

# A Novel Dual-band Reconfigurable Frequency Selective Surface

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**Abstract**—Based on the switch active frequency selective surface beam reconfigurable antenna, an AFSS design structure with single double frequency switching characteristics is obtained by loading PIN diodes on four feet of the deformed cross structure. The structure improves the polarization stability and angle stability, and provides a new design idea for FSS in complex electromagnetic environment.

**Keywords**—Active frequency selective surface; PIN diode; Single double frequency switching

## I. INTRODUCTION

The frequency selective surface is a single or multilayer structure which is arranged periodically by the resonant unit on the medium layer. Therefore, the designer can design different electromagnetic parameters to regulate electromagnetic wave transmission according to demand. With the rapid development of communication technology, the traditional frequency selective surface has no ability to meet the needs, therefore, the new functional features of the FSS has become the current research focus [1]-[3]. By adding active devices (such as PIN diodes and capacitive diodes) to the traditional frequency selective surface, and adjusting the control material, a controlled spatial filter with frequency selective characteristics, known as active FSS or active grid array, can be obtained [4]-[6]. The active frequency selective surface can change the resonant frequency according to the need and can adapt to the external environment, which will be more conducive to meet the current complex electromagnetic environment engineering requirements [7].

Based on the resonant principle of frequency selective and the configurable antenna of switched active frequency selective, an AFSS design structure with the characteristic of single double frequency switching is proposed. The function of single double frequency switching is realized by adjusting bias voltage to control the pass of pin diode.

## II. THE FSS STRUCTURE AND DESIGN

As shown in Figure.1, the dielectric uses a dielectric constant of 4.4, a positive tangent loss of 0.02, a thickness of 0.6 mm as well as a length and width of  $30\sqrt{2}$  mm of FR4\_epoxy.

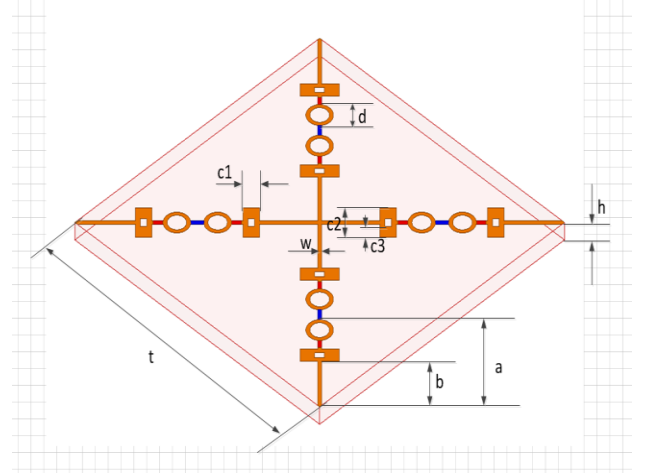


Figure. 1

Parameters as shown in table 1 below:

TABLE I.

Parameters	a	b	c1	c2
Value	14.2mm	7.4mm	2mm	4.8mm
Parameters	c3	d	w	
Value	1.8mm	3.4mm	0.5mm	

## III. RESULT AND DISCUSSION

For the structure designed in this paper, the red part is inductance,  $L = 40nH$ , and the blue part is PIN diode, whose resistance value is  $R = 3\Omega$ . Figure.2 and Figure.3 are the simulation results of the structure in the different states. It can be seen that when PIN diodes are connected, a band is created, and when pin diodes are in disconnection, a second band is created at a lower frequency.

