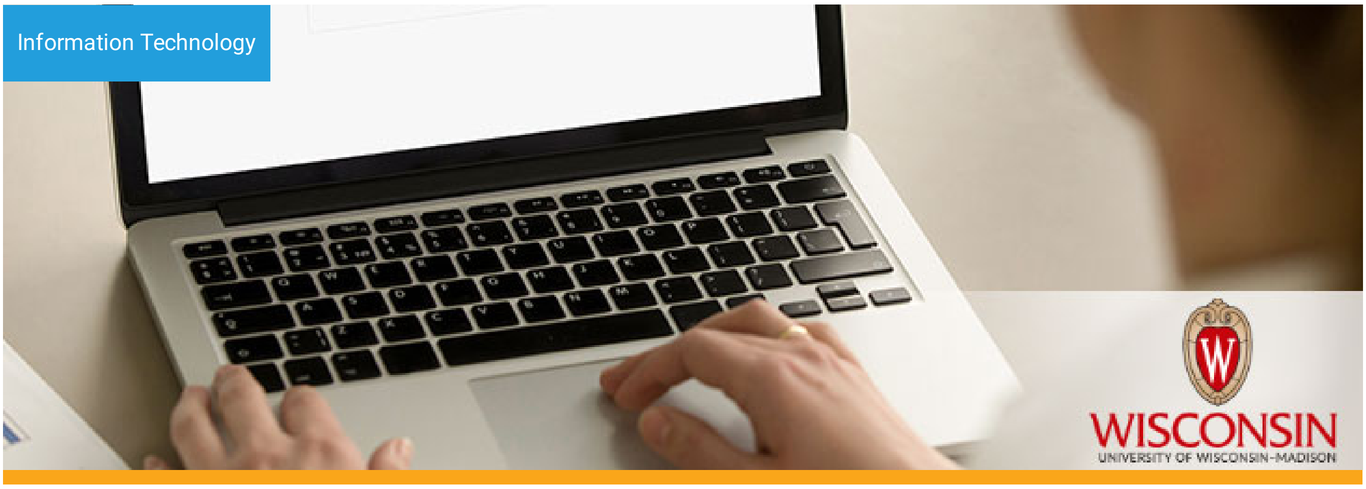

Hybrid Analog-Digital Transceiver for Enhanced Wireless Communications

View U.S. Patent No. 8,811,511 in PDF format.

WARF: P110040US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a hybrid wireless transceiver architecture for improved power, wireless link capacity and bandwidth efficiency.

Overview

The widespread use of wireless communication applications in daily life has resulted in an increased need for power and bandwidth efficiency in emerging wireless transceivers. Two recent technological trends offer opportunities for meeting the increasing demands on wireless capacity. Multiple-input, multiple-output (MIMO) systems exploit multi-antenna arrays for higher capacity by simultaneously communicating multiple signals (“multiplexing”) over multiple data streams. Millimeter wave (mm-wave) communication systems operate in the 60 to 100 gigahertz band, which provides larger bandwidths and allows high-dimensional MIMO operation with relatively compact arrays.

Two competing designs comprise current state-of-the-art systems. Traditional systems that employ continuous aperture “dish” antennas offer high power efficiency, but provide no spatial multiplexing gain. MIMO systems that use discrete antenna arrays offer a higher multiplexing gain, but suffer from power inefficiency. An improved communication architecture that combines the benefits of each design is needed.

The Invention

UW-Madison researchers have developed a hybrid analog-digital wireless transceiver architecture that improves wireless link capacity while providing gains in power and bandwidth efficiency. The improved transmitter system, known as a continuous aperture phased MIMO (CAP MIMO) system, employs a signal processor, a plurality of feed elements and an aperture. The hybrid architecture provides the lowest complexity analog-digital interface.

The system integrates analog and digital processing rather than employing only digital processing. The signal processor is configured to simultaneously receive digital data streams and transform them into analog signals. A number of the digital data streams are selected for transmission to a single receive antenna based on the transmission environment. The feed elements are configured to receive the analog signals, and in response, to radiate radio waves toward the aperture. The aperture is configured to receive the radiated radio waves and radiate a second plurality of radio waves toward the single receive antenna in response. This allows independent data streams for typically disjointed communication modes. The result is an improved wireless communication system with high power efficiency, high wireless capacity and improved bandwidth efficiency.

Applications

- Wireless communication at all spatial scales
- Wireless communication in varied propagation environments from line-of-sight to rich multipath
- Long-range, high-rate backhaul microwave links
- High-rate indoor wireless links such as high-definition television

- Smart base stations for point-to-multipoint network operation
- Emerging wireless systems and standards in the mm-wave and sub THz regimes (60-300 GHz)

Key Benefits

- Improves wireless link performance
- Enhances wireless capacity
- Increases power and bandwidth efficiency
- Improved security due to highly directional operation

Stage of Development

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Additional Information

Related Technologies

- For more information about a method to reduce interference in multiple antenna systems, see WARF reference number P02018US.

Tech Fields

- Information Technology : Networking & telecommunications

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846