



Phased-Array Antenna Concept Reduces Cost, Improves Power Handling

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WARF: P150090US01

Inventors: Nader Behdad, John Booske

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing phased-array antenna technology suitable for demanding commercial and military systems.

Overview

In a phased-array antenna the relative phases of the signals feeding the antennas are varied in such a way that the effective radiation pattern is reinforced in a desired direction and suppressed in undesired directions to provide beam steering. Systems come in different sizes and scales due to several factors such as frequency and power requirements.

The cost of these systems is a significant barrier in the commercial and military wireless industry, and the technology has been relegated to only the most expensive military systems. Due to the high cost, the use of sophisticated phased-array technology is out of reach of most commercial (and even many military) applications that could benefit.

Moreover, the solid-state technology at the core of existing phased-array antennas has inherent limitations in power handling capability, and generates large amounts of heat as a result. Therefore, in addition to cost, present technology is not capable of handling the high-power levels that many commercial and military systems demand.

The Invention

UW–Madison researchers have developed a new concept for designing low-complexity, low-cost phased-array antennas. The design consists of a collimating surface, a feed antenna and a macro electromechanical system (MaEMS) used to dynamically change the properties of the collimating surface. This surface can act in the transmitting mode (a lens) or in the reflecting mode (a reflectarray).

The researchers have explored several MaEMS tuning mechanisms to dynamically change the phase shift gradient and control the direction of the main beam of the antenna. Very small mechanical movements help achieve this tenability and the entire process can be performed extremely rapidly. Most existing solutions try to tune the capacitors.

Applications

- This technology would be incorporated into phased-array antenna systems and replace existing solid-state driven systems or phase shifters.
- Applications include broadcasting, naval, satellite and communications (5G) for both consumer and military uses.

Key Benefits

- Addresses cost and power handling issues
- Eliminates most expensive components (e.g., solid-state transmit/receive modules)
- Capable of handling high power levels without heat problems



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| info@warf.org | 608.960.9850

- Easily scaled to wireless systems operating in millimeter-wave and higher frequencies

Stage of Development

Simulations and modeling have been performed. The researchers predict that phased-array antennas employing the new technology can have scanning rates as high as 1,000-10,000 times per second, making them suitable for demanding commercial and military systems.

Additional Information

For More Information About the Inventors

- [John Booske](#)

Related Technologies

- [WARF reference number P120192US01 describes the researcher's ultrawideband, frequency-selective transceiver lens that could be combined with this technology.](#)

Publications

- [Read a news story about this technology.](#)

Tech Fields

- [Information Technology : Hardware](#)
- [Information Technology : Networking & telecommunications](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

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