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Dual Band Shared Aperture Multimode OAM Multiplexing Antenna Based on Reflective Metasurface

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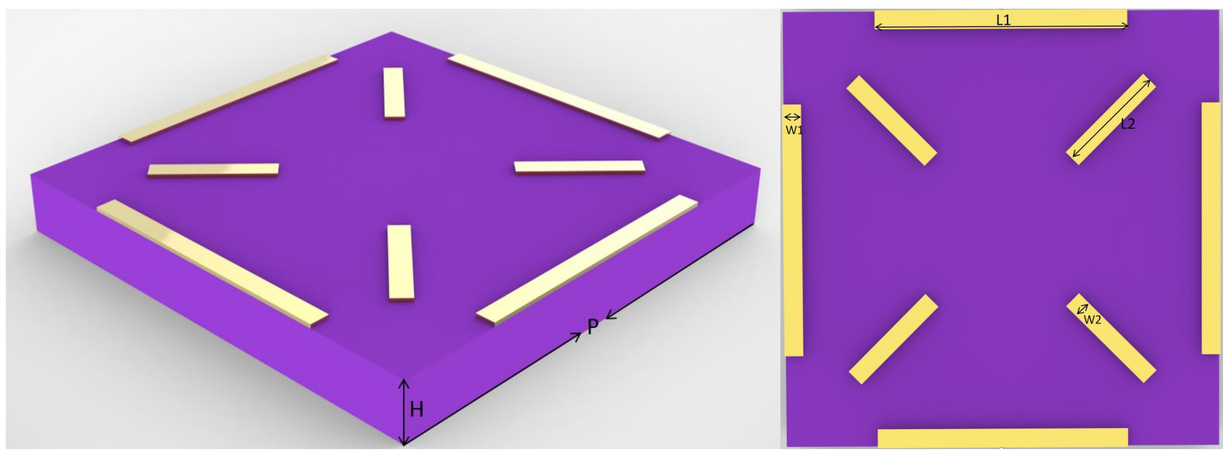
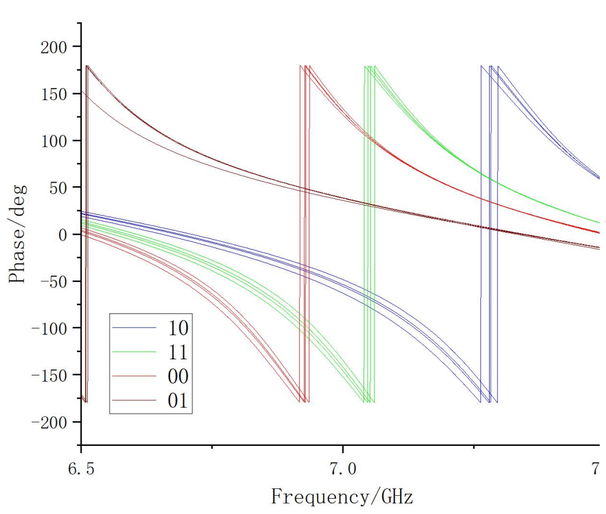
INTRODUCTION

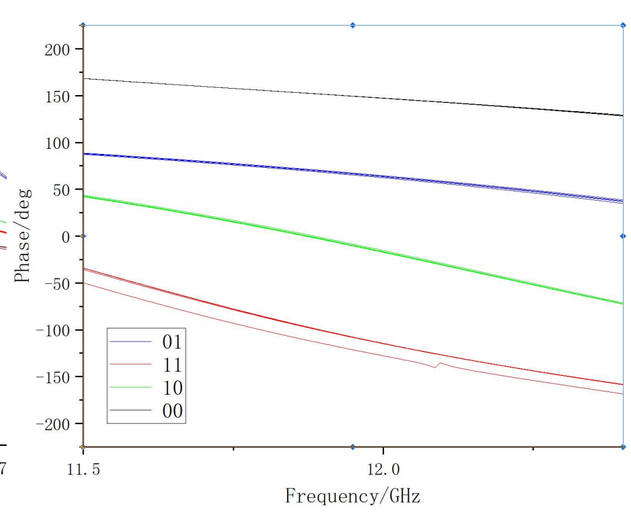
In this paper, a novel single-layer dual-band orbital angular momentum (OAM) multiplexed reflective metasurface array antenna is proposed. We first design a metasurface that can achieve nearly 360° phase coverage of dual frequencies at 7 and 12 GHz, and we realize a 2-bit coded metasurface cell by obtaining the appropriate geometrical parameters through simulation and optimization, and then we obtain a 30 × 30 reflective metasurface array by calculating the position of each cell in the array from the feed source. Afterwards, the corresponding phase compensation and the phase gradient required for specific mode OAM beam generation are calculated from the position of each cell in the array, and a 30×30 reflective metasurface array is obtained, which can generate l=-1 mode OAM beams in the C-band and l=+2 mode OAM beams in the Ku-band, and can accomplish the flexible beam control in each operating frequency band.