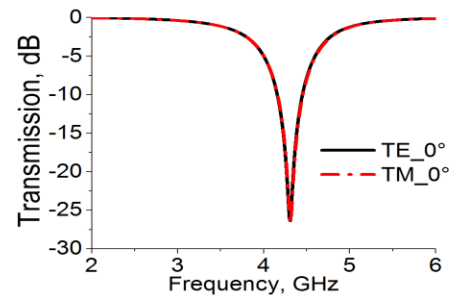


Figure. 2 Transport characteristics in on state

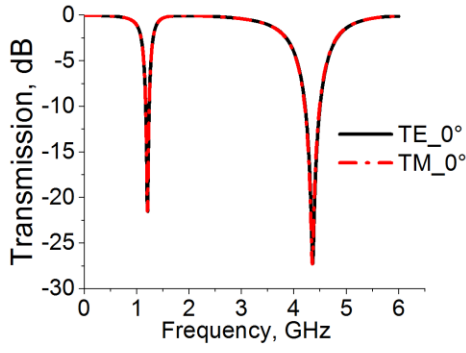


Figure. 3 Transport characteristics in off state  
The transport coefficient curves of TE and TM at the range of  $0^\circ \sim 70^\circ$  are simulated in the different states respectively, The results of the simulation are shown in Figure .4 and Figure .5.

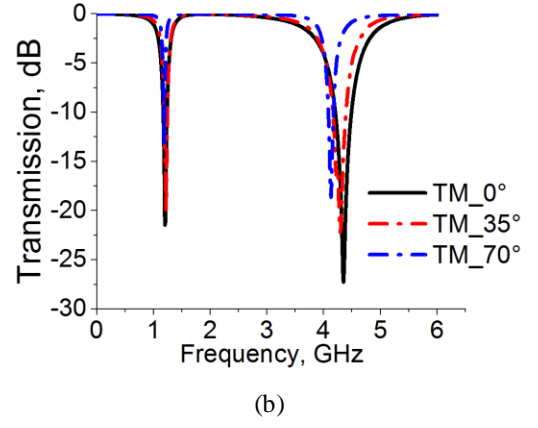
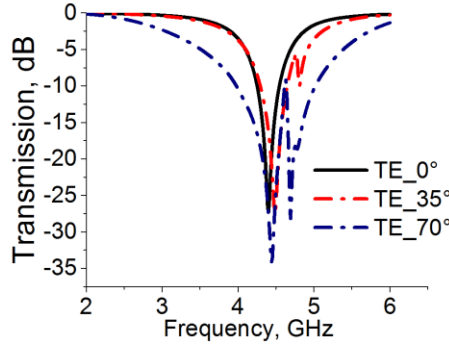
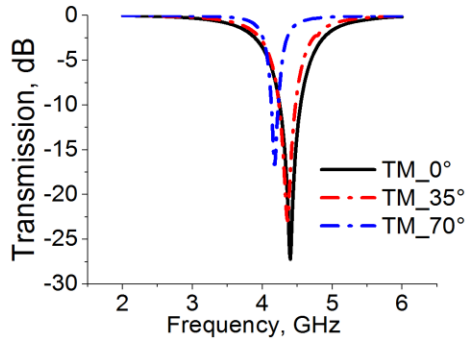


Figure. 5 Transport characteristics in off state

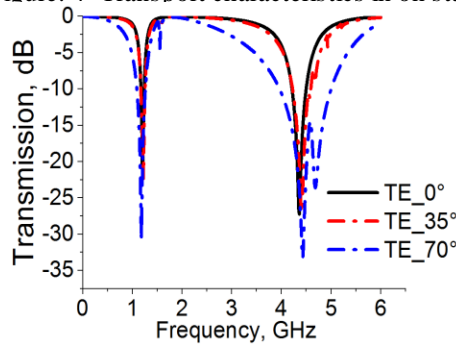


(a)



(b)

Figure. 4 Transport characteristics in on state



(a)

#### IV. CONCLUSION

In this letter, we propose a single double frequency switching band resistance frequency selective surface structure. When the PIN diode is connected, the frequency selective surface has only one band near 4.4GHz, when the PIN diode is disconnected, the frequency selective surface has the same band near 4.4GHz, and another band appears near 1.1GHz. This kind of single double frequency switch, simple structure and easy implementation of FSS, which provides a new design idea for practical engineering application.

a.

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