

Research interests:

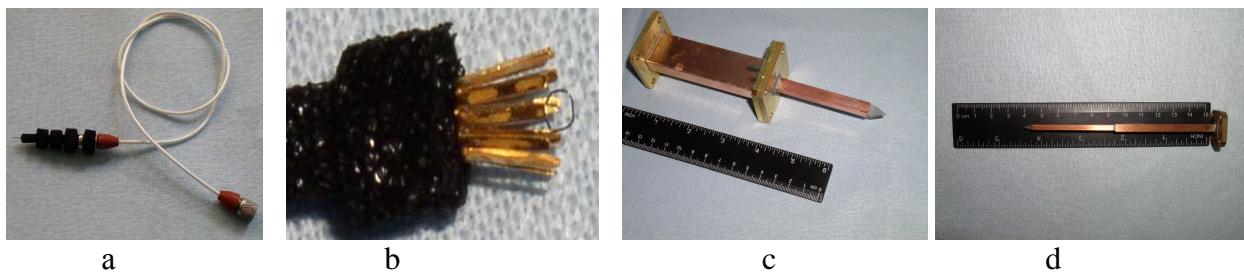
Experimental study of the diffractive contribution in the spatial structure of both the radiation fields and scattered ones by the objects being compared with the operational wavelength.

- development of probes for investigating the electromagnetic field distributions in the near- and intermediate regions of radiators;
- development of small-size antenna arrays.

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Research results:

The studies of antenna characteristics in the near- and far-field regions of radiation are carried out on the suitable measuring stands and in an anechoic chamber. To investigate the spatial near-field distributions the special electrical and magnetic probes are used while the metal-dielectric probes are applied to carry out the measurements in the intermediate region. 3D manipulator provides a spatial resolution no worse than 0.1mm.

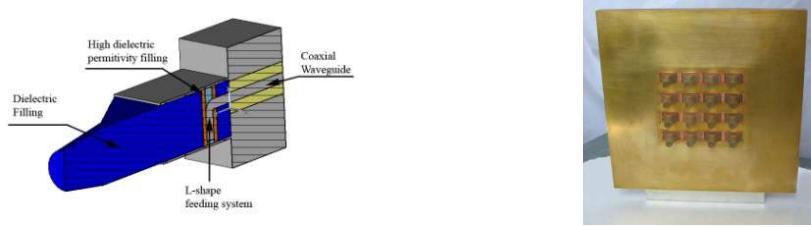


Probes for measuring the spatial near-field distributions in the microwave range (a, b) and probes for measuring in the intermediate region in microwave (c) and millimeter wave (d) ranges.

The information obtained about the spatial structure of the electromagnetic field near the radiating apertures allows for revealing the characteristic features for each object under test and to establish the regularities in the transformation of these fields according to the physical and geometrical parameters of the individual elements of various radiators. The knowledge and consideration of these regularities is extremely important, for example, at the use of radiators like those as the elements of different antenna arrays and particularly when their dense packing is required. Some examples are shown below.



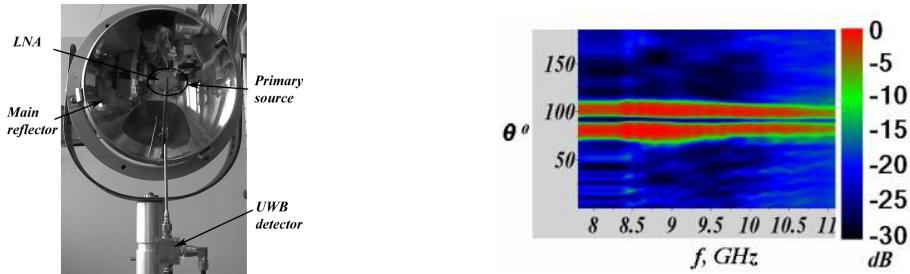
- the original horn radiator and the prototype of multi-beam antenna array (the operating range is 30–38GHz) as a component of the radio-telescope RATAN-600;



- the radiator as an open-ended waveguide filled with a dielectric of the complex configuration with the original excitation element and the 16-element antenna array with the possibility of an electronic beamsteering in the anglesector of $\pm 56^\circ$;



- the linear antenna prototype consisting of 10 individual radiators deployed in the uniform array configuration with the scanning beam in the $\pm 50^\circ$ in the *H*-plane and side lobe level not more than -9dB;



- the original broadband reflector antenna design with the cylindrical monopole antenna as a sub-reflector has been incorporated in the compact broadband direction-finder system. operating in the frequency range of 6–11.5GHz and ensures the accuracy of the SHF source bearing not worse than 2° . Such mobile direction-finder system seems to be very attractive for different wireless applications.

