High Optical Transparent Wideband Microwave Absorber

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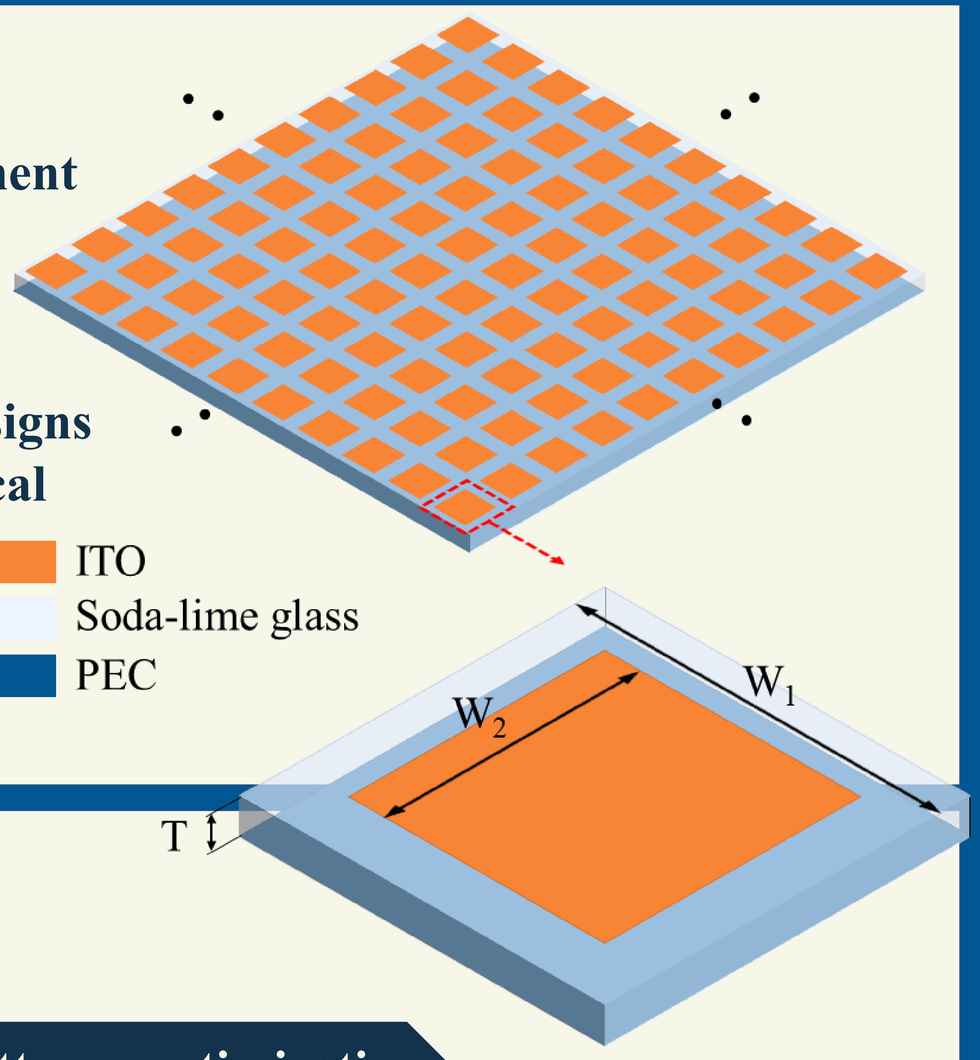
Introduction

Electromagnetic radiation has a great impact on electronic equipment and public health. Microwave absorbers provide an effective way to dissipate radiation and convert electromagnetic waves into heat.

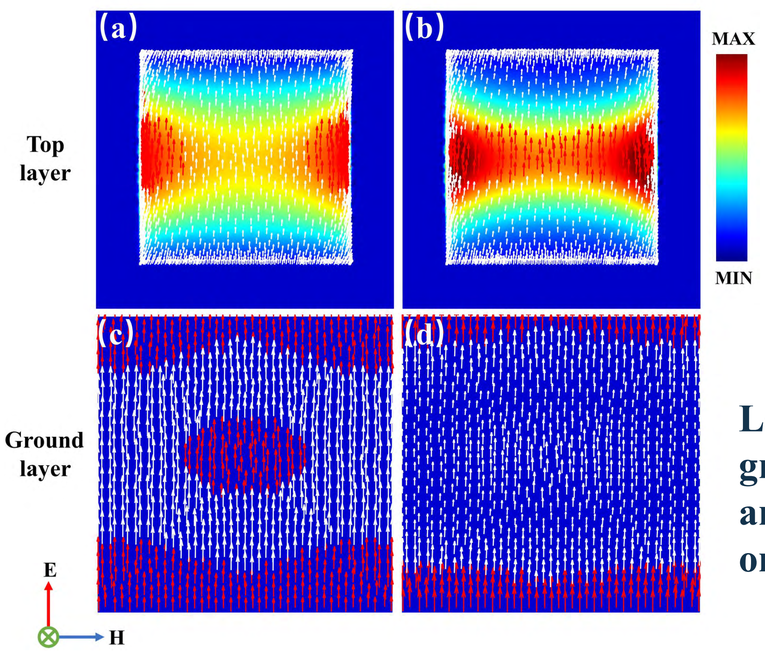
However, It is challenging to design a thin and optical transparent wideband microwave absorber, due to the conventional wideband designs reduce the light transmittance of the absorber. In this paper, the optical transmittance of the proposed absorber is effectively improved, maintaining the wideband absorption.

