FlexICoN: A Self-Interference-Cancelling Full-Duplex Enabling Next-Generation Wireless Communications

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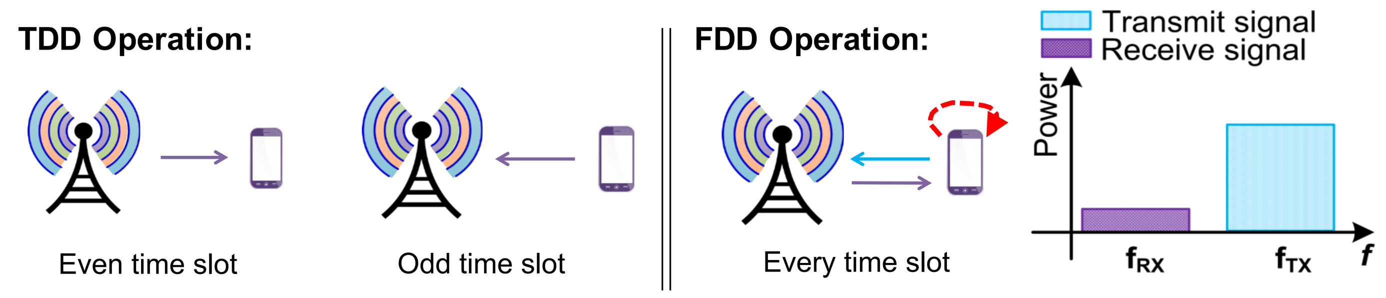
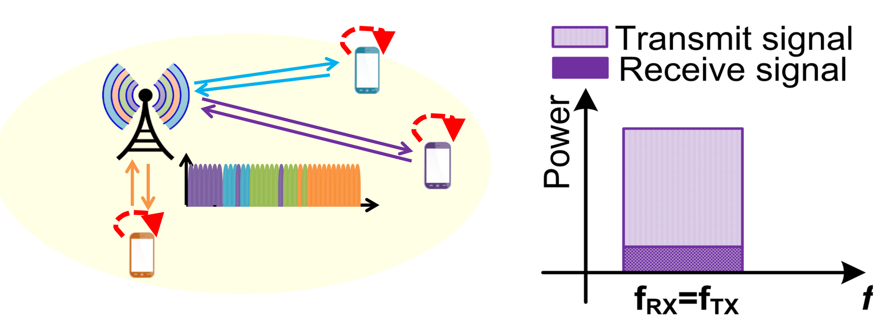
Motivation



