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W-Band Waveguide Slot Array Antenna with High Gain Based on Rectangular Micro-Coaxial Process

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Background

Rectangular Micro-Coaxial

Advantages of small size, lightweight, easy integration, low loss, no dispersion, wide bandwidth, good thermal performance, and large power capacity over traditional transmission lines.

Waveguide Slot Array Antenna

High gain, wide band, compatible with the rectangular micro-coaxial process.

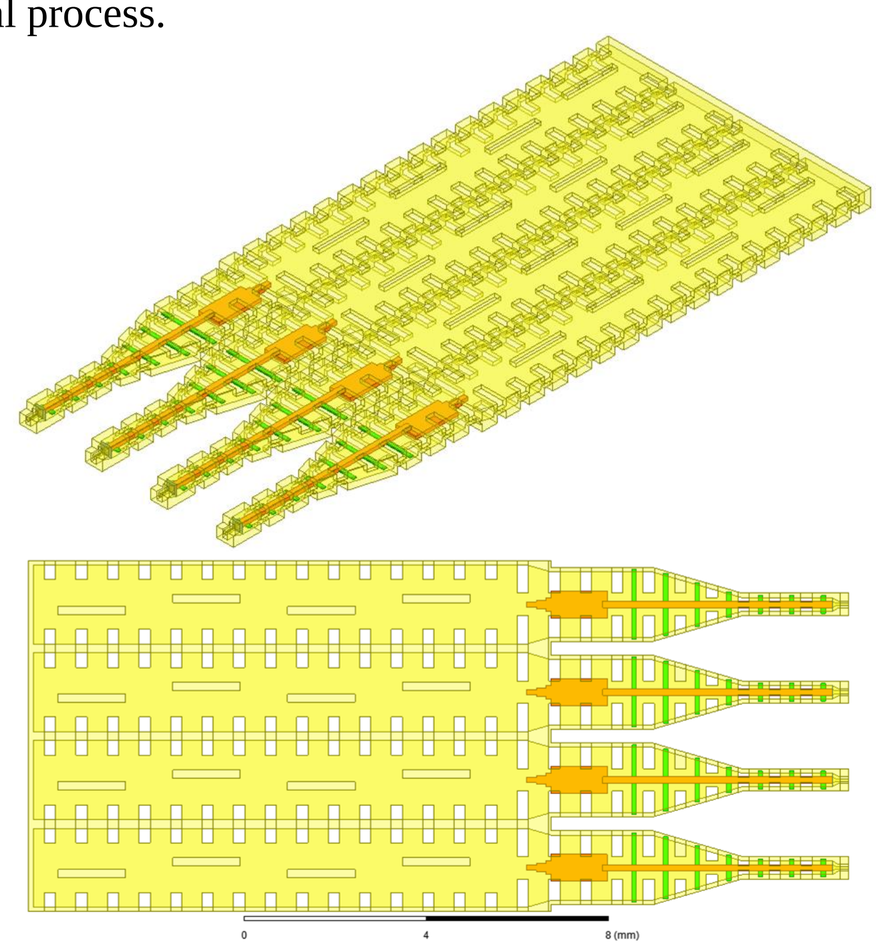
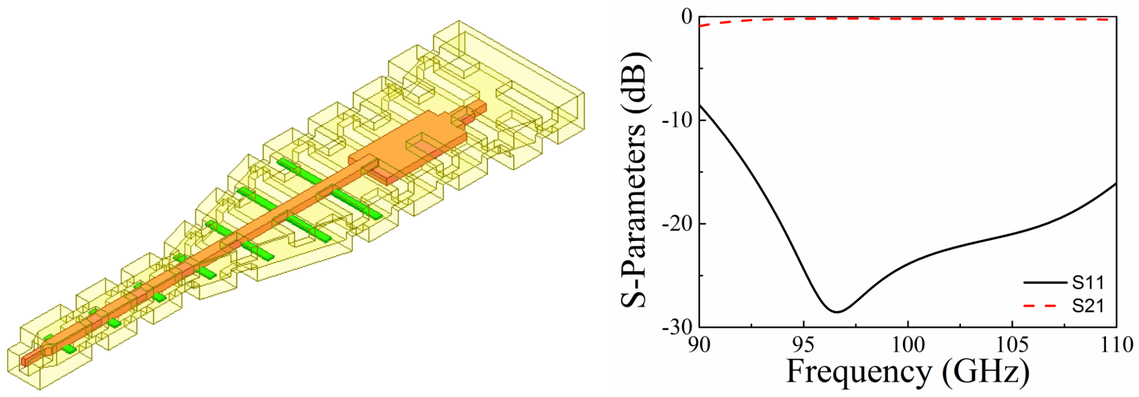


