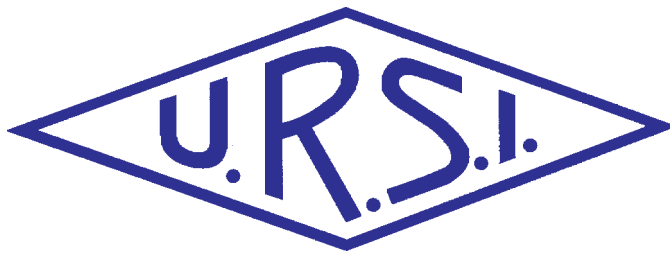


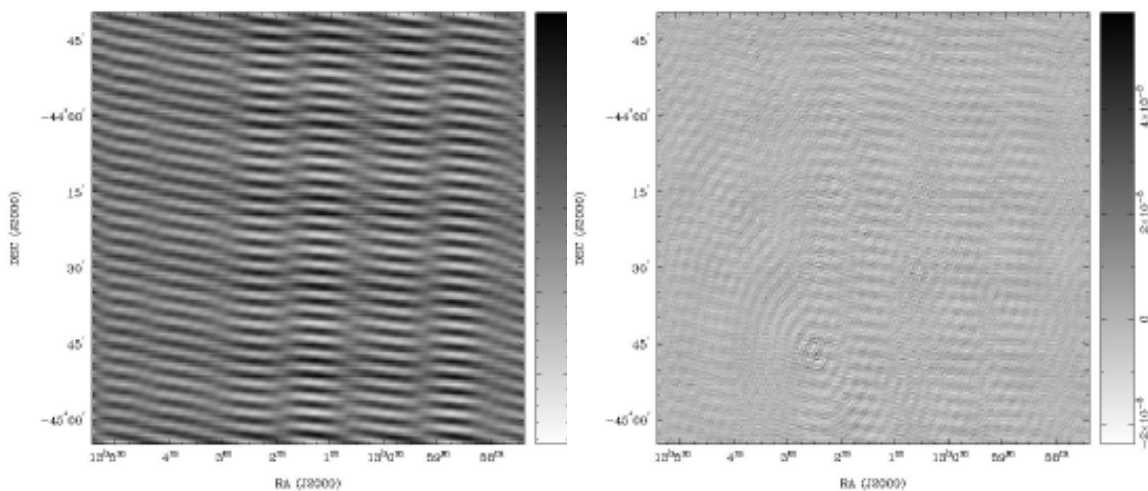
The Radio Science Bulletin

INTERNATIONAL
UNION OF
RADIO SCIENCE

UNION
RADIO-SCIENTIFIQUE
INTERNATIONALE



ISSN 1024-4530



No 322
September 2007

Publié avec l'aide financière de l'ICSU
URSI, c/o Ghent University (INTEC)
St.-Pietersnieuwstraat 41, B-9000 Gent (Belgium)

THE 6TH INTERNATIONAL KHARKOV SYMPOSIUM ON PHYSICS AND ENGINEERING OF MICROWAVES, MILLIMETER AND SUB-MILLIMETER WAVES (MSMW'07) AND WORKSHOP ON TERAHERZ TECHNOLOGY (TERATECH'07)

Kharkov, Ukraine, 25 - 30 June 2007

Abstract

The MSMW'07 Symposium took place at the V. Karazin Kharkov National University, Ukraine on June 25-30, 2007. It was organized by the Scientific Council of the National Academy of Sciences of Ukraine (NASU) on

Radio-Physics and Microwave Electronics, in co-operation with the following organizations: the A. Usikov Institute of Radio-Physics and Electronics of NASU (IRE NASU), the Institute of Radio Astronomy of NASU (IRA NASU), the V. Karazin Kharkov National University (KhNU), Kharkov National University of Radio Electronics (KhNURE), the Institute of Magnetism of NASU and Ministry of Education

Science of Ukraine (MESU) (IM NASU&MESU), the Institute of Ionosphere of NASU and MESU (II NASU&MESU), IEEE AP/MTT/ED/AES/GRS/NPS/EMB Societies East Ukraine Joint Chapter, IEEE MTT/ED/COM/CPMT/SSC Societies Central Ukraine Joint Chapter, IEEE MTT/ED/AP/CPMT/SSC Societies West Ukraine Joint Chapter and the National URSI Committee of Ukraine.

