Research and Experimental Verification of RF Distortion Calibration and Self-Interference Suppression Techniques in Multi-Antenna Full-Duplex Systems

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***Abstract*— Complex distortion cancellation methods are often used at the radio frequency (RF) front end of multiantenna full-duplex transceivers to mitigate signal distortion; however, these methods have high computational complexity and limited practicality. To address these problems, the present study explored the complexities associated with such transceivers to develop a practical multistep approach for suppressing distortions arising from in-phase and quadrature (I/Q) imbalance, nonlinear power amplifier (PA) responses, and multipath self-interference caused by simultaneous transmissions on the same frequency. In this approach, the I/Q imbalance is estimated and then compensated for, following which nonlinear PA distortion is estimated and pre-compensated for. Subsequently, an auxiliary RF transmitter is combined with linearly regenerating self-interference signals to achieve full-duplex self-interference cancellation. The proposed method was implemented on a software-defined radio platform, with the distortion factor calibration specifically optimized for multiantenna full-duplex transceivers. Experimental results demonstrate that the method has high potential for enhancing the performance of multiantenna RF full-duplex systems.**

***Keyword*—multi-antenna full-duplex systems, I/Q imbalance, self-interference, power amplifier nonlinear distortion, digital predistortion.**

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