A Reconfigurable Beamscanning Sinusoidally Modulated Reactance Surface Antenna using Varactors

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I. Introduction

In recent years, sinusoidally modulated reactance surface (SMRS) antennas received attention due to their low profile and beam scanning characteristics [1]. These SMRS antennas are basically periodic leaky wave antennas which utilize their −1th floquet mode to radiate. The beam angle of the general leaky wave antennas is dependent on operating frequencies. In this paper, we propose a reconfigurable beamscanning sinusoidally modulated reactance surface antenna which uses varactors so that can tilt the beam electronically by controlling the capacitances between the antenna unit cells.

II. Designed Antenna Model

The previous SMRS leaky wave antenna was designed with periodically repeating gap sizes between adjacent strips. The beam angle of this kind of antenna become tilted as the operating frequencies of the antenna changes.

Our proposed antenna has same the uniform gap sizes between adjacent strips and this was previously proposed by [2]. Instead of varying the gap between strips, sinusoidally varying capacitances are loaded between the strips and this leads to the sinusoidally modulated reactance surface of the leaky wave antenna. Fig.1 shows the designed SMRS antenna and loaded capacitances between strips are shown in the inset.

When the capacitances between the strips can be controlled reconfigurably, the antenna beam angle can be controlled electronically without changing the operating frequency of the antenna.

The antenna is designed to operate at 9 GHz with 40 degree of beam angle.

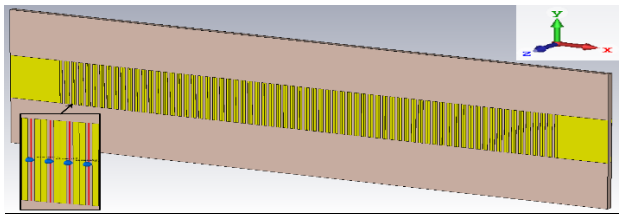

Fig. 1. Simulated reconfigurable beamscanning SMRS antenna model & capacitance loadings between strips(Inset)

III. Simulated Results

With different three sets of loading capacitances, we obtained reconfigurable beamscanning characteristic of the antenna around targeted 40 degree of beam angle at 9 GHz. E−field pattern of the antenna is shown in Fig. 2 and the antenna's S11 is shown in Fig. 3. The maximum gain is about 15 dB in f=1 case.

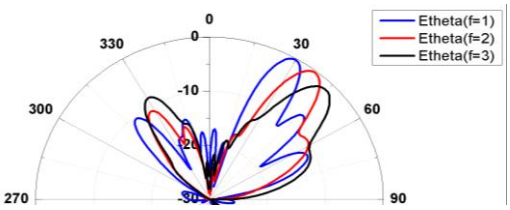

Fig. 2. Simulated E−field patterns according to different capacitance tuning factor f at 9 GHz.

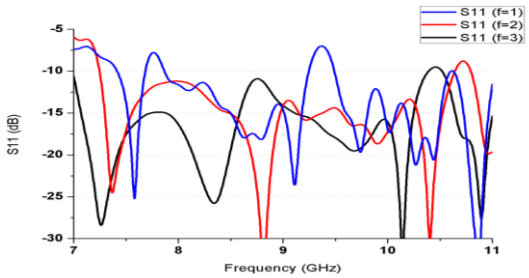

Fig. 3. Simulated antenna S11 of different three capacitance tuning factor f..

Acknowledgement

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References

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