This Symposium was possible thanks to the support of sponsors: URSI (Commissions D and F), IEEE ED and MTT Societies, the US Army International Technology Center-Atlantic, Research Division, the European Office of Aerospace Research and Development, AEOSR, AFRL and has also been made possible thanks to the efforts of the traditional founders and organizers of MSMW and new co-organizing establishments - IM and II NASU&MESU. The European Microwave Association (EuMA) has donated a special grant for the funding of the EuMA-MSMW Microwave Prizes awarded to the young scientists who presented outstanding papers during the Symposium.

The working days of the Symposium were June 26 to 29, 2007. Every day the program started with a plenary session of five 35-min of invited lectures in a large auditorium followed by four or three parallel sessions of 15-min of contributed papers. The working language of the Symposium was English. June 26 was filled in with social events. The number of registered participants was 232 including 133 from Kharkov, 30 from the rest of Ukraine, 27 from Russia, 8 from Mexico, 6 from Germany, 4 from Japan and Lithuania, 3 from USA and 2 from Belarus, China, France, Italy, Israel, Turkey, the United Kingdom, Canada, the Czech Republic and India. The total number of papers presented during the Symposium was about 290 (out of 322 included in the Program) including 32 invited ones.

MSMW'07 Proceedings (two-volume, 1004 pages) had been published before the Symposium. The Symposium program contains papers submitted by world-known experts in microwaves and shorter wavelength science and technology, that's why participation in the Symposium has become a unique experience to Ukrainian participants.

This year, upon the initiative of the IMNASU&MESU, a Workshop on Terahertz Technologies (TERATECH'07) was organized in the framework of the MSMW'07 Symposium in the format of a special two-day session. We strongly hope that it will have remarkable impact on the ongoing and future R&D in this novel area. This is fully in line with traditionally strong emphasis placed by the MSMW program on the mm and sub-mm wave physics and technology. The extremely captivating and challenging area of nanophysics and nanoelectronics, considered as the key technology of the current century, has also been included in the agenda of the workshop.

Another important contribution to the success of MSMW'07 (organised by IM NASU&MESU) was a bus

tour to the unique experimental research center "Incoherent Scatter Observatory" located in the natural reserve about 50 km southwards from Kharkov on the forested bank of the Seversky Donets River.

June 25, 2007

On June 25, the day of registration, a bus city tour was organized, enabling participants to get acquainted with the history of Kharkiv, the second-largest Ukrainian city. Remarkable historical buildings and monuments, such as the Assumption Cathedral, WW II Memorials, and the "Gosprom" complex built in the 1920s in the constructivism style of the early Soviet period were visited.

June 26, 2007

MSMW'07 started at 9:00 on June 26, 2007 with the opening ceremony at the "Large Chemical" auditorium of the Kharkov National University. The first to address the participants was the MSMW'07 Chairman, Director of IRE NASU and Vice-Chairman of the Ukrainian National URSI Committee, Prof. Vladimir M. Yakovenko. He was followed by the welcome words from other organizations behind MSMW'07: Vice-Director of IRA NASU, Prof. Alexander A. Konovalenko, Vice-Rector of KhNU, Prof. Ilyi I. Zalubovsky, Rector of KhNURE, Prof. Michail F. Bondarenko, and Vice-Director of II NASU&MESU, Dr. Valeriy N. Lysenko. The representative of Administration of the Kharkov region, Dr. Vladlen Vavilov, informed the audience about the most significant achievements of scientists and engineers of Kharkov. The next to make a welcoming speech was MSMW'07 Co-Organizer Prof. Alexander I. Nosich of IRE NASU, who spoke in the name of the IEEE AP/MTT/ED/AES/GRS/NPS/EMB Societies East Ukraine Joint Chapter.

