



## More for Less: Higher Throughput, Lower Energy Communications Made Possible In Mobile Devices

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**WARF: P160037US01**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new method and device for enhancing MIMO transmission and applications in mobile devices without increasing energy consumption.**

### Overview

In radiofrequency (RF) communications systems such as wireless local area networks (LANs) and 3G and 4G mobile networks, multiple input, multiple output (MIMO) technology has been crucial for achieving high-rate wireless standards.

Compared with conventional single input, single output (SISO) systems, MIMO transmitters increase the amount of data that may be wirelessly transmitted by using multiple antennas to code the same data symbols and allowing parallel transmission of these symbols via different antennae, achieving both diversity and multiplexing gain.

However, while MIMO systems enable higher throughput without added RF spectrum needs, they require additional RF chain components (digital analog converters, filters, amplifiers, etc.), increasing power consumption and making them ill-suited for devices like Wi-Fi-equipped smartphones and ZigBee sensors.

### The Invention

UW-Madison researchers have developed a new device and method that brings the benefits of MIMO systems to energy-constrained mobile devices.

The researchers discovered that they could increase the amount of data wirelessly transmitted to an RF receiver without significantly increasing energy consumption by switching between transmit antennas of an RF transmitter on a sub-symbol basis and by adaptively determining how often antenna switching occurs.

In the new system, a transmitter runs on a single RF chain but switches between multiple passive antennas. A data symbol, consisting of waveform patterns, is broken into parts and sent using the multiple antennas. The index of the antennas may be used to convey extra bits of information on top of the original data symbols being transmitted. The receiver, which may use a single antenna, then deciphers the transmit antenna's index inside each symbol to successfully decode the data signals.

### Applications

- Mobile devices, tablets and smartphones with Wi-Fi capability

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- RF communication systems and data transmission
- ZigBee communication systems

- Internet of Things

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## Key Benefits

- Improves RF communication without additional energy cost
- Reduces reliance on multiple antenna/RF chains
- Enhances efficiency and bandwidth in battery-powered wireless devices

## Additional Information

### Related Technologies

- [For more information about MIMO systems and radiofrequency communication efficiency, see WARF reference number P07056US.](#)

### Tech Fields

- [Information Technology : Computing methods, software & machine learning](#)
- [Information Technology : Networking & telecommunications](#)

For current licensing status, please contact Michael Carey at [mcarey@warf.org](mailto:mcarey@warf.org) or 608-960-9867

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