

# A Millimeter-Wave Circularly Polarized Curl Antenna and Array

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Abstract

In this paper, a wideband circularly polarized curl antenna and its triangular array are proposed for millimeter-wave applications. Circularly polarized radiation is achieved by coaxial cable fed radiating curl. A parasitic stub is introduced to adjust the impedance matching and axial ratio bandwidth. Simulated impedance and axial ratio bandwidths of the element are 32.4% and 13.9%, respectively. A  $2 \times 2$  sequential rotation triangular array shows good performances of wide impedance and AR bandwidth of 34.5% with total efficiency higher than 80%.

## Element Analysis and Array

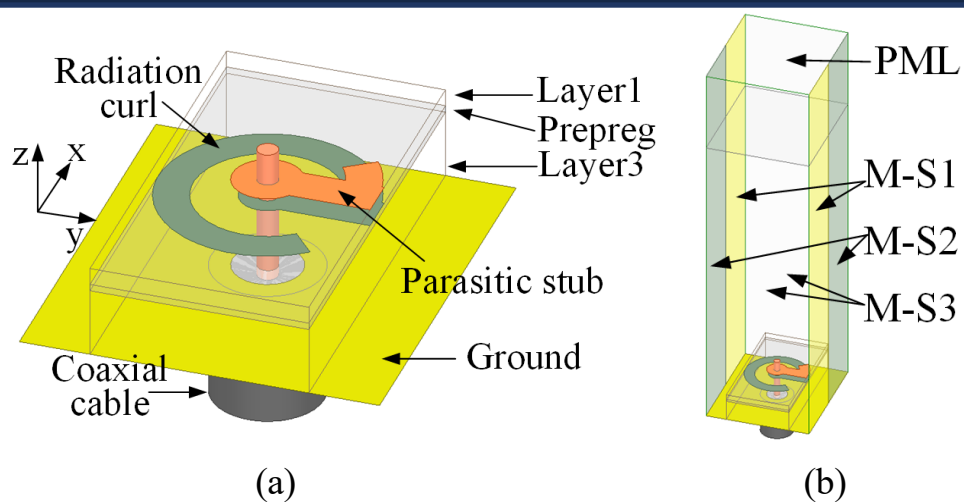


Fig. 1 The proposed antenna element (a) geometry of the antenna, (b) simulation setup.

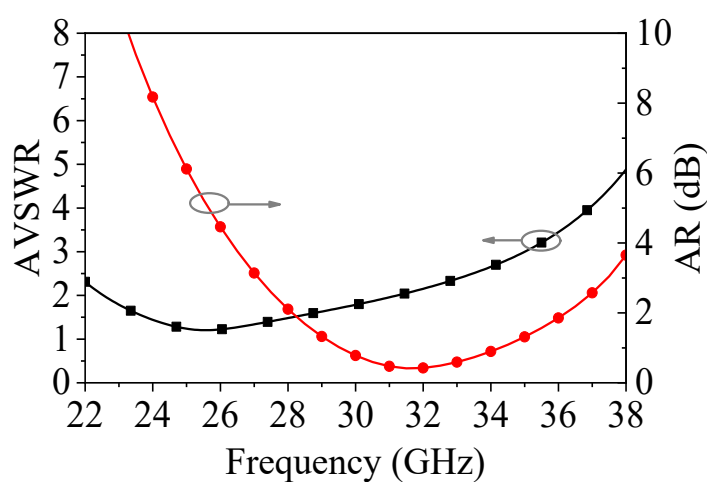


Fig. 2 Simulated AVSWR of the element cell.

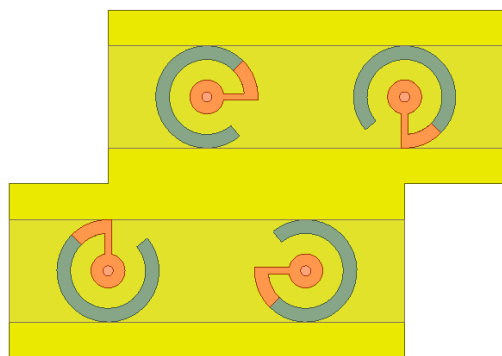


Fig. 3 The  $2 \times 2$  antenna array with sequential rotation.