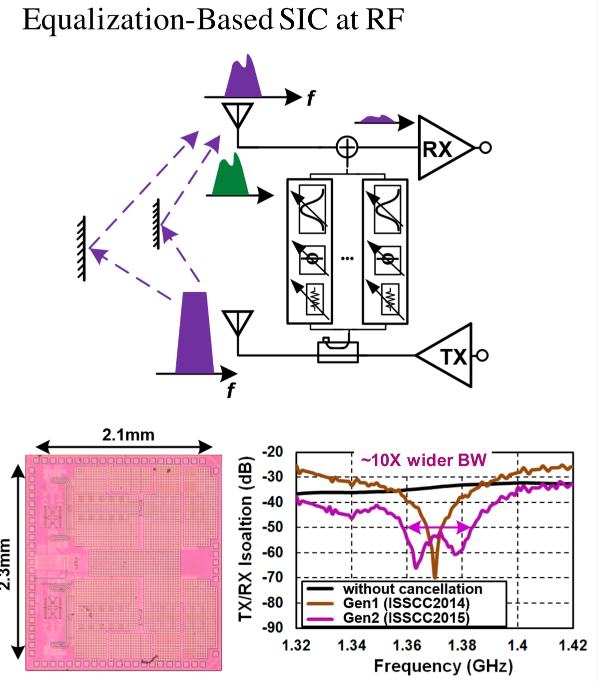


Simultaneous transmission and reception at the same frequency

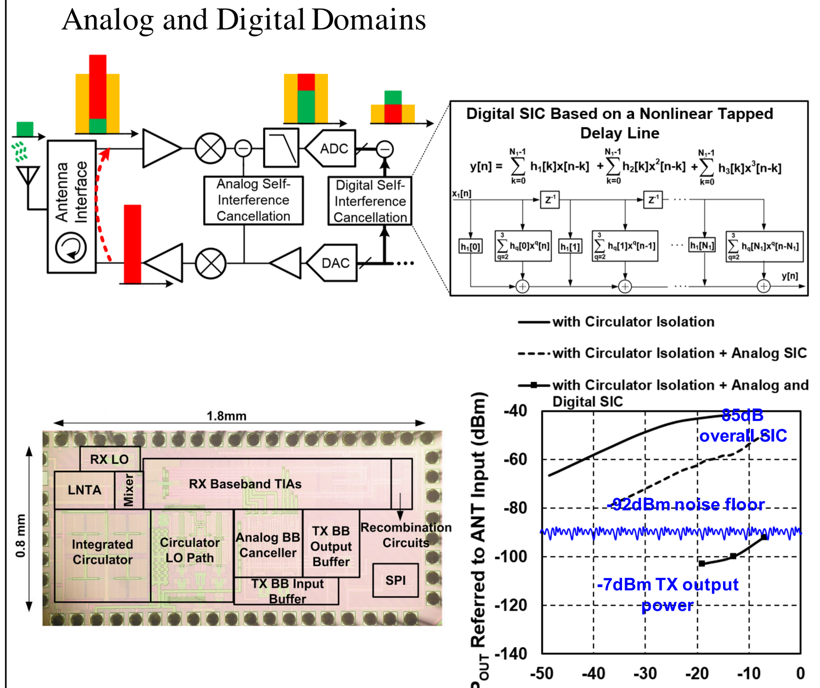
- Significantly improves wireless network throughput
- Enables more flexible use of the wireless spectrum

RFIC Results

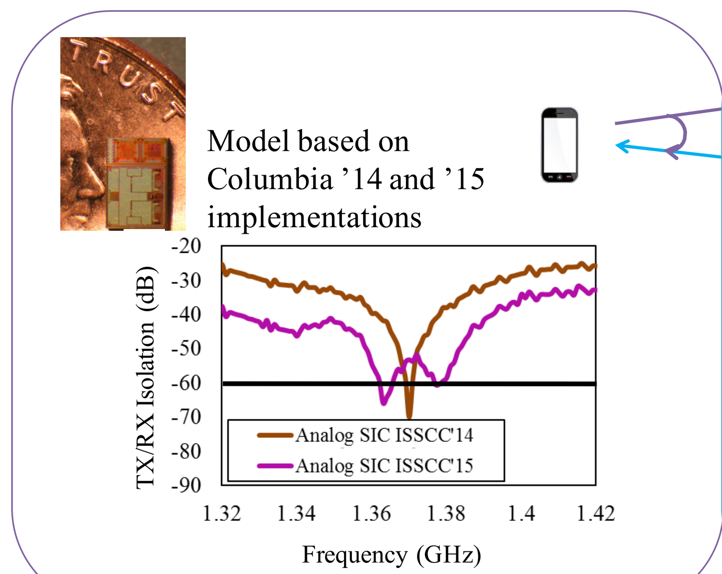
Full-Duplex Radio with Freq.-Domain-Equalization-Based SIC at RF

