(SD2021-267) Improving the Range of WiFi Backscatter Via a Passive Retro-Reflective Single-Side-Band-Modulating MIMO Array

Tech ID: 32667 / UC Case 2021-Z08-1

BACKGROUND

Wi-Fi is the most ubiquitous wireless networking technology for IoT in homes, offices, and businesses. Since the power of Wi-Fi transceivers (10s-to-100s of mW) can be prohibitively high for emerging classes of IoT devices (which desire <100µW), recent work has suggested piggybacking baseband signals from the IoT device directly on top of incident Wi-Fi signals generated by access points (APs) via Wi-Fi-compatible backscatter modulation, where as low as 28µW of active power has been demonstrated. However, the major limitation of this approach is range.

TECHNOLOGY DESCRIPTION

To increase range over the present limitation, researchers from UC San Diego developed a design that improves on this. In applications where there is sufficient area for multiple antennas, a second design is also proposed that utilizes a passive MIMO-based approach. Specifically, these two designs are fabricated in a single Wi-Fi-compatible IC that employs: 1) a non-absorbing termination approach that enables fully-reflective SSB backscatter modulation, improving measured gain by 4dB and range to 13m; and 2) an entirely passive MIMO antenna array that steers a directional beam back to the AP in a retro-reflective manner while maintaining SSB operation via an IQ-modulated Van Atta array, improving measured gain by 15dB and range to 23m towards pragmatic adoption in home and office environments.

APPLICATIONS

This technology realizes the benefits of MIMO into a Wi-Fi-compatible backscatter system by leveraging the concept of a Van Atta retro-reflector, which reflects incident waves back to their source in a fully passive manner.

In cases where the Wi-Fi source (for example a cellular phone) is within 5m of the tag, communication to an access point >30m away is possible with the single-antenna fully-reflective termination approach.

INTELLECTUAL PROPERTY INFO

This patent-pending technology improves the state-of-the-art technology of extremely low power WiFi and enables it to work 3x range (30 meters) compared to previous generation. UCSD is seeking companies interested in

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OTHER INFORMATION

KEYWORDS

Radio frequency, Propagation losses, Transceivers, Solid state circuits, Wireless fidelity, Backscatter, MIMO communication, wireless LAN, backscattering tag, single-side band modulation, modulated signals, nonabsorbing termination, Wi-Fi transceivers, IoT device, Wi-Fi-compatible backscatter modulation, piggybacking baseband signals, path loss, Internet of Things

CATEGORIZED AS

- Communications
- Wireless

RELATED CASES

2021-Z08-1

commercial development. Please contact UCSD's Office of Innovation & Commercialization for licensing terms.

RELATED MATERIALS

- M. Meng et al., "12.2 Improving the Range of WiFi Backscatter Via a Passive Retro-Reflective Single-Side-Band-Modulating MIMO Array and Non-Absorbing Termination," 2021 IEEE International Solid- State Circuits Conference (ISSCC), 2021, pp. 202-204, - 01/31/2021

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