XIXth International Seminar/Workshop DIPED-2014

The XIXth International Seminar/Workshop on Direct and Inverse Problems of Electromagnetic and Acoustic Wave Theory (DIPED-2014) was organized by the IEEE MTT/ED/AP Georgian and MTT/ED/AP/CPMT/SSC West Ukraine Chapters. This year, DIPED was held at the Tbilisi State University, Tbilisi, Georgia, on September 22-25. The Ivane Javakhishvili Tbilisi State University (TSU) and Pidstryhach Institute of Applied Problems in Mechanics and Mathematics, NASU, Ukraine, were the co-organizers of DIPED-2014. IEEE Antennas & Propagation Society, Electron Devices Society, and Microwave Theory & Techniques Society provided the Technical Co-Sponsorship for the Seminar/Workshop. The TSU provided the especial financial support for the event what made the possibility to extend the DIPED-2014 audience from outside of Georgia (Figure 1).

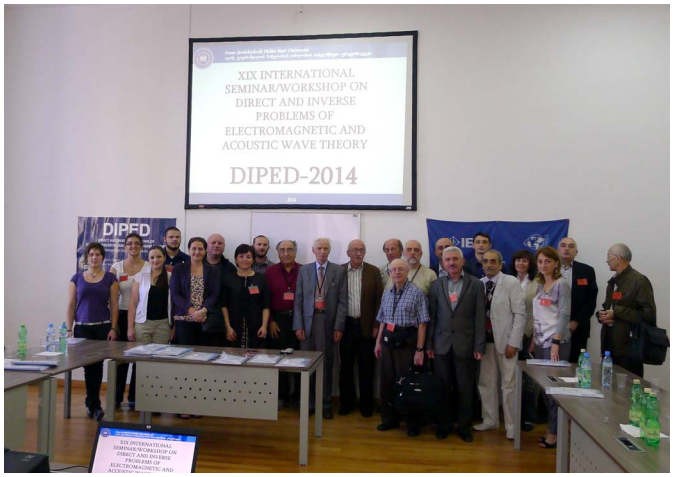

Figure 1. A group photo of the DIPED-2014 participants at the opening ceremony.

The IEEE Solid State Circuits Society and IEEE Section Ukraine were the supporting IEEE institutions.

Prof. Revaz S. Zaridze, Chairman of the Local Organizing Committee, Dr. Tamar Gogua, IEEE MTT/ED/AP Georgian Chapter Secretary, and Dr. Giorgi Ghvedashvili, IEEE MTT/ED/AP Georgian Chapter Chairman, bended all efforts for the general and local organization of the event.

The DIPED-2014 technical program consisted of 44 papers, including 5 invited talks. Scientists from Georgia, Germany, Israel, Pakistan, Poland, Russia, South Korea, USA and Ukraine brought forward their papers. The papers were arranged at the following sections:

- Theoretical Aspects of Electrodynamics
- Diffraction and Scattering
- Antenna Synthesis and Inverse Problems
- Novel Methods in Electrodynamics
- Antenna Design
- Analytical and Numerical Methods
- Acoustics and Remote Sensing

The Plenary Session started with presentation by Prof. Alexander G. Ramm (Kansas State University, USA) devoted to theory of wave scattering by small bodies (particles). In his presentation, the mathematical foundations of electro-magnetic (EM) wave scattering theory for small impedance particles of an arbitrary shape were given. This problem was originated by Lord Rayleigh in 1871, who understood that the main term in the scattered field is the dipole radiation. He did not give formulas for calculating this radiation for small bodies of an arbitrary shape. This was done by the author in the series of previous publications. In particular, the theory was developed to include scalar wave scattering for various boundary conditions (the Dirichlet, Neumann, impedance, and interface boundary conditions) and the problem of wave scattering by many small bodies of arbitrary shapes. The report has been stimulated the active discussion after presentation and prolonged debate in lobby.

