

# Microwave Absorption of $\lambda/4$ Wave Absorbers Using High Permeability Magnetic Composites in Quasi-microwave Frequency Band

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## Abstract

For the aim of thin electromagnetic wave absorbers used in quasi-microwave frequency band, this study proposes the high-permeability magnetic composite sheets of quarter wavelength thickness ( $\lambda/4$  spacer) coated with resistive film of  $377 \Omega/\text{sq}$  (impedance transformer). For the  $\lambda/4$  spacer, flexible magnetic composite sheets of  $\text{Fe}_{85}\text{Si}_{9.5}\text{Al}_{5.5}$ flake particles aligned in rubber matrix are prepared by conventional magnetic composite fabrication technique. Due to high permeability and high permittivity of the composite sheets,  $\lambda/4$  thickness can be reduced as low as 0.5 mm in 2 GHz. The microwave absorbance (determined at 2 GHz) of the magnetic composite sheets are found to be -4.6 dB (65% power absorption) at a  $\lambda/4$  thickness of 0.5 mm. By coating the conductive paste (graphite and carbon black dispersed in polymer resin matrix) on the  $\lambda/4$  spacer (thickness = 0.5mm), the microwave absorbance is greatly improved. When the sheet resistance of coated films is close to  $377 \Omega/\text{sq}$ , the reflection loss is reduced to -11 dB (90% power absorption). This is attributed to the wave impedance matching led by the resistive film of free-space impedance combined with a  $\lambda/4$  thickness of high-permeability magnetic spacer. It is, therefore, proposed that the resistive film/magnetic composite structure with controlled electrical properties and thickness can be useful as thin microwave absorbers used in quasi-microwave frequency band.

## References

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