METHOD

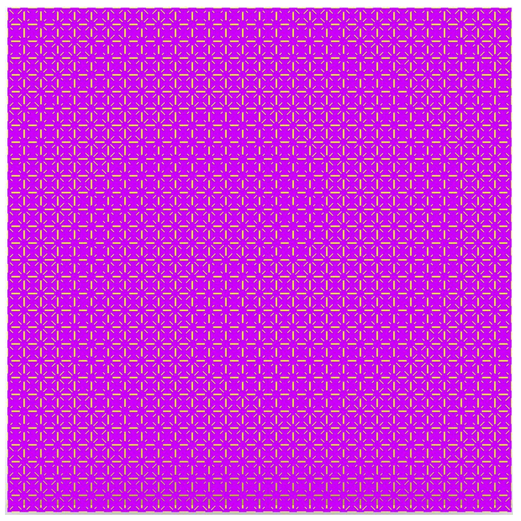


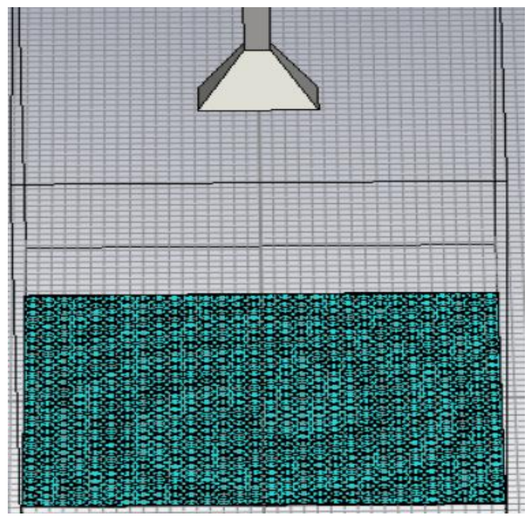
Frequencies [GHz]	parameters	Coding states with geometric parameters			
		00	01	10	11
7	L1(mm)	6.12	6.6	5.72	5.98
12	L2(mm)	4	1.9	3	3.32

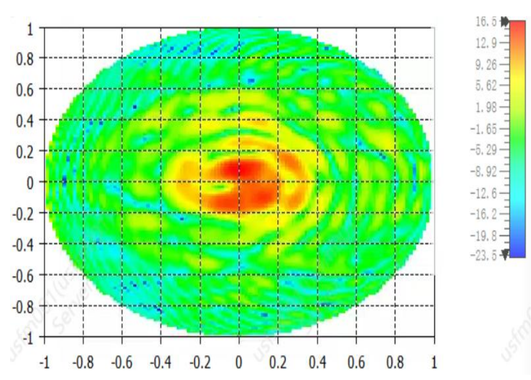


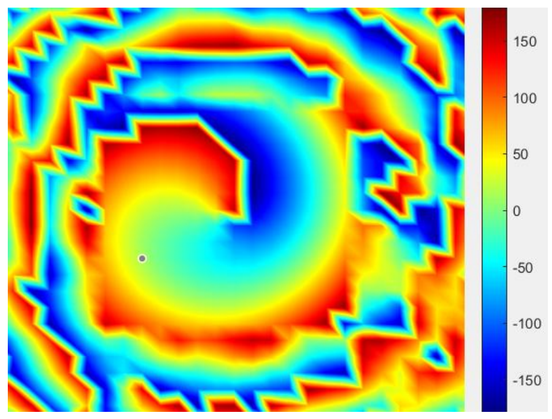


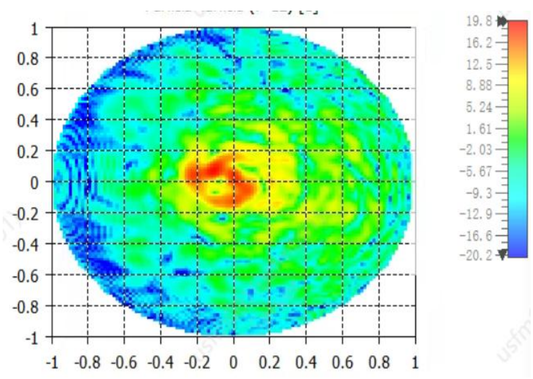
RESULTS

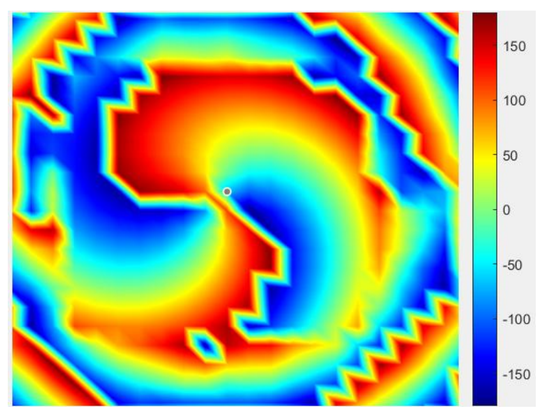












CONCLUSION

The simulation results demonstrate that this OAM multiplexed reflective array antenna based on the programmed metasurface has the excellent performance of independently controlling the reflected electromagnetic waves without affecting each other in the C and Ku bands, and generates dual-band multimode OAM multiplexing, which is conducive to the realisation of more transmission frequency bands and larger channel capacity in communication.

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