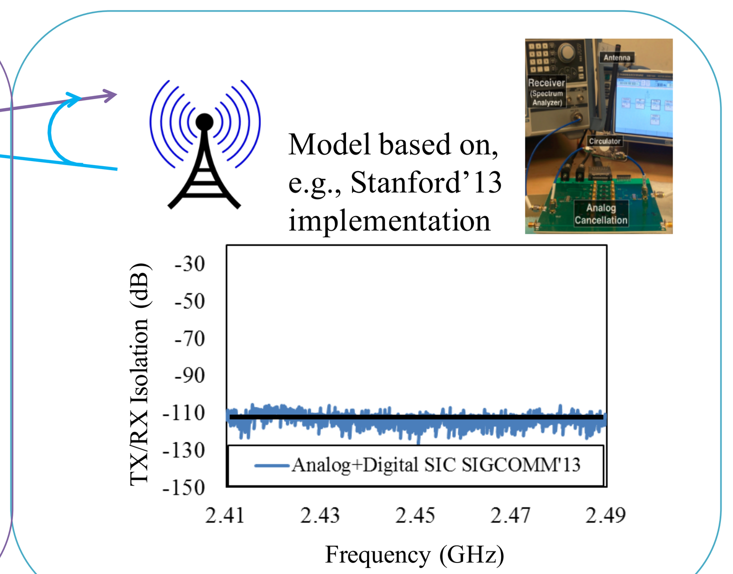


Full-Duplex Radio with SIC Across the Antenna, Analog and Digital Domains

