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# MAGNET-LESS RING COMBINER AND SWITCHES FOR FULL DUPLEX COMMUNICATION

## HARDWARE, CIRCUITS, & SENSORS

Magnet-less ring-combiner and switch that enables full duplex communication with enhanced form factor and performance optimized for 5G wireless communications.

### TECHNOLOGY TYPE

Communications & Networks
Signal Processing
5G Wireless

### STAGE OF DEVELOPMENT

- Functioning prototypes.

- Matching simulation and measured data.

### IP PROTECTION

Three PCTs filed.

### LEARN MORE

Reference Numbers: U-6332, U-6333, U-6334

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### TECHNOLOGY SUMMARY

Conventional communication circuits are unable to send and receive signals simultaneously, which limits communication throughput. Systems involving magnets are similarly restricted to transmission in a single direction, due to the magnetic field generated by magnets.

University of Utah researchers have developed a magnet-less ring combiner that enables full duplex communication, which provides simultaneous transmission and reception of signals. This combiner is configurable with n-number of ports, while maintaining a smaller overall size, reducing manufacturing costs, and enhancing performance. Combiners can be coupled with various switched output port configurations including a SP3T using a 6-way ring combiner.

### FEATURES AND BENEFITS

- Offers wide operating bandwidth. Design frequency is 5.5GHz & 16.5GHz.
- Handles higher or low power applications.
- Provides high port isolation and low insertion loss.
- Allows monitoring of phase alignment and thermal load dissipation with a common delta port.
- Scales to other frequencies and technologies.

### RECENT PUBLICATIONS

Holzer, K. D., & Walling, J. S. (2017). Magnetless ring circulators for full duplex division wireless communication. *2017 47th European Microwave Conference (EuMC)*. doi: 10.23919/eumc.2017.8230803

### INVENTOR PROFILE

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