Fig. 1 Illustration diagrams of the W-band waveguide slot array antenna. (a) 3D view. (b) Top view.

Broadband Transition



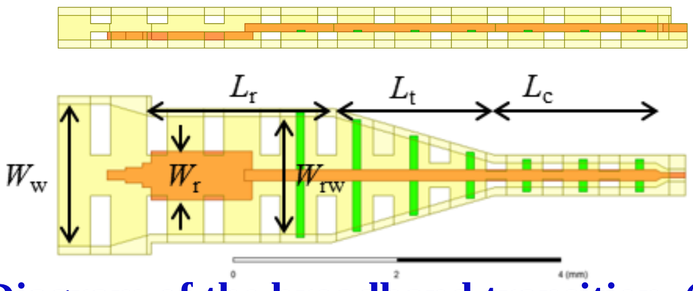
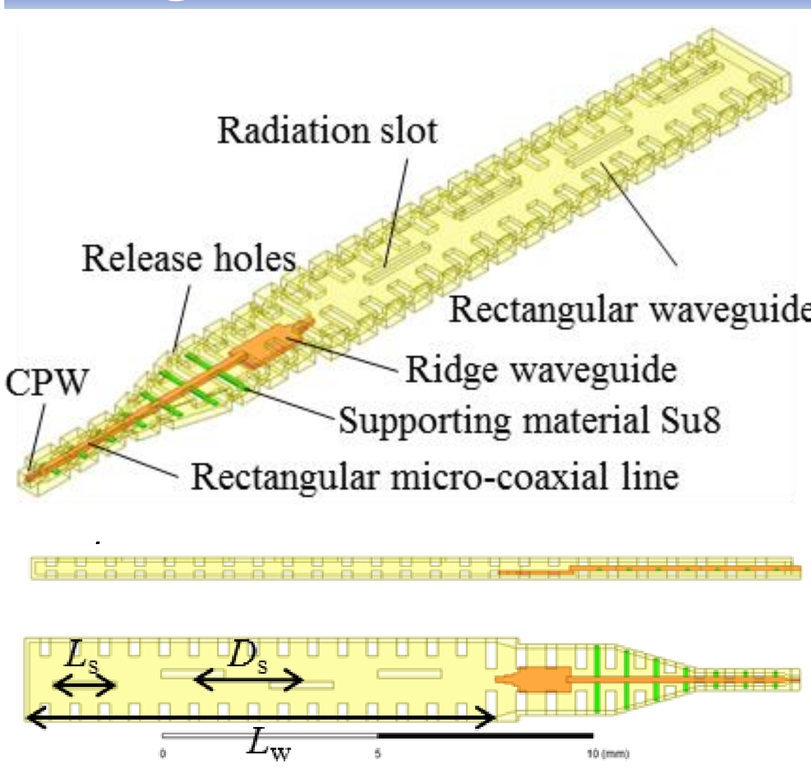


Fig. 2 (a) Diagram of the broadband transition. (a) 3D view. (b) Simulated S-parameters of the designed transition. (c) Side view. (d) Top view.

The inner conductor of the rectangular micro-coaxial line excite the TE_{10} of the ridge waveguide and the rectangular waveguide. And the simulated bandwidth of the transition is around 12.78 GHz (S11<-20 dB over 93.89-106.67 GHz).

