

Electromagnetic properties of such artificial materials (metamaterials) as structures based on wire media:

- the transmission of subwavelength images by wire media structures [5]
- the application of metamaterials in engineering technology of the millimeter waveband [1-9].

Responsible: Liubov I. Ivzhenko (Junior Researcher), Sergey I. Tarapov (Corr. member NASU)



Technique: The experimental test-band (scanning module (Fig. 1)) for registration of 2D- pattern of the electromagnetic field distribution in the vicinity of wire metamaterials (Fig. 2) in the millimeter waveband [4,8,9].

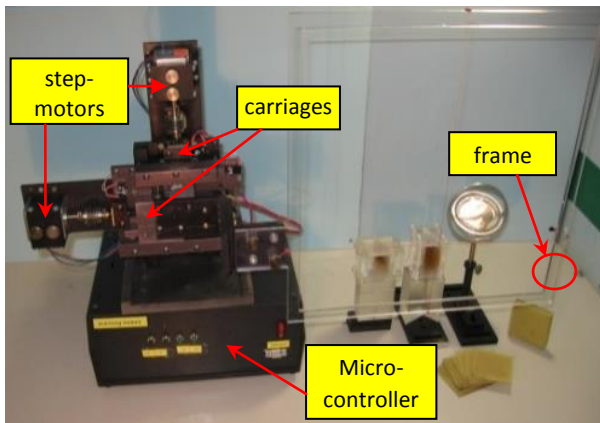


Fig. 1: The scanning module for registration of 2D pattern of the field distribution in the metamaterials.

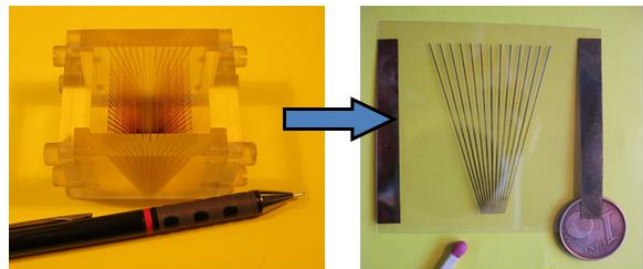


Fig. 2 Wire medium lens (metamaterial)

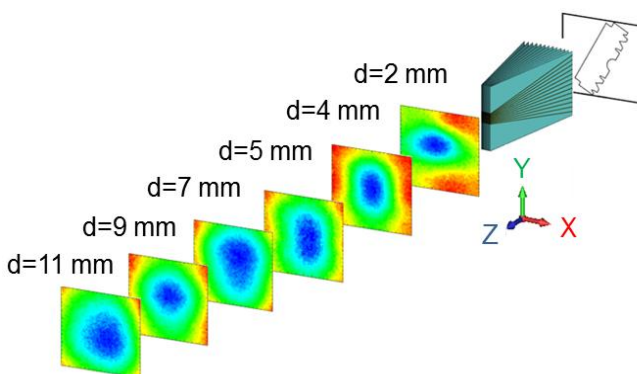


Fig.3 Spatial field distribution patterns in vicinity of the wirelens

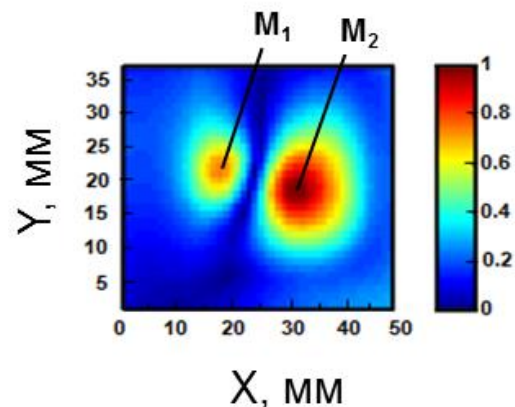


Fig.4 The subwavelength image from two point sources on the surface of the wire lens.

Main results:

1. The experimental technique, based on the small perturbation technique and implemented in special software designed for Network Analyzer has been elaborated for electromagnetic field distribution record [4-9].
2. The focusing properties of the wire medium lens has been demonstrated experimentally [6-9]
3. The electromagnetic energy concentration by wire medium lens has been demonstrated experimentally [4,6-9].
4. The transmission of subwavelength image with a $\lambda/15$ resolution by wirelens has been demonstrated experimentally (Fig. 4) [5].

References

- [1] L.I. Ivzhenko, E. Odarenko, S.I. Tarapov «Magnetically controlled wire media in millimeter wavelength range», Radiotekhnika, № 183, 2015, p. 127-131, (Rus.)
- [2] L. Ivzhenko, “The Spatial Anisotropy of the Wire Metamaterials in the Millimeter Waveband” International Young Scientists Forum on Applied Physics, YSF 2015, September 29 – October 2, 2015.
- [3] L.I. Ivzhenko, E. Odarenko, S.I. Tarapov, “ Magnetically controlled wire media in millimeter waveband” VIII International Scientific Conference "Functional base of nanoelectronics", September 28 -02 October, 2015, (Rus.)
- [4] L.I. Kozhara, S.Y. Polevoy, I.V. Popov, “Technique for analysis of the spatial field distribution in tapered wire medium”, Solid State Phenomena Vol. 214 (2014), pp 75-82
- [5] L.I. Kozhara, S.Y. Polevoy, D.S. Filonov and S.I. Tarapov «Transmission of Subwavelength image by wire lens with phase compensation in the millimeter wavelength range» Radiotekhnika, № 176, 2014, pp. 205-209, (Rus.)
- [6] L. V. Kozhara, V. A. Damaschin, S. Tarapov “Anisotropic properties of wire medium formed by various conductors” in 3d International Workshop on THz Radiation: Basic Research & Applications, 2011, pp.. (014)1-3.
- [7] L. Kozhara, E. Ostrizhnoy “Polarization and focusing properties of wire media lens in the millimeter waveband”, XI Kharkiv Young Scientist Conference on Radiophysics, Electronics, Photonics and Biophysics, 2011
- [8] L.I. Kozhara, S. Yu. Polevoy, I.V. Popov, S. V. Nedukh, “Spatial distribution of the electromagnetic field in the vicinity of tapered wire medium metamaterial, The Eighth International Kharkov Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves (MSMW’13) and Workshop on Terahertz Technology (Teratech’13), 2013, WT-14
- [9] L.I. Kozhara, S.Y. Polevoy “Technique for measuring the spatial field distribution in tapered wire medium”, International Symposium on Electrodynamics and Mechatronic Systems (SELM) 2013, pp.67-68.