After the opening ceremony, the first plenary session was held, consisting of five invited talks:

- G. Duxbury, N. Langford, Glasgow Quantum Cascade Laser Spectroscopy Trace Gas Analysis to Non-Linear Optics, Glasgow, UK
- V. Parshin, the Precise Microwave Resonator Spectroscopy of Gases and Condensed Media, Nizhny Novgorod, Russia
- T. Idehara, H. Tsuchiya, La Agusu, H. Mori, H. Murase, T. Saito, I. Ogawa, S. Mitsudo, Development of CW THz Gyrotrons in FIR FU, Fukui, Japan
- O. A. Tretyakov, Separation of the instantaneous and Dynamic Polarizations in Studies of Dispersive Dielectrics, Gebze, Turkey
- J. Chandezon, Evolution of C-Method within the Frames of Diffraction grating Theory Development in France, Lasmea, France

After a lunch, the symposium continued with four simultaneous sessions:

- Session W. Workshop on Terahertz Technology
- Session I. Electromagnetic Theory and Numerical Simulation
- Session II. Waves in Semiconductors and Solid State Structures
- Session VIII. Radio Astronomy and Earth's Environment Study

In those sessions, the following invited papers were presented:

- (Session W):
 - G. Annino, T. Kolodiaznyi, M. Martinelli, Open Resonators for Millimeter-Wave Spectroscopy, Pisa, Italy
 - E. M. Ganapolskii, Z. E. Eremenko, Yu. V. Tarasov, Influence of Random Bulk Inhomogeneities on Quasioptical Cavity Resonator Spectrum, Kharkov, Ukraine
- (Session I):
 - A. Brovenko, P. Melezhik, A. Poyedinchuk, N. Yashina, G. Granet, Periodic Interface with/of Metamaterial: Resonant Absorption, Radiation, and Eigen Regimes, Kharkov, Ukraine, Aubiure, France
 - S. L. Prosvirnin, N. I. Zheludev, Planar Chiral Meta-Materials, Kharkov, Ukraine
- (Session II):
 - M. Rendon, N. Makarov, F. Izrailev, Square-Gradient Mechanism of Surface Scattering in Quasi-1D Waveguides with random rough Surfaces, Nice, France, Puebla, Mexico
 - G. A. Luna-Acosta, J. A. Méndez-Bermúdez, Microwave Chaotic open Cavities. Applications of Dynamical Trapping, Puebla, Mexico
 - N. M. Makarov, Localization Length for one-dimensional Array of Dielectric Bi-Layers with Correlated Positional Disorder, Puebla, Mexico
- (Session VIII):
 - E. Serabyn, toward a 25 m Submillimeter Telescope, California, USA

After these sessions, all the participants were invited to enjoy the concert provided by amateur performers of IRE NASU. Later that evening, at 8:00 p.m., on the welcome party at the university restaurant, Ukrainian champagne was served. This event created a perfect atmosphere to relax after long and sometimes tiring journeys that participants had to make to reach MSMW'07.

June 27, 2007

At the plenary session, the following invited papers were presented:

- S. Vitusevich, Low Noise Microwave Devices: ALGAN/GAN High Mobility Transistors and Oscillators, Juelich, Germany

- M. Lankaster, Micromachined Microwave Components for Communications and Radars, Birmingham, UK
- Y. Kulikov, new mobile Ground-Based Microwave Instrument for Research of Stratospheric Ozone (some Results of Observation), Nizhny Novgorod, Russia
- Y. He, H. Li, A. He, S. Li, X. Zhang, C. Li, L. Sun, Q. Zhang, F. Li, Developments of HTS Microwave Filters for Applications in TD-SDMA Base Station, Satellite Receiver and Meteorological Radar, Beijing, China
- N. Pompeo, R. Rogai, S. Sarti, E. Silva, Microwave Properties of Cup Rate Superconductors in External Magnetic Fields, Roma, Italy D.M.