With the 82.1% high visible light transmittance, the proposed absorber can achieve around 90% absorption in 19.2–36GHz.



Design and discussion

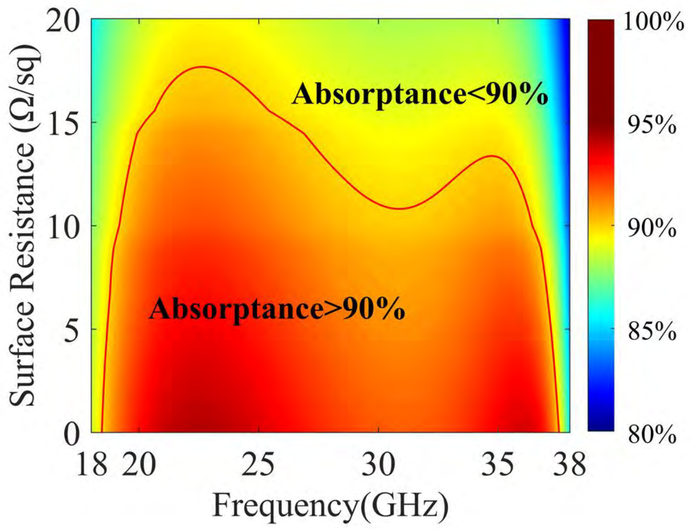
1.Absorption mechanism analysis



Similar distributions between surface loss density and surface currents on the top layer.

Low surface loss density on ground layer although high amplitude surface currents on it.

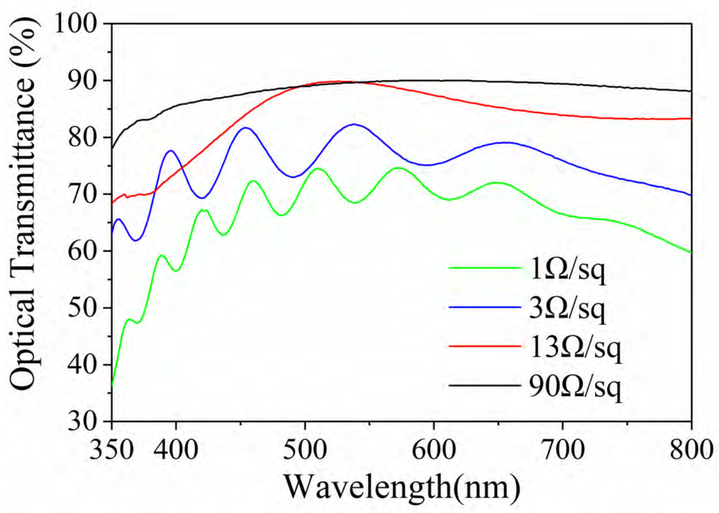
- **According to Joule's laws, the surface current flows through the resistive sheet causes ohmic loss.**
- **The ohmic loss concentrated on the top layer causes absorption.**
- **The floor layer does not contribute to absorption.**



Absorption of proposed absorber versus surface resistance of the ground layer.

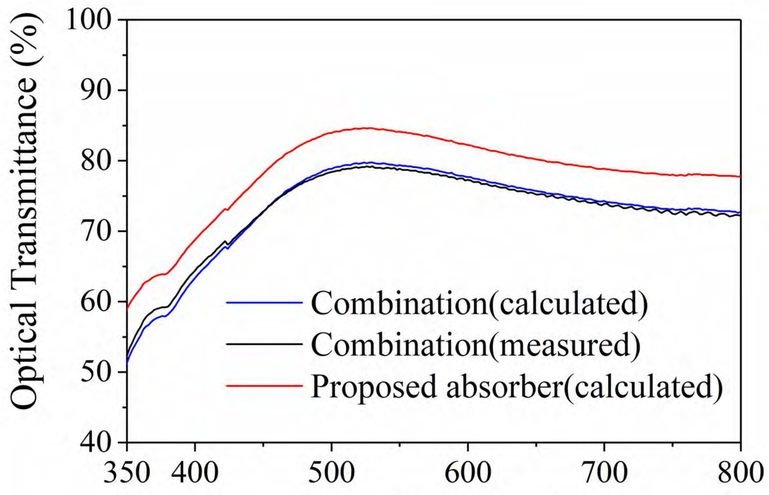
- **The surface resistance of ground layer can be controlled in a certain range keeping the absorption mechanism and absorptance.**

2.Transmittance optimization



The light transmittance of ITO film increases with the increase of sheet resistance.

- **The floor layer with higher sheet resistance achieves higher optical transmittance.**
- **The maximum of the ground layer sheet resistance range is best design with highest optical transmittance.**



- **The proposed absorber optical transmittance is calculated and measured.**
- **The proposed absorber achieves 82.1% optical transmittance, with high microwave absorption in 19.2-36GHz.**

Conclusion

By analyzing surface current and power loss, the mechanism of the flexible range of the ground layer is revealed. Due to the characteristic of the ITO film, the maximum of the range is choose for the highest optical transmittance. With the 82.1% light transmittance, the proposed absorber offers absorptance around 90% in 19.2–36GHz, and its thickness is 0.07λ at the lowest operating frequency. And the transmittance calculation method can predict the transmittance of the design, paving the way for further transmittance optimization.