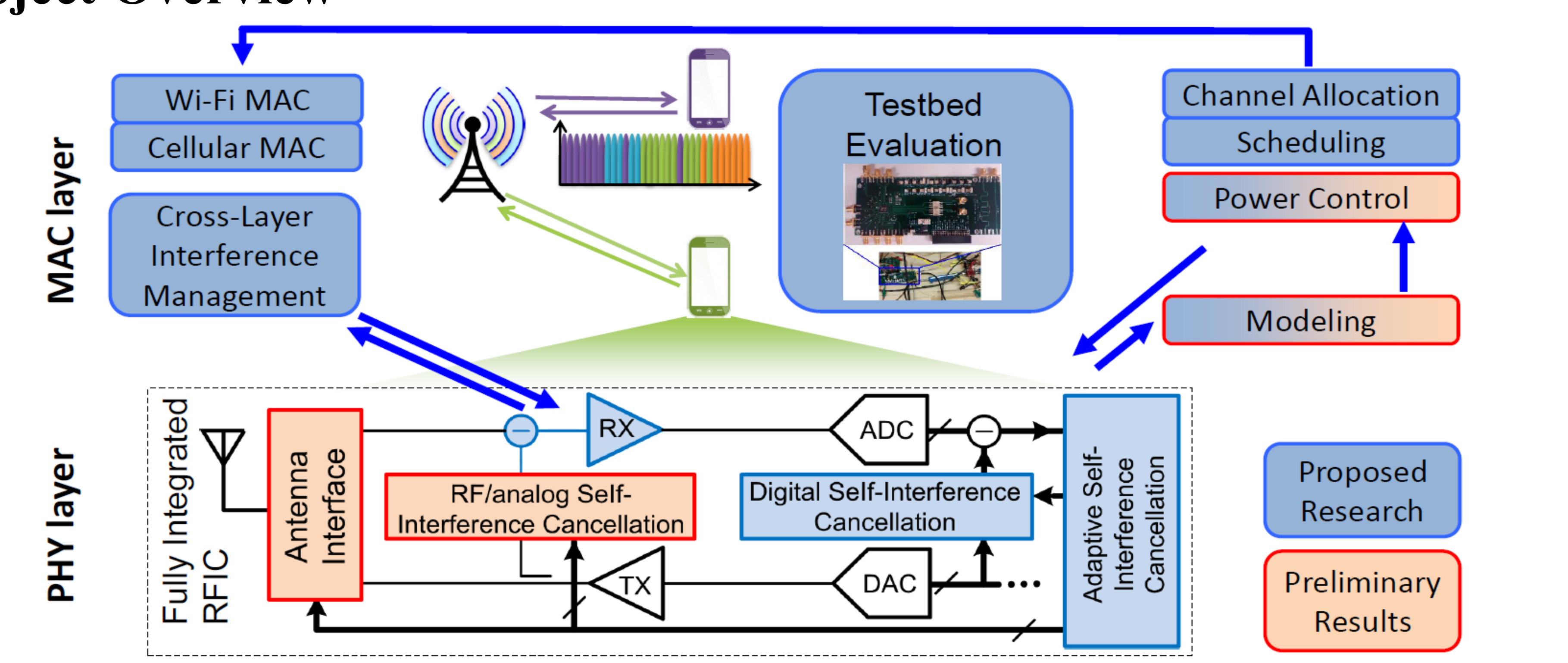


Considering Residual Self-Interference



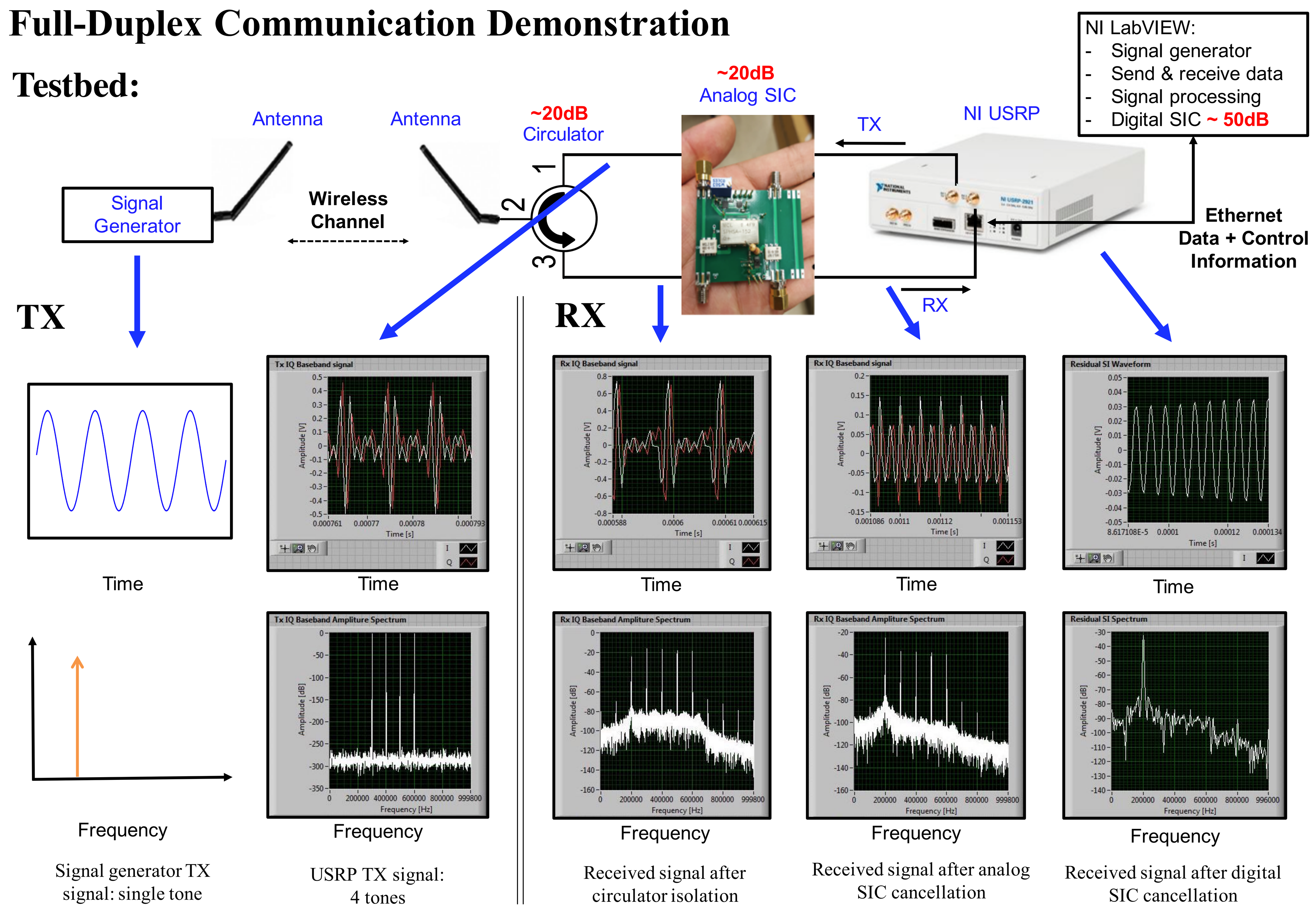


