

# Introduction to a Special Mini-Issue on Two Russian Organized Conferences With Focused THz Content

**D**URING 2014, there were several conferences organized in Russia or by Russian scientists that included THz science and technology as key topics. In particular, the *16th International Conference on Laser Optics*, Saint Petersburg, Russia, June 30th–July 4th 2014, and the *International Conference on Advanced Laser Technologies (ALT 2014)*, held in Cassis, France, from October 6th–10th, 2014, contained much of the latest research carried out in Russia involving THz science and technology. In order to highlight some of the most interesting developments and make sure they are available for the THz community worldwide, we selected several conference papers and asked the authors to expand them for inclusion in this Special Mini-Issue of the IEEE TRANSACTIONS ON TERAHERTZ SCIENCE AND TECHNOLOGY. We are releasing the solicited papers in two installments, one in July, and the other in September. Each installment contains approximately half the selected papers. The sum total of all the papers gives a comprehensive snapshot of current THz research and development activities in Russia.

The first installment of the Special Mini-Issue (July) is mostly devoted to solid-state studies at THz frequencies. In the first paper, D. Khokhlov and his team address the high value of surface electrical conductivity in crystalline topological PbSe and  $\text{Pb}_{1-x}\text{Sn}_x\text{Se}$  insulators. Using an original photo-electromagnetic effect method (PEM) at THz frequencies that they developed previously, the authors demonstrate that the high conductivity is related to surface electron states in PbSe, and not to the actual condition of the surface, resulting, for example, from oxidation.

In the second paper, V. Kornienko *et al.* study the influence of scattering on the transmission of THz waves through powdered materials. Using the Rayleigh–Gans–Debye approximation of the Mie theory, they are able to remove the scattering effects

from the transmission spectra, and thus determine the absorption spectra of the powdered substance.

The third paper, by V. D. Antsygin *et al.*, deals with THz photo-generation at a narrow-gap semiconductor, which is enhanced by a properly applied magnetic field. *n*-InSb excited by a pulsed laser at 1.55- $\mu\text{m}$  wavelength under a 0.8 T magnetic field is shown to be the most efficient photo-generator of THz radiation.

The fourth paper, by M. Nazarov *et al.*, reports on the electrical conductivity of highly doped semiconductors, like silicon. Using several clever experimental techniques based on the excitation of surface plasmons and on the characterization of their propagation properties, they show that the conductivity does not obey the classical Drude model.

The last paper in this part of the Special Mini-Issue is by V. Koshelets and colleagues. It details a superconducting receiver integrated on a single chip for THz heterodyne detection and monitoring of key molecules in the Earth's stratosphere. Using high-quality SIS tunnel junctions and a smart phase-locking system for the cryogenic THz oscillators, the operating frequency of the receiver is extended beyond 1 THz. Experimental data is presented.

The Guest Editors hope you will enjoy their selection of papers for this Special Mini-Issue and look forward to presenting for you, a final set of additional papers in the September 2015 issue of these Transactions.

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**Alexander Shkurinov** was born in Moscow, U.S.S.R., September 13, 1962. He graduated with honors from the M.V. Lomonosov Moscow State University (MSU), in 1985, and received the Ph.D. in physics from MSU in 1988.

In 1993, he spent a year as an Invited Professor at the University Bordeaux I, Bordeaux, France; in 1995, he spent two years as a Visiting Professor of University of Twente, Enschede, The Netherlands, and since 1996, for 6 years, he was a Professor at the University of Littoral, Dunkerque, France. Since 2004, he is a full-time Professor at the Department of Physics of the M.V. Lomonosov Moscow State University, Moscow, Russia, where he is Head of the Laboratory of ultrafast processes in Biology. His research interests are mainly centered around the development and application of femtosecond laser techniques, time-resolved spectroscopy of molecules in liquid phase, nonlinear optics, and THz techniques and spectroscopy. The results obtained have been published in more than 150 scientific papers in peer-reviewed journals. He reads lectures and gives seminars in general physics to undergraduate students at MSU and develops and reads specialized courses

of lectures in molecular nonlinear optics at the Moscow Physical Technical University. Apart from teaching, he is a scientific supervisor to undergraduate and postgraduate students.

Throughout his career, Dr. Shkurinov both participated and joined advisory boards, organizing and program committees of numerous international conferences. In 2008, The Russian Optical Society awarded him with the Medal in honor of Prof. Rozhdestvensky for his contribution into the development of optical science and technology. He is a member of the Optical Society of America (OSA), the International Society for Optics and Photonics (SPIE), and The European Optical Society (EOS).



**Jean-Louis Coutaz** received the Ph.D. degree from University of Grenoble, France, in 1981, for a dissertation on ion-exchange in glass and the “Docteur d'Etat” degree from the Polytechnic University of Grenoble (INPG) in 1987, whose subject was the generation of second harmonic waves at metallic grating surfaces.

In 1981–1982, he served as a lecturer at the University of Blida, Algeria, under a cooperation scheme. From 1983 to 1993, he was a full-time researcher at the French CNRS, working on guided-wave nonlinear optics (second harmonic generation, Raman scattering, electro-optic modulation). During 1988–1989, he was a Post-Doctoral fellow at the Royal Institute of Technology (KTH), Stockholm, Sweden, where he worked on semiconductor doped glasses. In 1993, he became a professor of physics at the University of Savoie, where he has started research activities in ultrafast optoelectronics. He was for several years director of the laboratory LAHC in the same university, and since 2007, he serves as deputy director of the IMEP-LAHC institute, a common laboratory of the Universities of Grenoble and Savoie. He was an invited professor at KTH Stockholm in 2000, and at Tohoku University, Sendai, Japan, in 2013. His present research activities include terahertz time-domain spectroscopy, electro-optic sampling and ultrafast III-V semiconductor devices. He is the author and co-author of about 500 papers and communications, and he was the editor of the book (in French) “*THz Optoelectronics*”, EDP Sciences (Paris, 2008). He was the guest editor of special issues of the *Proceedings of the Institution of Electrical Engineers* (vol. 81, 2002), and of *Comptes-Rendus (Physique)* (vol. 9, 2008) and (vol. 11, 2010). He was the secretary of the French Optical Society (2005–2009). He is a member of the committee of several international conferences, and of the editorial board of *International Journal of Infrared, Millimeter and Terahertz Waves*.

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