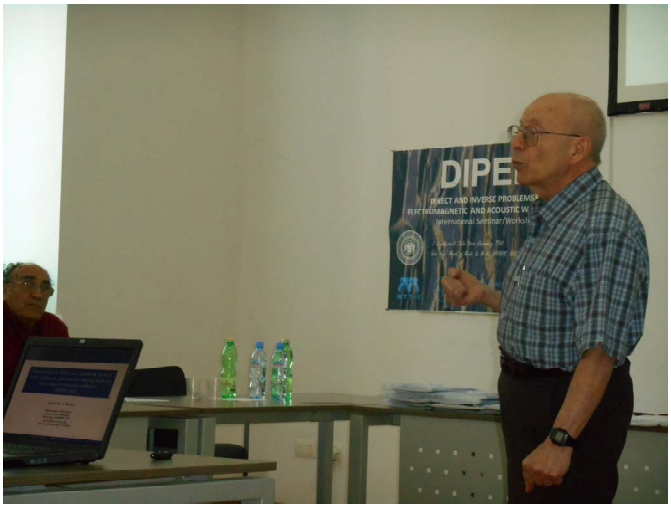

Figure 2. Prof. Alexander Ramm presenting the plenary invited talk about EM wave scattering on small impedance bodies.

The next contribution “Base Station Antenna’s EM Field Distribution in the Room with a Human Model Inside” was given by Veriko Jeladze. The mobile communication system base station's radiation interaction with a human model inside of a building was presented. The inner field and its amplification by the building as a resonator were studied. The problem was solved using the Method of Auxiliary Sources with a program package, created for numerical experiments. Several cases of the human location and building wall’s transparency parameters were presented.

The presentation “Comparing Different Approaches to Linear Antenna Synthesis Problems according to Power Radiation Pattern”, given by Dr. Olena Bulatsyk, was devoted to antenna synthesis problem according to the prescribed power radiation pattern with the equality of norm condition. The problem was solved by the approach based on the concept of

generating polynomials. The variational formulation, supplied by the Lagrange method of multipliers, was applied for solving the problem. The modified Newton method was used for numerical solving of the respective integral-transcendental equation systems. The approach was numerically tested on the example of the linear antenna synthesis problem, recently solved directly by the Newton method; numerous computational results were presented, analyzed and discussed.

Figure 3. Prof. Nikolai Voitovich (in center) looks on the active discussion between Prof. David Karkashadze (l) and Prof. Alexander Ramm (r) after his presentation.

This year, the DIPED traditional topics were extended by presentations related to the antenna measurements, application of EM waves micro and macro measurements, technology of production of carbon nanoparticles, as well as to elaboration of tools for search of the non-metallic targets.

One more interesting presentation devoted to the electromagnetic analysis of a complex structure cylindrical antenna was given by Prof. Guram Kevanishvili (Georgian Technical University, Tbilisi, Georgia). In his presentation, a specially constructed cylindrical-shaped antenna's electromagnetic analysis was presented, formulas for calculating the antenna's radiation characteristics were obtained, and series of new physical phenomena was announced.

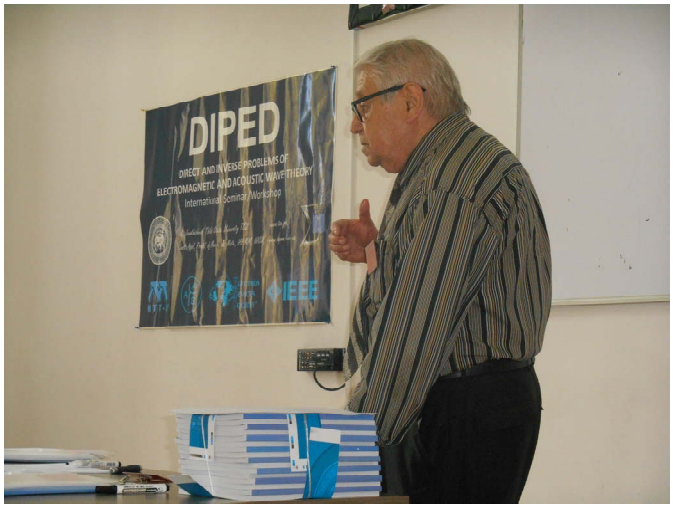

Figure 4. Prof. Guram Kevanishvili makes public new physical results related to complex cylindrical antenna.

Figure 5. Coffee break for the DIPED-2014 participants.

