

The resonance spectrum of two nonparallel dielectric rings

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The resonance scattering spectra of subwavelength linear structures consisting of two nonparallel dielectric flat thin rings located along the wave vector and excited by an incident plane electromagnetic microwave wave are studied experimentally and by computer modeling. It was found that in the amplitude-frequency spectrum in the resonance region of the magnetic field inside a system of two rings, a sharp dip occurs at the resonant frequency of a single ring when the planes of the rings are tilted relative to each other. With parallel planes of the rings, the resonant dip is not recorded. The detected effect can be used when mounting several rings to control their planes or to create a small angle deviation diagnosis.

Keywords: metamaterials, dielectric magnetic dipole, negative magnetic response, dielectric ring, dielectric structure, plane electromagnetic wave, microwave, resonance.

REFERENCES

1. Haxha S., AbdelMalek F., Ouerghi F., Charlton M. D. B., Aggoun A. and Fang X., Scientific Reports **8**, 16119 (2018).
2. Zheng Y., Dai H., Wu J., Zhou C., Wang Z., Zhou R. and Li W., Frontiers in Physics **10**, 1069722 (2022).
3. Zheludev N. I. and Kivshar Y. S., Nature Materials **11**, 917–924 (2012).
4. Engheta N., IEEE Transactions on Antennas and Wireless Propagation Letters **1** (1), 10–13 (2002).
5. Lagarkov A. and Kissel V., Pys. Rev. Lett. **92** (7), 077401 (2004).
6. Pendry J. B., Phys. Rev. Lett. **85** (18), 3996 (2000).
7. Rybin M. V. and Limonov M. F., Phys. Usp. **62**, 823–838 (2019).
8. Kuznetsov A. I., Miroshnichenko A. E., Fu Y. H., Zhang J. Bo. and Luk'yanchuk B., Sci. Rep. **2**, 492 (2012).
9. Jahani S. and Jacob Z., Nature Nanotechnology **11**, 23 (2016).
10. Pecherkin V. Ya., Vasilyak L. M., Bukharin M. M. and Dobroklonskaya M. S., Applied Physics, № 5, 15–21 (2023) [in Russian].