Project Overview



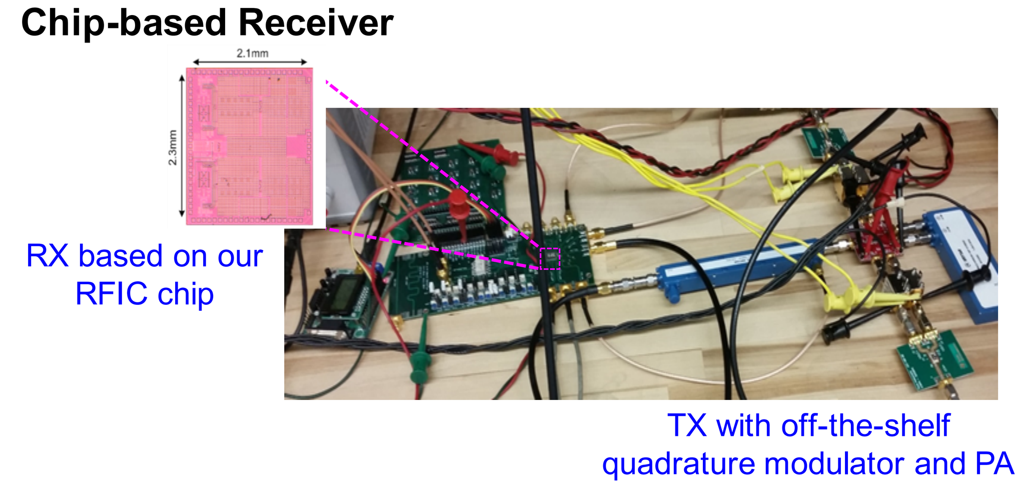
Full-Duplex Communication Demonstration

Testbed:

