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Author: Dr. Jiao-rong Fan
China Academy of Launch Vehicle Technology (CALT), China

PRINCIPLE, METHOD AND REALIZATION OF ORBITAL ANGULAR MOMENTUM MICROSTRIP ANTENNA BASED ON VORTEX METAMATERIALS

Abstract

Abstract: As the demand of communications capacity has increased dramatically, the transmission rate and channel bandwidth have become bottlenecks in the development of wireless communication technology. Due to the good orthogonal characteristic, vortex electromagnetic wave can provide an infinite range of possibly achievable OAM states as information carriers for multiplexing, and greatly promoted spectrum utilization efficiency and communication capacity. The generation of different OAM-carrying vector beams with OAM charge number and polarization order is crucial for many applications in free-space information transfer and communications. On the one hand, the functions of multiplexing and demultiplexing have resulted in massively complex antenna multiplexing system. On the other hand, it is still hard to solve the issues of the multi-mode OAM beams in divergent directions. The implement of the multiplexing, directional high gain antenna is an advanced technology urgently needed for the improvement of OAM wireless communication. Owing to their dispersion and polarization response, metasurfaces have the potential to tremendously increase the integration of communication devices. This report presents a novel active method to achieve high -directivity vector beams microstrip antenna through Fabry-Perot cavity-coupling double-layer nanoantenna. This is achieved from the vortex metameterials and the zero index metamaterial back reflector plane with a dielectric specer. Such cavity-antenna components are employed to meliorate the beam orientation, and enhance the directivity of the OAM array via strong multiple reflections. This is achieved from periodic patterns of plasmonic resonant nanocavities in free-standing capped-pillar nanostructure arrays. We would focus on solving the key challenges in the development, design and manufacturing of metamaterials, the processing technology and integration of microstrip antenna components. The presented idea and technical solution would span a new era in orbital angular momentum wireless communication for multiplexing transmission.

Key words: Metamaterials-based optical integrated devices; Multi-mode vortex beams; zero index; Microstrip antenna; Fabry-Perot cavity