UNIVERSITY OF MINNESOTA
Driven to Discover℠

Development of High Gain and High Aperture Efficiency Virtual Element Arrays

A Fabry-Perot Cavity Antenna (FPCA) consisting of a source antenna and a Frequency Selective Surface (FSS) to increase aperture efficiency and antenna gain

IP Status: US Patent Issued 11,515,638

Applications

- 5G wireless communication

Technology Overview

Compact, high-directivity antenna systems are needed for emerging applications like 5G, nano-satellites, Internet of Things (IoT), which have high performance, i.e. high gain and high aperture efficiency. Currently, antenna gain is increased by increasing the number of antenna elements. Unfortunately, the overall size of the aperture increases and due to layout complexity there are increased losses that degrade performance.

Researchers at the University of Minnesota have developed a Fabry-Perot Cavity Antenna (FPCA) consisting of a source antenna and a Frequency Selective Surface (FSS). Critically, the FSS is a periodic arrangement of unit cells with slots that shape the near field radiation to increase aperture efficiency, which in turn increases higher antenna gain. Additionally, multiple aperture arrays split the beam (akin to a "lens") to generate 'virtual' beams. Essentially, this produces virtual antennas. This would lead to improved aperture efficiency and antenna gain, a very compact and simplified design, particularly with virtual antennas that do not require the interconnects for actual antennas, and it can easily integrate with current integrated circuitry.

Phase of Development

TRL: 4-5
Working prototype available

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- Rhonda Franklin Professor, Department of Electrical and Computer Engineering

References

Technology ID

2019-205

Category

Engineering & Physical Sciences/Instrumentation, Sensors & Controls
Software & IT/Communications & Networking

Learn more

1. Dave, A. and Franklin, R(2019) ,
https://ieeexplore.ieee.org/abstract/document/8888386/authors#authors, 2019 IEEE
International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting