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Nonreciprocal Reflectarray Antennas based on time-modulation

Tech ID: 30611 / UC Case 2019-440-0

ABSTRACT

Researchers at the University of California, Davis have developed nonreciprocal and reconfigurable reflectarray antennas based on time-modulation with demonstrated advantages over the state of the art.

FULL DESCRIPTION

Reflectarray antennas are tailored surfaces able to reflect electromagnetic waves coming from a feeder to conform high-gain radiation patterns. Thanks to their advantages compared to parabolic reflectors and phased-array antennas in terms of low-profile and much simpler feeding, reflectarrays have gained significant attention in radar as well as in wireless and satellite communication systems. Even though reconfigurable reflectarrays based on various technologies such as varactors, MEMS or liquid crystals have been explored, they are usually lossy and unable to provide full control of the radiated beam in space. Furthermore, to date, reflectarrays are bounded by reciprocity and thus offer identical response in transmission and reception, which limits their capabilities to deal with strong jamming or unwanted signals.

Researchers at the University of California, Davis have developed nonreciprocal and reconfigurable reflectarray antennas based on time-modulation. To this purpose, each unit-cell that compose the structure is modulated with a very low frequency signal. By adequately controlling the applied modulation, the resulting reflectarrays provide fully reconfigurable responses, polarization control, and nonreciprocal transmission/reception patterns. This low-loss technology offers extended flexibility in primary radar and communication systems as well as unprecedented capabilities to handle interferences and jamming signals without requiring magnetic components.

APPLICATIONS

- ▶ Wireless and satellite communication systems
- ▶ Radar
- ▶ Superior alternative to existing reflectarray antenna technologies

FEATURES/BENEFITS

- ▶ Nonreciprocal responses without requiring magnetic fields
- ▶ Control of the radiation pattern and polarization of a radiating beam
- ▶ Low-loss
- ▶ Planar surface allows for low-profile, low-mass and lower-cost antenna systems

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20210359409	11/18/2021	2019-440

Additional Patent Pending

CONTACT

Michael M. Mueller
mmmueller@ucdavis.edu
tel: .



INVENTORS

- ▶ Alvarez, Alejandro
- ▶ Correas-Serrano, Diego
- ▶ Gomez, Juan S
- ▶ Zang, Jiawei

OTHER INFORMATION

KEYWORDS

Reflectarray,
nonreciprocity, antennas,
time-modulation

CATEGORIZED AS

- ▶ **Communications**
- ▶ **Wireless**

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2019-440-0

University of California, Davis
Technology Transfer Office
1850 Research Park Drive, Suite 100, ,
Davis, CA 95618

Tel: 530.754.8649
techtransfer@ucdavis.edu
[https://research.ucdavis.edu/technology-
transfer/](https://research.ucdavis.edu/technology-transfer/)
Fax: 530.754.7620

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