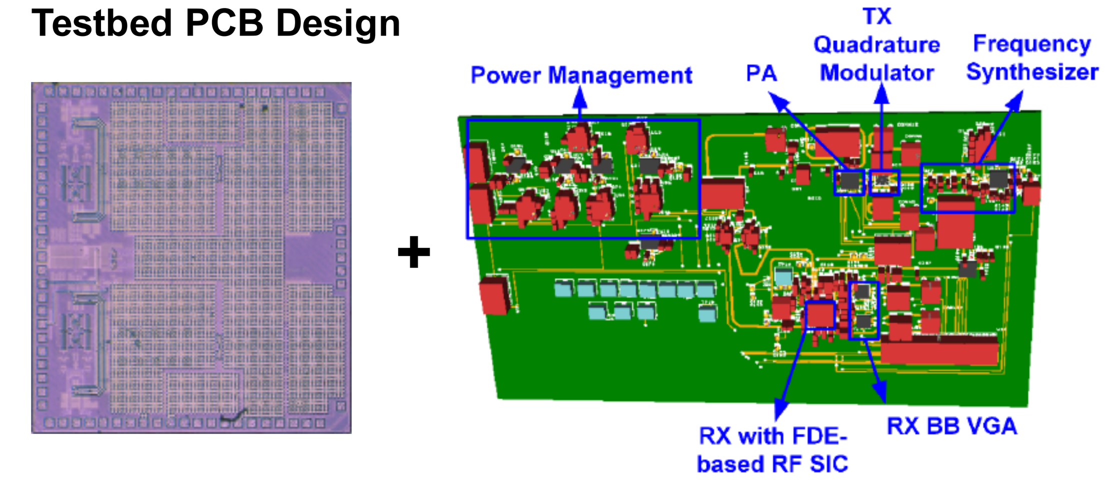


On-going Testbed Development

Chip-based Receiver

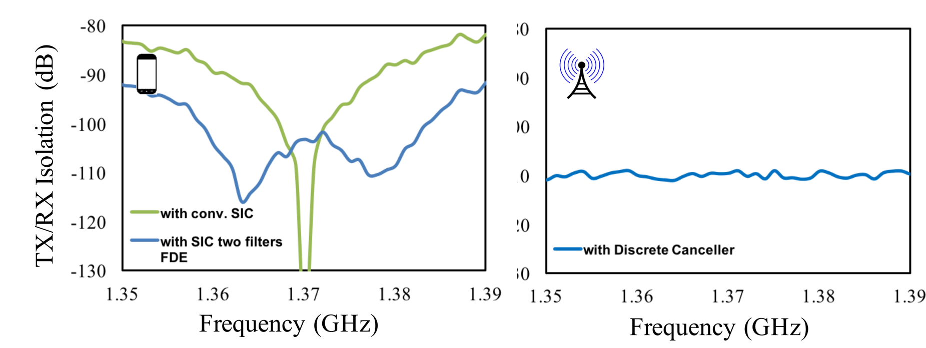


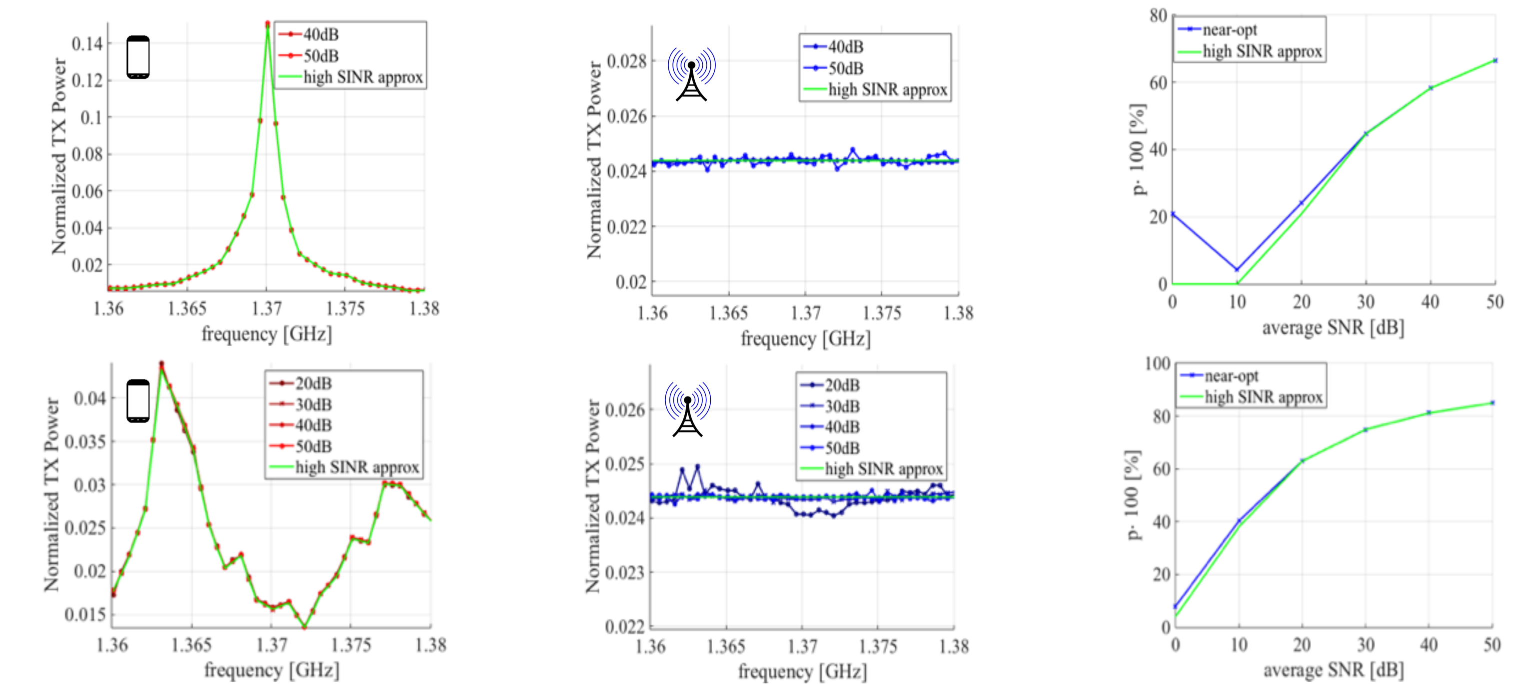
Testbed PCB Design



Power Allocation

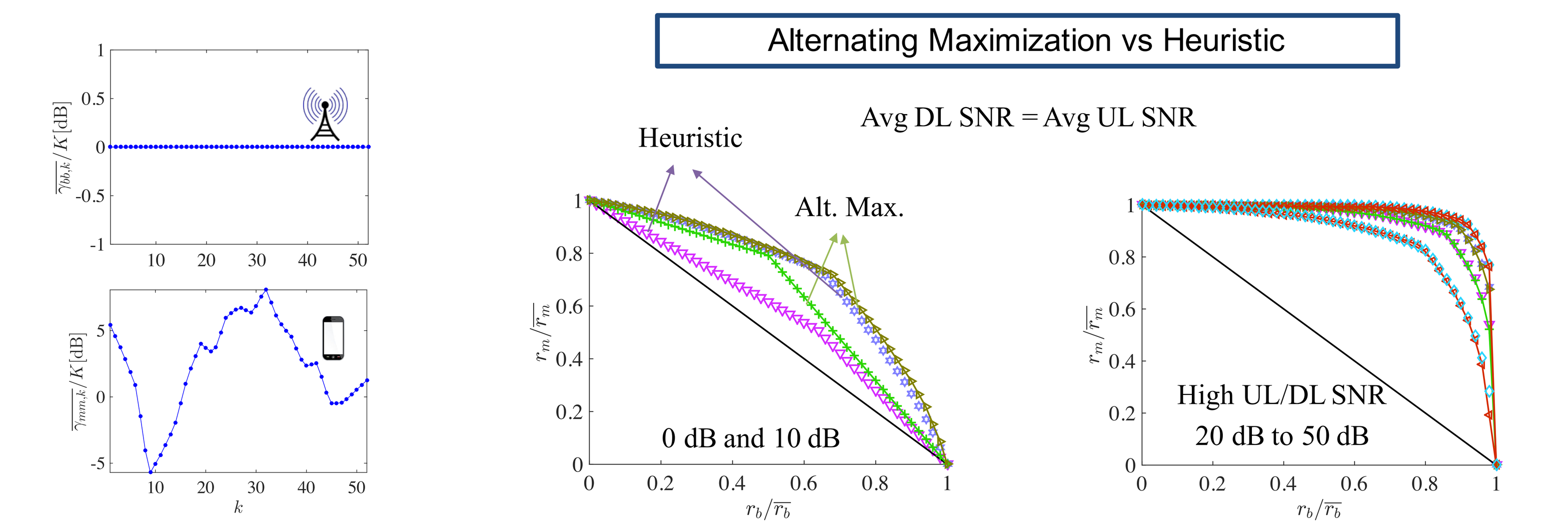
- Near optimal polynomial-time algorithm for general SINR regime
- Near optimal fast algorithm for high SINR approximation
- Measured and modeled cancellation profile





