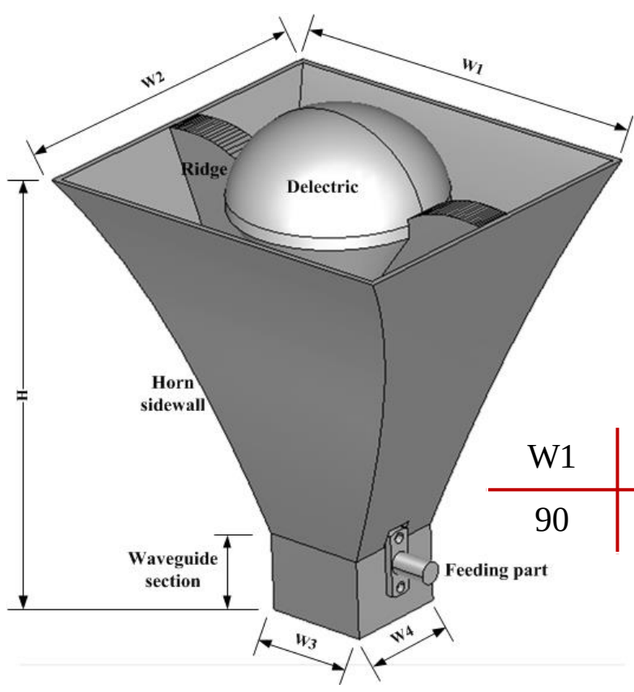
Dielectrically Loaded Wideband Double-Ridged Horn Antenna with Beam Equalization

Zhaosong Liu[1]*, Zhihui Liu[1], Jianjun Wu[1], Zhao Li[1], and Ying Liu[2]
[1]Nanjing Research Institute of Electronics Technology, Nanjing, Jiangsu, China
[2]Science and Technology on Antenna and Microwave Laboratory, Xidian University, Xi'an, Shaanxi, China

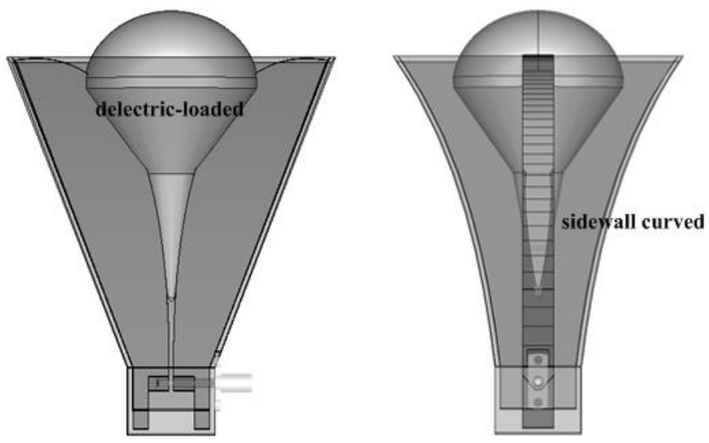
Introduction

A wideband dielectric-loaded double-ridged horn antenna is proposed. The proposed antenna has excellent impendence matching and good radiation characteristics from 2GHz to 18GHz. During this frequency band, the beam equalization is realized with the beamwidth difference of fewer than 10 degrees between the E- and H-plane. This horn antenna is capable of the electromagnetic testing system and the feeding of reflector antenna.