This year, the group of regular students, Ph.D. Students and young scientist was presented at the Seminar/Workshop in large quantities. The following young participants (Figure 6) were granted by the Best Young Speaker Award:

- Ms. Veriko Jeladze (Tbilisi State University, Tbilisi. Georgia) for "Base Station Antenna's EM Field Distribution in the Room with a Human Model Inside".
- Dr. Olena Bulatsyk (Pidstryhach Institute of Applied Problem in Mechanics and Mathematics, Lviv, Ukraine) for "Comparing Different Approaches to Linear Antenna Synthesis Problems according to Power Radiation Pattern".
- Mr. Victor Lysechko (Physiko-Mechanical Institute, Lviv, Ukraine) for "Diffraction of the Sound Wave by a Finite Soft (Rigid) Cone".
- Mr. Giga Gabriadze (Tbilisi State University, Tbilisi. Georgia) for "Modified Edge Current Method for High Frequency Scattering Problems".
- Mr. Giorgi Jambazishvili (Tbilisi State University, Tbilisi. Georgia) for "Experimental Localization of a Dielectric Object near a Two-way Line".

Figure 6. The DIPED-2014 Young Speaker Award recipients: Victor Lysechko, Kaka Lomia, Giga Gabriadze, Giorgi Jambazishvili, Veriko Jeladze, and Olena Bulatsyk (from l to r).

- Mr. Kaka Lomia (Tbilisi State University, Tbilisi. Georgia) for “Bio Heat Equation Modeling on Macro and Micro Scales”.

The recipients of Award were recognized by the especial certificate from the Program Committee and financial grant from the Organizing Committee.

Following to the DIPED tradition, time given up to the free lobby discussion takes a considerable part of total continuation of DIPED-2014.

The big excursion tour in the framework of the Seminar/Workshop social events consisted of three parts. First of them was excursion in Tbilisi and acquainting with most interesting architectural sights (Figures 7-9).

The next point was visit to the Jvari church (Figures 10-11). The Jvari church, the church of the Holy Cross, is situated in Mtskheta, and stands on the rocky mountaintop at the confluence of the Mtkvari and Aragvi rivers. The beginning of Christianity in Georgia is closely connected to its history. After the conversion of Kartli, a large wooden cross was erected on the spot where the church was later constructed. The cross was able to work miracles and therefore drew pilgrims from all over Caucasus. The Jvari church was built between 586 and 605 by Ersimtavari Stepanoz I, upon the cross which it enclosed within its interior.

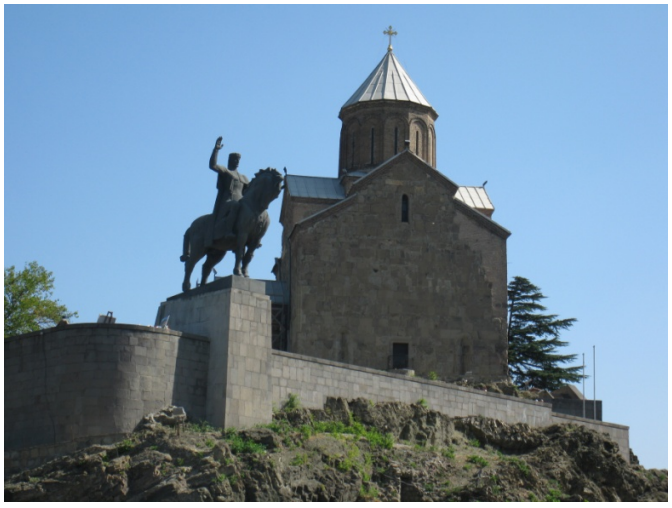

Figure 7. Monument of Vakhtang Gorgasali, Tbilisi founder, with Metekhi Church at the background.

A tour around Mtsheta - the oldest capital of Georgia, finished the excursion. Mtsheta is placed within 30 km from Tbilisi, this beautiful rare architectural ensemble of XIth century is unique in one's own way. Standing at the confluence of the Aragvi and Mtkvari rivers, one of the oldest towns in Georgia, Mtskheta has been populated since the second millennium BC. It was the capital of the Eastern Georgian kingdom of Iberia from the third century BC. It is thought that the name "Mtskheta" comes from the name for the "father of all Georgians, the son of Kartlos - Mtskhetos". Mtskheta is designated as a UNESCO World Heritage Site and is a living museum, with many architectural and historical monuments.

Figure 8. Monument of Taras Shevchenko, national Ukrainian poet, nearly the main TSU building.