That day regular sessions of contributed papers consisted of:

- Session W: Workshop on Terahertz Technology
- Session III: Microwave Superconductivity
- Session IV: Wave Propagation, Radar, Remote Sensing and Signal Processing
- Session V: Vacuum Electronics

In those sessions, the following invited papers were presented:

- (Session III):
 - V. M. Pan, A. L. Kasatkin, A. A. Kalenyuk, Nonlinear Microwave Properties of High-Temperature Superconducting $YBa_2Cu_3O_{7-d}$ Single Crystal thin Films, Kiev, Ukraine
 - J. Wosik, M. R. Kamel, L. Xue, L.-M. Xie, K. Nesteruk, Houston, Superconducting 300 MHz Phased-Array for Magnetic Resonance Imaging Applications, USA; Warsaw, Poland
- (Session IV):
 - D. M. Vavriv, O. O. Bezvesilniy, V. V. Vynogradov, V. A. Volkov, R. V. Kozhin, High-Accuracy Doppler Signal Processing: Techniques and Applications, Kharkov, Ukraine
 - K. A. Lukin, A. A. Mogyla, P. L. Vyplavin, V. P. Palamarchuk, I. V. Zemlyaniy, Y. Shiyan, N. E. Zaets, V. N. Skresanov, A. I. Shubniy, V. Glamazdin, M. P. Natarov, I. G. Nechayev, Ka-Band Ground-Based Noise Waveform SAR, Kharkov, Ukraine

June 28, 2007

On the third day, the plenary session looked as follows:

- R. Heidinger, Development of the ECRH Launcher at the Iter upper port, Karlsruhe, Germany
- A. A. Savchenkov, A. B. Matsko, V. S. Ilchenko, N. Yu, L. Maleki, Microwave Photonics Applications of Whispering Gallery Mode Resonators, Pasadena, USA
- J. Wosik, C. Darne, P. Xie, J. Krupka, Resonant and Broadband Microwave Characterization of Single-Walled Carbon Nanotubes, Houston, USA; Warszawa, Poland
- F. Pérez-Rodríguez, F. Díaz-Monge, N. M. Makarov, R. Márquez-Islas, B. Flores-Desirena, Spatial-

Dispersion Effects in one-dimensional Photonic Crystals with Metallic Inclusions, Puebla, Mexico

- R. G. Barrera, A. Reyes-Coronado, A. García-Valenzuela, E. Gutiérrez-Reyes, Insights into the Problem of Reflection from Colloidal Systems: an Effective Medium Approach, Mexico-City, Mexico

Three parallel sessions of regular papers that day went along the following topics:

- Session IX. Radiospectroscopy, Complex Media, Nanophysics
- Session X. Scientific, Industrial and Biomedical Applications
- Session XI. R-Functions, Atomic functions, Wavelets, Fractals

During those sessions the following invited papers were presented:

- (Session IX):
 - K. N. Rozanov, I. T. Iakubov, A. N. Lagarkov, S. A. Maklakov, A. V. Osipov, D. A. Petrov, I. A. Ryzhikov, M. V. Sedova, S. N. Starostenko, Laminates of thin Ferromagnetic Films for Microwave Applications, Moscow, Russia
 - V. Krivoruchko, A. Marchenko, A. Mazur, A. Prokhorov, Magnetic Structure and Microwave Properties of $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ Ultrafine Particles, Donetsk, Ukraine
- (Session X):
 - Y. Feldman, A. Puzenko, P. B. Ishai, A. Caduff, A. J. Agranat, the Electromagnetic Response of Human Skin in Submillimeter Frequency Range, Jerusalem, Israel
- (Session XI):
 - V. Ponomaryov, Order Statistics Based Algorithms in Filtering of 2D-3D Images and Objects, Mexico-City, Mexico

That evening, the Symposium banquet was held at the university restaurant. It was a lovely event accompanied with live music, dance and informal speeches. The dominant tone, however, was the joy of meeting old friends and colleagues and making new ones.

