

Design of Reconfigurable and Non-reciprocal Metasurface with Independent Controls of Transmission Gain, Attenuation and Phase

Authors : Shi Yu Wang, Qian Wei Zhang, He Li, Hao Han He, Yun Bo Li

Abstract : The spatial controls of electromagnetic (EM) waves have always been a research hot spot in recent years. And the rapid development of metasurface-based technologies has provided more freedoms for manipulating the EM waves. Here we propose the design of reconfigurable and non-reciprocal metasurface with independent controls of transmission gain, attenuation and phase. The proposed meta-atom mainly consists of the cascaded textures including the receiving antenna, the middle layer in which the power amplifiers (PAs), programmable attenuator and phase shifter locate, and the transmitting antenna. The programmable attenuator and phase shifter can realize the dynamic controls of transmission amplitude and phase independently, and the PA devices in the meta-atom can actualize the performance of non-reciprocal transmission. The proposed meta-atom is analyzed applying field-circuit co-simulation and a sample of the meta-atom is fabricated and measured under using two standard waveguides. The measured results verify the ability of the independent manipulation for transmission amplitude and phase of the proposed the meta-atom and the design method has been verified very well correspondingly.

Keywords : active circuits, independent controls of multiple electromagnetic features, non-reciprocal electromagnetic transmission, reconfigurable and programmable

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