A detailed summary of the results is presented in publications:

1. E. Semouchkina, G. Semouchkin, W.Cao, R.Mittra, I. Ivanchenko, A.Korolev, and N.Popenko. Modal analysis of rectangular dielectric resonator antennas. “*Intern. Symposium on Antennas, JINA 2002, Nice, France*”, vol.1, pp.103-106, 2002.
2. I.V.Ivanchenko, D.I.Ivanchenko, A.A.Korolev, and N.A.Popenko. Experimental studies of X-band leaky-wave antenna performances. “*Microwave and Optical Technology Letters*”, vol.35, No.4, pp.277-281, 2002.
3. E. Semouchkina, G. Semouchkin, M. Lanagan, I. Ivanchenko, A. Korolev, and N. Popenko. Paper Number: 2507. “Enhancement of Circular Polarization Output in Square Patch Microstrip Antennas”. *Proc. of 34th European Microwave Conference* (The Netherlands, Amsterdam, EuMC2004, 11-15 October, 2004), pp.1333-1336.
4. A.S. Andrenko, I.V. Ivanchenko, D.I. Ivanchenko, S.Y. Karelina, A.M. Korolev, E.P. Laz'ko, and N.A. Popenko. Active Broad X-Band Circular Patch Antenna. “*IEEE Antennas and wireless propagation letters*”, Vol. 5, 2006, pp. 529-533.

5. И.Я. Бровенко, И.В. Иванченко, Н.А. Попенко, Р.Е.Чернобровкин. Зонд для диагностики ближнего поля в миллиметровом диапазоне. *РАДИОФИЗИКА И ЭЛЕКТРОНИКА*, №1, 2006, с.19-28.
6. R.Chernobrovkin, I.Ivanchenko, and N.Popenko. A Novel V-band Antenna for Nondestructive Testing Techniques, *Microwave and Optical Technology Letters*, vol. 49, No 7, pp. 1732-1735, Jul. 2007.
7. S. Radionov, I. Ivanchenko, A. Korolev, N. Popenko. "Broadband SHF Direction-Finder". *Radioengineering*, vol. 17, No. 2, pp. 61-65, June 2008.
8. I. V. Ivanchenko, A. M. Korolev, N. A. Popenko, R. E. Chernobrovkin, K. Yu. Sirenko. The novel microwave stop-band filter, *Active and Passive Electronic Components*, vol. 2008 (2008), Article ID 745368, 5 pages doi:10.1155/2008/745368.
9. I. Ivanchenko, D. Ivanchenko, A. Korolev, N. Popenko, S. Radionov, "Mobile X-band direction finder", *Radioelectronics & Informatics*, No. 4, 2008, pp. 11-15.
10. R. Chernobrovkin, I. Ivanchenko, L. Lighart, A. Korolev, N. Popenko. Wide-angle X-band antenna array with novel radiating elements. "Radioengineering", vol. 17, No. 2, pp. 72-76, June 2008.
11. R.Ye. Chernobrovkin, N.O. Popenko, V.B. Khaikin, and C. Granet. Spline-Profile Horn for Array Applications in Radio Astronomy. "Радиофизика и Радиоастрономия", № 3, Том 14, Сентябрь 2009, сс. 314-319.
12. Roman Chernobrovkin, Christophe Granet, Vladimir Khaikin, and Nina Popenko. Compact Efficient Feed-Horn at 30-38 GHz for a Multi-beam Radio Telescope. – J Infrared Milli Terahz Waves DOI10.1007/s10762-010-9652-x , Springer, May 2010. – 12 pages.
13. Sergey Radionov, Igor Ivanchenko, Maksym Khruslov, Aleksey Korolev and Nina Popenko. A New X-Band Mobile Direction Finder. In the book "Microwave and Millimeter Wave Technologies: from Photonic Bandgap Devices to Antenna and Applications" (Edited by: Prof Igor Minin, Publisher: INTECH, March 2010), pp. 273-288.
14. S. Radionov, I. Ivanchenko, M. Khruslov, A. Korolev and N. Popenko. A New X-Band Mobile Direction Finder. In the book "Microwave and Millimeter Wave Technologies: from Photonic Bandgap Devices to Antenna and Applications" (Edited by: Prof Igor Minin, Publisher: INTECH, March 2010), pp. 273-288.
15. R. Chernobrovkin, I. Ivanchenko, V. Pischikov, and N. Popenko. UWB equiangular spiral antenna for 7.5–40GHz. "Microwave and optical technology letters", Vol. 54, No. 9, 2012, pp. 2190-2194.
16. И.В. Иванченко, Н.А. Попенко. Исследование распределений электромагнитных полей как метод изучения характеристик электродинамических структур. «Физические основы приборостроения». Москва, 2013, Т. 2, № 1, сс. 18-32.
17. R. Chernobrovkin, D. Ivanchenko, I. Ivanchenko, N. Popenko, V. Pishikov. A compact broadband spiral antenna for millimeter wave applications. "Microwave and optical technology letters", vol. 56, No 2, 2014, pp. 293-297.