Antenna Design



W1	W2	W3	W4	H
90	80	22	22	100

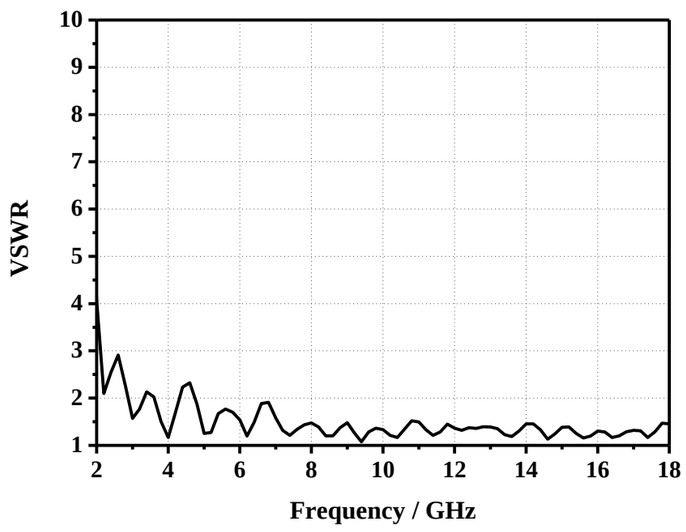


(a) E-Plane (b) H-Plane

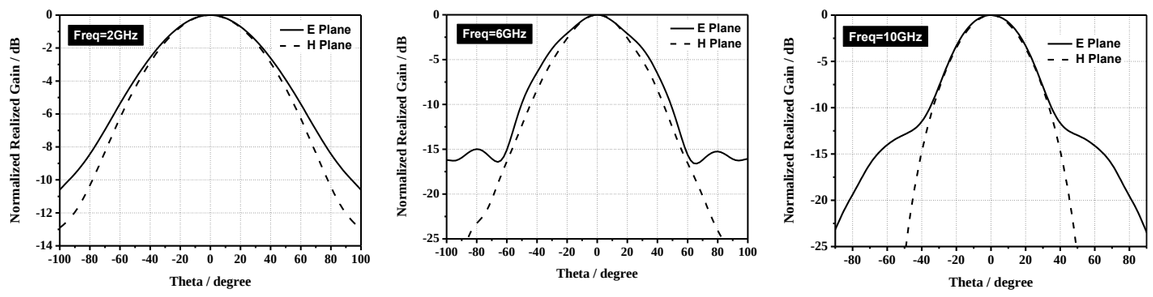
This antenna consists of five parts: waveguide section, horn sidewall, ridges, dielectric, and feeding part. The ridge curve and the horn aperture size are critical for impedance matching.

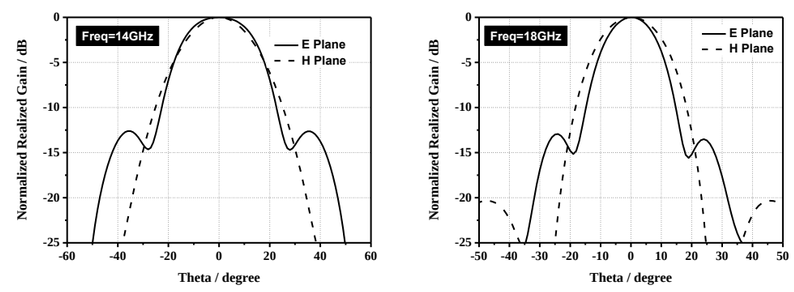
To achieve beam equalization, a drop-liked dielectric load and the exponentially curved sidewall are used to manipulate the electric field mode transmission in the horn section.

Simulation Results

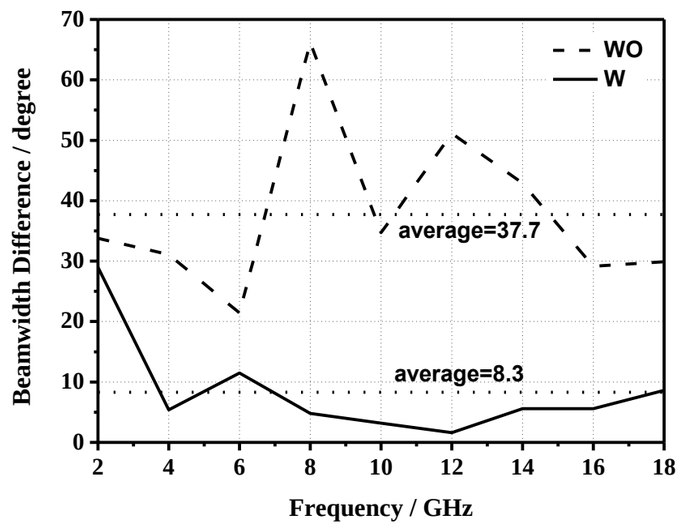


The simulated VSWR is almost less than 3 ranging from 2GHz to 18GHz and below 2 over 90% bandwidth.





The radiation pattern performance is stable with no split in the whole working frequency band. Furthermore, the beamwidths in the E- and H-plane are comparable.



The beamwidth difference of the horn with dielectric loading is much smaller than that of the horn without the treatment. For the proposed horn antenna, the difference is almost less than 10 degrees during the whole frequency band with the average equal to 8.3 degrees. Without the loading, the average rises to 37.7 degrees.

The simulated results prove that the presented horn antenna has wideband impedance matching and achieves beam equalization phenomenon.

Conclusion

A dielectrically loaded wideband double ridged horn antenna is presented in the paper. The simulation reveals that the designed horn antenna has well impendence matching over 2GHz to 18GHz. Dielectric loading together with the exponentially curved sidewall is utilized to realize the rotationally axial symmetric radiation pattern. A comparison between the radiation patterns with and without the drop-liked dielectric loading is given to support the effectiveness of the design method. The proposed horn antenna can serve as the high-efficiency feeding of the electromagnetic testing system and reflector antenna.

Reference

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Tel: 15529388720 Email: liuzs_0627@163.com