

**VIIIth International Seminar/Workshop
DIRECT AND INVERSE PROBLEMS OF
ELECTROMAGNETIC AND ACOUSTIC WAVE THEORY**

DIPED-2003

The West Ukraine Chapter organized VIIIth International Seminar/Workshop on Direct and Inverse Problems of Electromagnetic and Acoustic Wave Theory (DIPED-2003) on September 22-25, 2003. The Republic of Georgia Chapter was co-organizer of this event. The Electron Devices Society provided technical co-sponsorship and inclusion of the Seminar Proceedings into the IEEE Book Broker Program. The MTT-S, AP-S, CPMT-S, SSC-S, and Section Ukraine were among the supporting IEEE institutions. The Seminar/Workshop was held at the Pidstryhach Institute of Applied Problems of Mechanics and Mathematics, NASU, Lviv, Ukraine.



*DIPED-2003 opening by Prof. Nikolai Voitovich,
Organizing Committee Chairman*

48 papers of participants from Georgia, Germany, China, Lebanon, Poland, Russia, UK, and Ukraine were presented in the 6 oral sessions:

Theoretical Aspects of Electrodynamics,
Complex Media,
Diffraction and Numerical Methods,
Antennas and Transmission Lines,
Mobile Antenna Radiation,
Acoustics and Field Measurement.

The topics of papers covered the traditional scientific areas: propagation,

diffraction and scattering of waves in homogeneous and non-homogeneous media, synthesis of radiating systems and field transformers, restoring the shape of radiating and scattering bodies, as well as the novel problems such as study and simulation of electromagnetic field in the complete vehicle structure, development and modeling the new antenna system for mobile phones, and decreasing the interaction of electromagnetic field of mobile phones on the human's body.

Three papers were presented as invited ones at the plenary session. They were "Highfrequency electrodynamics for the last half century" by Prof. B. Z. Katsenelenbaum, Moscow, Russia, "Non-reciprocal polarization effects in diffraction by a planar chiral array" by Prof. S. L. Prosvirnin, Kharkiv, Ukraine, A. Papakostas, N. I. Zheludev, both Nottingham, UK, "Inverse problem for acoustical tomography" by Prof. V. F. Chekurin, Lviv, Ukraine.

In the paper of Prof. Boris Katsenelenbaum, a brief review of the major trends in highfrequency electrodynamics for recent years was presented. There was given a list of the new ideas and methods, which were introduced, and sketches of the principal problems appeared, namely, complex and associated waves in waveguides, the two-plain mirror highquality resonator and spectral theory of open resonators were also discussed. The recent ideas and methods, which stimulated the highfrequency electrodynamics over the last 50 years, were the following:

- a) Geometrical theory of diffraction.
- b) Complex geometrical optics.
- c) Parabolic equation in diffraction theory.
- d) Complex source of the Gaussian beams.
- e) Complex and associated waves in waveguides.
- f) Cross-section method in closed and open waveguides.

- g) Semi-infinite waveguides and the strip gratings.
- h) Two-plain-mirror highfrequency resonator.
- i) Local field in the half-shadow and local conditions on dielectric surfaces.
- j) Method of auxiliary sources.
- k) Theory of thin vibrators and narrow slots.
- l) Realizability and approximability of the fields.

The existing problems in solving the actual problems of electrodynamics require the involving of such approaches

- a) application of known analytical methods to new objects (chiral medium, optical fibers, long narrow beams, antiradar unreflective surfaces, plasma volumes, etc.);
- b) development of computational methods based on the use of computers;
- c) creation and application of new analytical methods or establishment of universal field properties not known before.

The presentation of Prof. Sergey Prosvirnin was devoted to investigation of the electromagnetic field diffraction by the planar-chiral double periodic arrays. The theoretical studies of non-reciprocal diffraction in such arrays in an attempt to explain the reported difference between the eigen-polarization states for waves diffracting through the array in opposite directions were explained. It was shown that waves diffracted on planar chiral arrays have non-reciprocal polarization rotation and different polarization eigenstates in the direct and reverse diffraction scenarios.

In his speech, Prof. Vasyl Chekurin talked about the problem of the heterogeneous structures stress state restoration on the base of the data, obtained by the different methods of nondestructive testing. The proposed mathematical model involves three elements: model of the body stress state, nondestructive testing data, obtained by one or several physical methods, and model describing the interaction between zoning irradiation and stresses in the solid. A specific sample of application of the developed method for the study of the stress concentration near interface of heterogeneous parts is considered.



Dr. Andriy Synyavskyy is presenting his paper

The papers “Determination of Multilayered Permittivity Profile from Specified Angular Dependence of Reflection Coefficient” by A. Synyavskyy, J. Modelski, Y. Yashchyshyn, Warsaw, Poland “Carleman-Vekua Method and “Longwave Asymptotic in Scattering Problem by Curvilinear Strips” by G. I. Koshovy, Kharkiv, Ukraine, and “Investigation of the Field Distribution Inside Rooms Located Near the Basic Antenna Stations” by D. Kakulia, K. Tavzarashvili, V. Tabatadze, R. Zaridze, Tbilisi, Georgia were the more interesting among the presented at the regular sessions.

The educational and social events were widely presented alongside with the scientific program. Many young scientists and students attended the Seminar and received the possibility to learn better the MTT, ED, and SSC Societies promotion materials distributed for the DIPED-2003.

The Best Young Speaker Award was granted at the Seminar closing ceremony. Dr. Kakhaber Tavzarashvili from Tbilisi State University, Tbilisi, Georgia for “Investigation of the Field Distribution Inside Rooms Located Near the Basic Antenna Stations” and Ms. Eugeniya Yakovenko from the National University “Lviv Polytechnic” for “The Verification of the

Mathematical Model of Electromagnetic Field Distribution in the Human Head Phantom from External Sources” won these Awards.



The DIPED-2003 Participants with the IAPMM building at the background

The next Seminar/Workshop DIPED will be held at the Tbilisi State University, Tbilisi, Georgia, on October 11-14, 2004. The deadline for the full paper submission is July 1, 2004. Papers will be accepted in electronic form (MS Word or PDF format).

The topics of papers will include:
Theoretical Aspects of Electrodynamics,
Scattering, Diffraction and RCS,
Propagation and Scattering in Complex Media,
Numerical Methods in Electromagnetic Theory,
Antenna Synthesis Theory,
Waveguides, Antennas and Antenna Arrays,
Photonics in Antenna Systems,
Acoustics: Theory and Applications

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