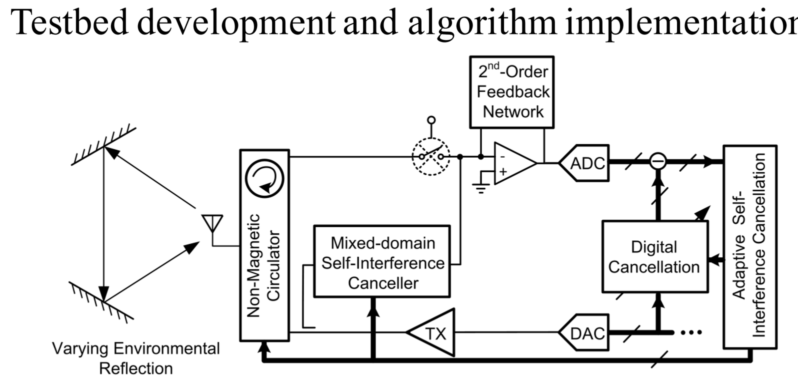
Rate Regions

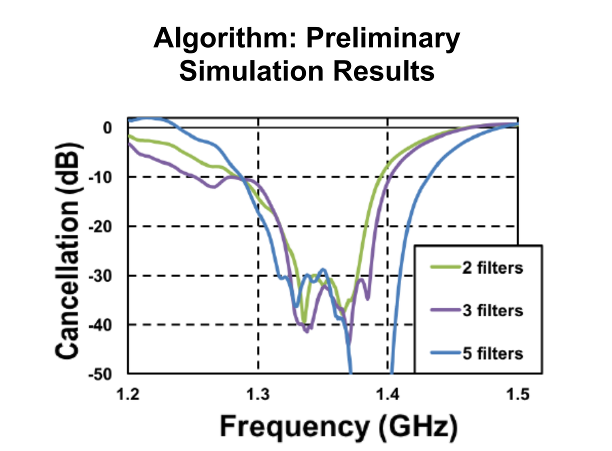
- The problem is non-convex and hard to solve in general
- However, we design an alt. max. algorithm that is guaranteed to converge to a stationary point (a global max in practice)
- We also design a simple heuristic with similar performance



Future Work

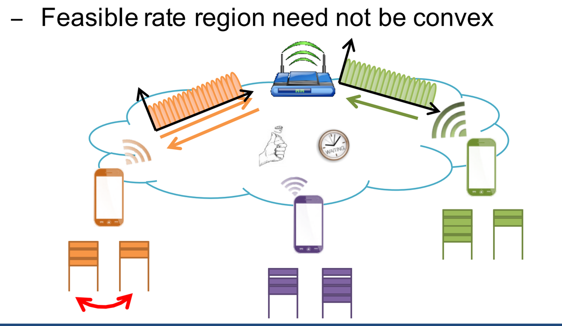
- Adaptive self-interference-cancellation
- MAC layer algorithm design for full-duplex networks
- Testbed development and algorithm implementation





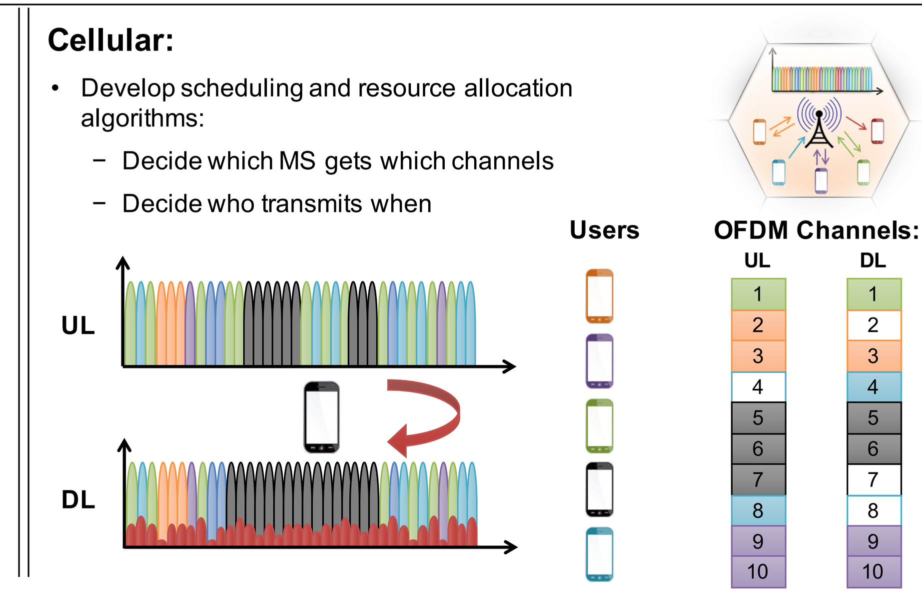
Wi-Fi:

- Design scheduling algorithms that support both half- and full-duplex users
- Design challenges:
  - Full-duplex users are prioritized: how do we guarantee fairness/QoS?
  - Correlation between UL/DL rates
  - Feasible rate region need not be convex



Cellular:

- Develop scheduling and resource allocation algorithms:
  - Decide which MS gets which channels
  - Decide who transmits when



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Poster based on:

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