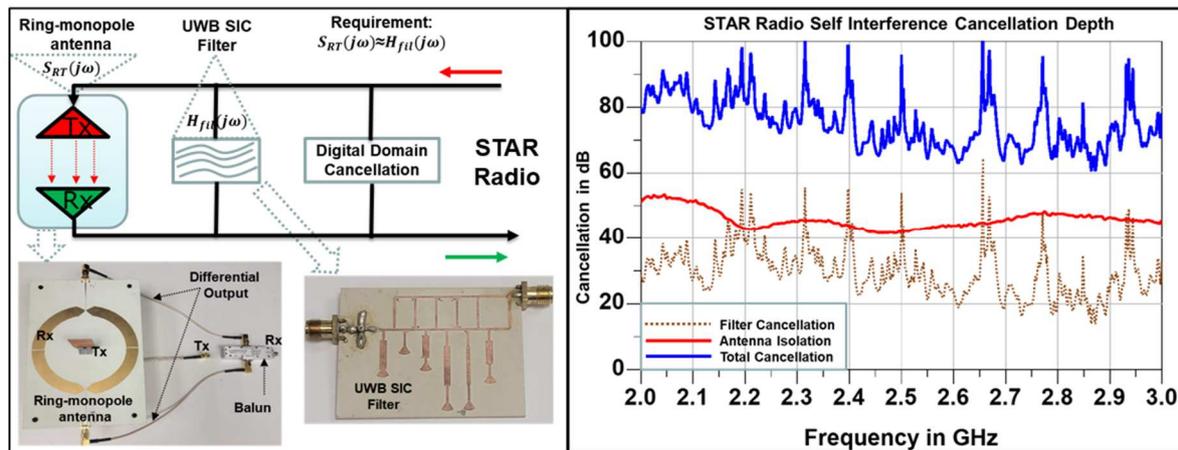


Figure 1. Antenna and interference cancellation filter for STAR radios to achieve high isolation across 1GHz of bandwidth.

Fig. 1 shows the proposed antenna and interference cancellation filter for a STAR radio. This figure shows that the custom-designed antenna consists of a loop and a monopole that generate orthogonal polarizations, and therefore achieve high isolation [2]. The antenna contributes to 45dB of cancellation. Also, the RF cancellation filter behind the antenna adds another 25dB of cancellation. The total achievable cancellation is 70dB across the entire 1GHz band of 2 -3GHz. At the meeting, we will present the design process, as well as simulations and measurements to validate the design.

1. S. Bojja Venkatakrishnan, E. A. Alwan and J. L. Volakis, "Wideband RF Self-Interference Cancellation Circuit for Phased Array Simultaneous Transmit and Receive Systems," in IEEE Access, vol. 6, pp. 3425-3432, 2018, doi: 10.1109/ACCESS.2017.2788179.
2. A. Hovsepian, S. B. Venkatakrishnan and J. L. Volakis, "Active Feed Tuning for Excitation Symmetry in Simultaneous Transmit and Receive Antennas," in IEEE Antennas and Wireless Propagation Letters, vol. 20, no. 1, pp. 3-7, Jan. 2021, doi: 10.1109/LAWP.2020.3033489.