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Self-Interference Suppression for Integrated Sensing and Communication

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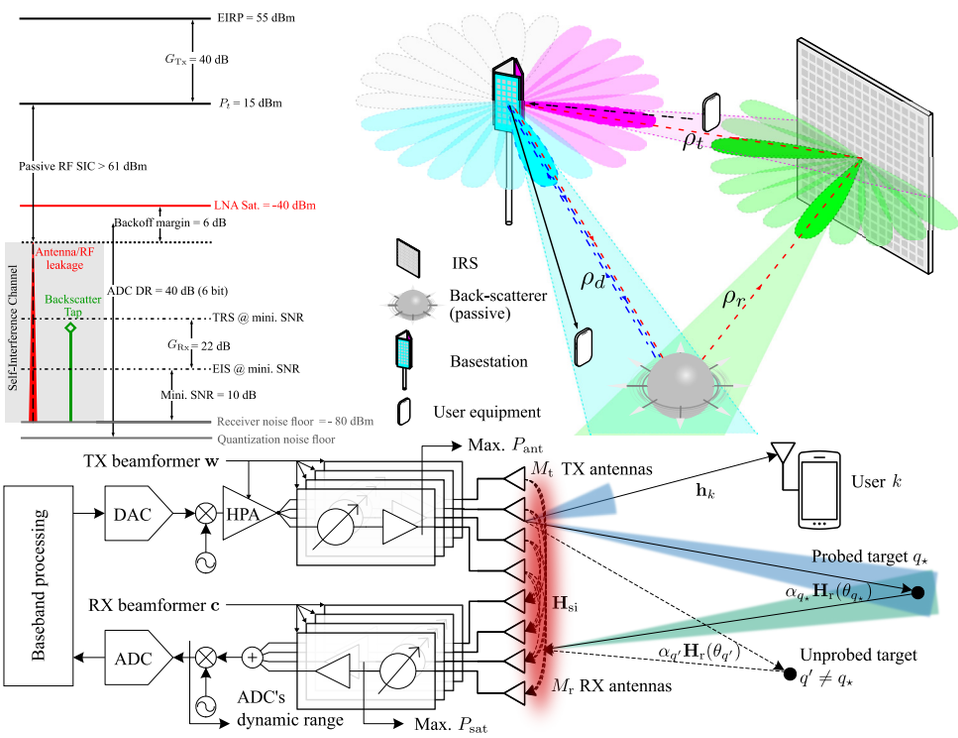
Why is self-interference a challenge for integrated sensing and communication? Which technology enablers can we rely on to overcome self-interference?



Strong self-interference poses problems for integrated sensing and communication along the full signal path, like saturation and desensitization. Intelligent reflecting surfaces can be deployed to alleviate these by creating benign additional echo paths. Alternatively, analog beamforming can be designed to satisfy sensing and communication constraints while canceling the self-interference loop.

KEY FINDINGS

Next-generation mobile networks will incorporate sensing capabilities for mobility, industry, and healthcare. Here, the problem of self-interference remains one main challenge to address for the integration of radar-like sensing alongside broadband communication. While self-interference must be considered along the full signal path, the analog domain represents the weakest link in the chain due to non-linear effects, such as saturation, desensitization, quantization, or low dynamic range. Following the full-duplex paradigm, our research explores ways to realize monostatic sensing over communication waveforms.

Analog and hybrid beamforming architectures can help to mitigate self-interference over the air. A dedicated beamforming design can add up to 30 dB of extra isolation while retaining good performance of simultaneous sensing and communication. Moreover, intelligent reflecting surfaces can be deployed to extend the sensing range or to reduce the hardware requirements.

These techniques, together with other methods like canceller circuits or passive isolation, pave the way for clean digital signals from which high-quality sensing data can be extracted at communication devices.

E. Tohidi, R. Askar, Z. Utkovski, and S. Stańczak, "Full-Duplex Operation of ISAC: Self-Interference Reduction from the Lens of IRS," in GLOBECOM 2023 - 2023 IEEE global communications conference, Kuala Lumpur, Malaysia, Dec. 2023.

R. Hernangómez, J. Fink, R. L. G. Cavalcante, Z. Utkovski, and S. Stańczak, "Optimized Detection with Analog Beamforming for Monostatic Integrated Sensing and Communication," in 2024 IEEE International Conference on Communications (ICC), Denver, CO, Jun. 2024.