## Array Performance

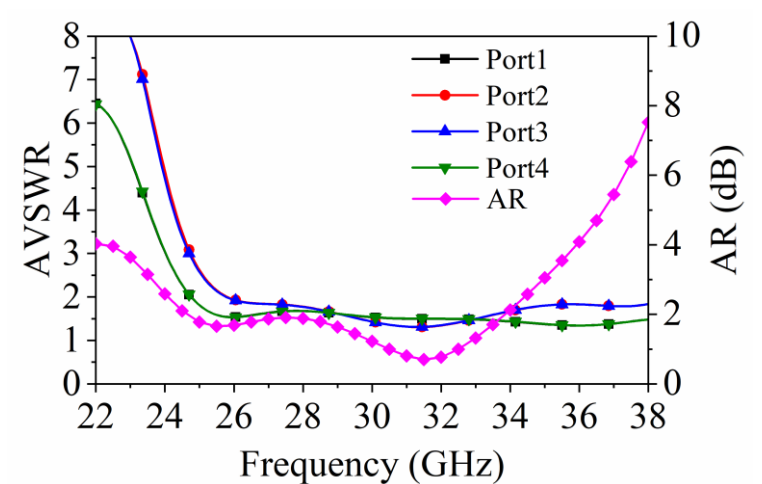


Fig. 4 Simulated AVSWR and AR of the  $2 \times 2$  antenna array.

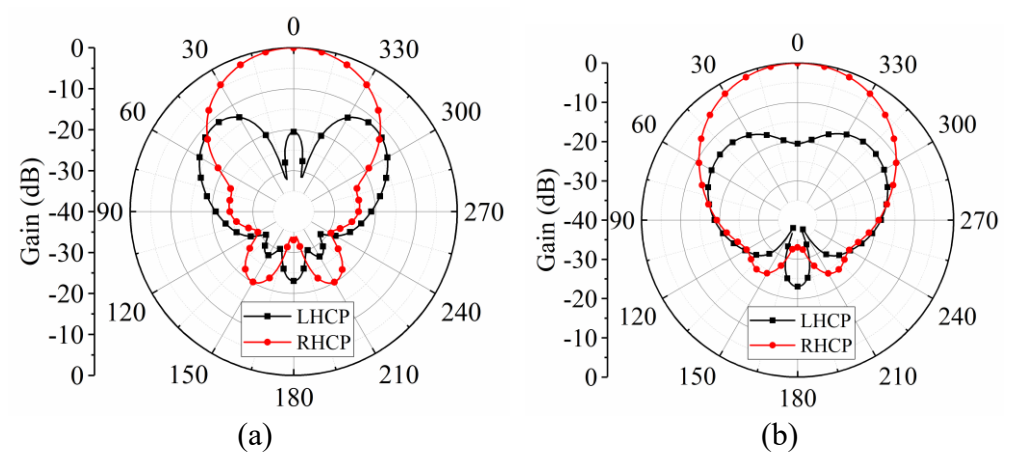


Fig. 5 Normalized radiation pattern of the  $2 \times 2$  antenna array at 29 GHz (a)  $\Phi = 0^\circ$ , and  $\Phi = 90^\circ$ .

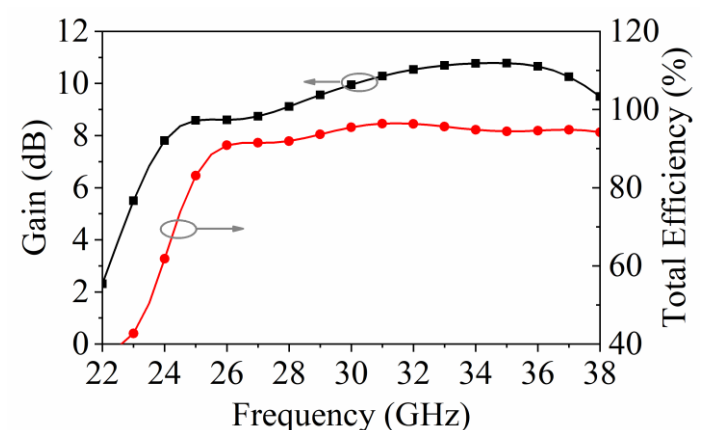


Fig. 6 Simulated gain and total efficiency of the antenna array.

Conclusion

In this paper, a single fed curl antenna operating in mmW frequency band is designed. Performances of the element with triangular architectures are firstly evaluated with period boundary simulation. Sequential rotation technique is applied to further enhance the impedance bandwidth and decrease the AR. Full-wave simulation of a  $2 \times 2$  array was carried out. An overlapped bandwidth of 34.5% is achieved for the array. The proposed antenna is a good candidate for mmW satellite communication antenna systems with wide bandwidth.