Waveguide Slot Element And Array Antenna



Parameters	Dimension (mm)
L_r	2.75
L_c	35
L_t	13.25
W_{rw}	5.47
W_r	1.57
W_w	4.35
L_w	2
L_s	29
D_s	16

Fig. 3 Diagram of the element antenna. (a) 3D view. (b) Side view. (c) Top view.

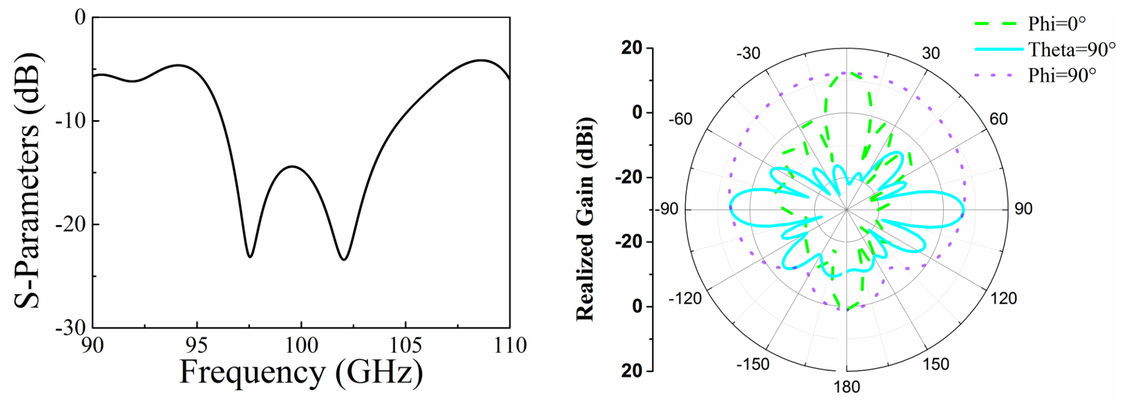


Fig. 4 Simulated results of the waveguide slot element antenna. (a) S-parameter. (b) Radiation pattern.

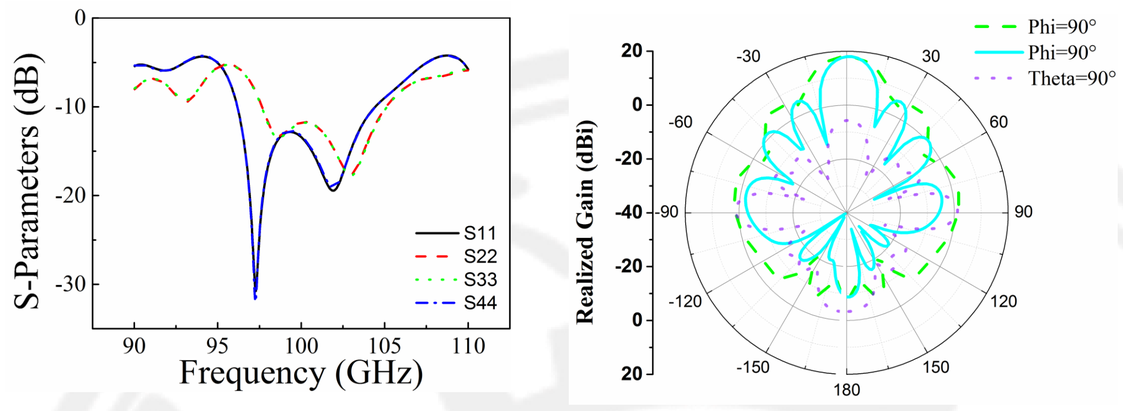


Fig. 5 Simulated results of the waveguide slot array antenna. (a) S-parameters. (b) Radiation pattern.

Conclusion

- A W-band waveguide slot array antenna with high gain based on rectangular micro-coaxial process is proposed in this paper.
- The designed W-band waveguide slot array antenna achieves a simulated bandwidth of 8.7% and a realized gain of 18 dBi at 100 GHz. The maximum mutual coupling between adjacent antennas of 15 dB can be observed.