PACS: 75.78.-n, 77.84.-s

Resonant scattering of plane electromagnetic waves by a subwavelength linear structure of two dielectric rings

V. Ya. Pecherkin[1], *L. M. Vasilyak*[1], *M. M. Bukharin*[1,2] *and M. S. Dobroklonskaya*[1]

[1] Joint Institute for High Temperatures of Russian Academy of Sciences
Bd. 2, 13 Izhorskaya st., Moscow, 125412, Russia
E-mail: vasilyak@ihed.ras.ru

[2] National University of Science and Technology "MISIS"
Bd. 1, 4 Leninskiy prospekt, Moscow, 119049, Russia

Received 14.09.2023; revised 28.09.2023; accepted 3.10.2023

The resonant scattering spectra on the main magnetic mode by a subwavelength linear structure consisting of two dielectric flat thin rings located along the wave vector and excited by the displacement currents of the incident plane electromagnetic wave of the microwave range are investigated experimentally and by computer modeling. In the scattering spectra of the magnetic field in the far wave zone, near wave zone and near the centers of the rings, splitting of the resonant frequency is observed, unlike a single ring. The measured spectra coincide with the spectra obtained by computer calculations at all measurement points.

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

DOI: 10.51368/1996-0948-2023-5-15-21

REFERENCES

1. Rybin M. V. and Limonov M. F., Phys. Usp. **62**, 823 (2019).
2. Kuznetsov A. I., Miroshnichenko A. E., Fu Y. H., Zhang J. Bo. and Luk'yanchuk B., Sci. Rep. **2**, 492 (2012).
3. Jahani S. and Jacob Z., Nature Nanotechnology **11**, 23 (2016).
4. Linden S., Enkrich C., Wegener M., Zhou J., Koschny T. and Soukoulis C. M., Science **306**, 1351 (2004).
5. Shvartsburg A. B. and Obod Yu. A., Progress in Optics **60**, 489 (2015).
6. Rybin M. V., Filonov D., Belov P., Kivshar Y. S. and Limonov M. F., Sci. Rep. **5**, 8774 (2015).
7. Krasnok A. E., Maksymov I. S., Denisyuk A. I., Belov P. A., Miroshnichenko A. E., Simovskii C. R. and Kivshar Yu. S., Phys. Usp. **56**, 539 (2013).
8. Tittl A. et al., Science **360**, 1105 (2018).
9. Remnev M. A. and Klimov V. V., Phys. Usp. **61**, 157 (2018).
10. Vallion P. and Geffrin J. M., J. Quant. Spectr. Radiat. Transfer **146**, 100 (2014).
11. Shvartsburg A. B., Pecherkin V. Ya., Vasilyak L. M., Vetchinin S. P. and Fortov V. E., Sci. Rep. **7**, 2180 (2017).
12. Shvartsburg A. B., Pecherkin V. Ya., Vasilyak L. M., Vetchinin S. P. and Fortov V. E., Phys. Usp. **61**, 698 (2018).
13. Pecherkin V. Ya., Shvartsburg A. B., Vasilyak L. M., Vetchinin S. P., Kostyuchenko T. S. and Panov V. A., J. Commun. Technol. El+ **66**, S62 (2021).
14. Shvartsburg A. B., Vasilyak L. M., Vetchinin S. P., Alybin K. V., Vol'pyan O. D., Obod Yu. A., Pecherkin V. Ya., Privalov P. A. and Churikov D. V., Opt Spectrosc+ **129**, 252 (2021).
15. Shvartsburg A., Pecherkin V., Jiménez S., Vasilyak L. M., Vetchinin S. P., Vázquez L. and Fortov V. E., J. Phys. D. Appl. Phys. **51**, 475001 (2018).
16. Shvartsburg A., Pecherkin V., Jiménez S., Vasilyak L., Vázquez L. and Vetchinin S., J. Phys. D. Appl. Phys. **54**, 075004 (2021).
17. Luk`yanchuk B., Vasilyak L. M., Pecherkin V. Y., Vetchinin S. P., Fortov V. E., Wang Z. B., Paniagua-Domínguez R. and Fedyanin A. A., Sci. Rep. **11**, 23453 (2021).
18. Bukharin M. M., Pecherkin V. Ya., Ospanova A. K., Il'in V. B., Vasilyak L. M., Basharin A. A. and Luk'yanchuk B., Sci. Rep. **12**, 7997 (2022).
19. O'Brien S. and Pendry J. B., J. Phys. Condens. Matter. **14**, 4035 (2002).