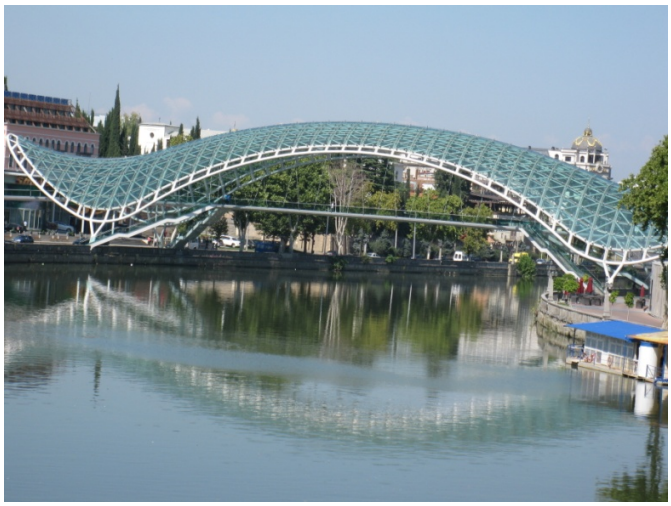

Figure 9. New architecture of old Tbilisi: bridge over Mtkvari river.

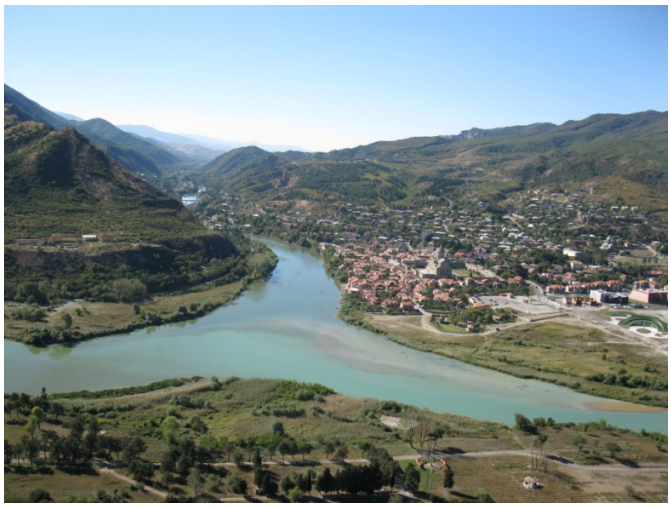

Figure 10. Nice view to the oldest capital of Georgia Mtskheta from the Jvari church high.

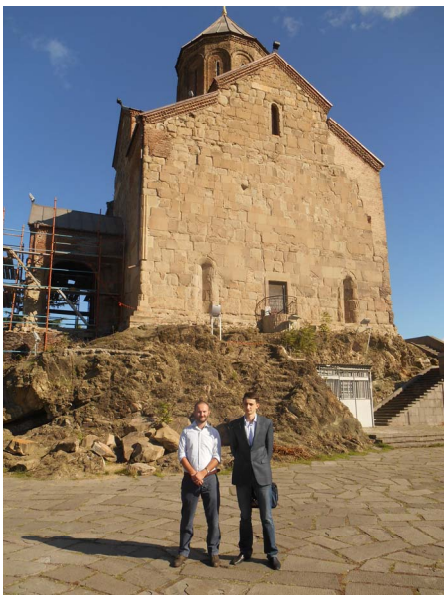

Figure 11. Kaka Lomia (l) and Victor Lysechko (r) with the Jvari church at the background.

Traditional Seminar/Workshop dinner was held after completion of the technical program. The Best Young Scientist Awards were presented there (Figures 12, 13), as well as the discussions about the improvement of the Seminar/Workshop format and proposals of the participants were taken into consideration. The original Georgian dishes and splendid drinks contributed to the intimate atmosphere of friendship between the participants and guests.

Figure 12. Prof. Revaz Zaridze, DIPED-2014 Organizing Committee Chairman (r) awarded Mr. Victor Lysecko (l) by the Best Young Speaker Award. Dr. Mykhaylo Andriychuk (c), Program Committee Secretary, assisted him.

Figure 13. Ms. Veriko Jeladze (l) was granted also by the Young Speaker Award.

In our opinion, DIPED-2014 Seminar/Workshop was served the further restoration and intensification of the conventional cooperation between scientific schools of participating countries in the diffraction theory and its application, widely presented in the program, as well as expansion of existing contacts and spheres of scientific interests.

It was announced by the organizers that the next 20th anniversary Seminar/Workshop DIPED will be held at the Institute of Applied Problems in Mechanics and Mathematics, Lviv, Ukraine, on September 21-24, 2015. The previous attendees and new participants are cordially invited.

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