June 29, 2007

On the last working day at the morning session, the following invited topics were presented:

Session VI. Solid State Devices
Session VII. Antennas Waveguides and Integrated Circuits

The plenary session consisted of one invited paper:

- G. Granet, Improvement of Fourier Modal Methods by Means of Non Conventional Coordinate Systems, Aubièrre, France

EuMA-MSMW Prizes

The closing ceremony of MSMW'07 took place in the "Large Chemical" auditorium of KhNU at 15:00. At first, the winners of the Best Young Scientist Paper Contest were announced and awarded with the EuMA-MSMW Prizes. This year the European Microwave Association established a 1000 Euro fund to be awarded to the winners of the Young Scientist Paper Contest. They were divided into 6 prizes: one First Prize (300 Euro), two second prizes (200 Euro), and three third prizes (100 euro). The number of papers considered for the Contest was 54. The International Awards Jury consisted of 9 members: T. Idehara, Fukui, Japan; M. Lancaster, Birmingham, UK; G. Granet, Aubièrre, France; A.I. Nosich, Kharkov; Ukraine, S.V. Boriskina, Kharkov; Ukraine, N. T. Cherpak, Kharkov; Ukraine, D.M. Vavriv, Kharkov; Ukraine, F.I. Yanovskiy, Kiev; Ukraine, and B. G. Kutuza, Moscow, Russia.

The First Prize was awarded to

- **O. Kononenko**, Mathematical Model of Ohmic Losses in Coaxial Cavity Gyrotron with a Corrugated Insert, KhNU, Kharkiv, Ukraine

Two Second Prizes were awarded to

- **Aleksey Gubin**, Grazing Incidence Reflectivity of High-TC Superconductors: MM Wave Technique, a new Approach to Study and first results, IRE NASU, Kharkiv, Ukraine
- **Stanislav Sekretarov**, Development of A Ka-Band Slotted Antenna Array, IRA NASU, Kharkiv, Ukraine

Three Third Prizes were awarded to

- **Ekaterina Yarko**, using of PSTD-Method and Transmission Matrixes for Research of Light Diffraction by Periodic Nanostructures, KhNU, Kharkiv, Ukraine
- **Olga Polischuk**, Tunable Screening of Inter-Contact Plasmons by a recessed Gate in Field-Effect Transistor with two-dimensional Electron Channel, Institute of Radio Engineering and Electronics RAS, Saratov, Russia
- **Oksana Shramkova**, Nonlinear Effects in the Layered Semiconductor Structures, IRE NASU, Kharkiv, Ukraine

Besides, 3 honorary mentions were made for the "Next to the best papers".

- **Sergey Boruhovich**, Three-Dimensional Chirality Degree Model, IRA NASU, Kharkiv, Ukraine
- **Vitaliy Lomakin**, Phenomena of Resonant Transmission through Perforated Metal Plates, University of California, San Diego, USA
- **Sergey Skripka**, Planar Waveguides and Resonators of mm- and submm Bands, Kiev National University, Kiev

The colorful certificates of the EuMA-MSMW Prize, signed by Prof. R. Sorrentino, President of the European Microwave Association and by Prof. Vladimir M.

Yakovenko, MSMW'04 Chairman, were handed to the winners by Prof. Felix. J. Yanovsky on behalf of EuMA.

Besides the EuMA-MSMW Prizes, another Young Scientist Award was granted by the IEEE East Ukraine Joint Chapter for the best poster paper presented at the symposium. It consisted of a certificate and a 100 USD money prize. This award was given to

- **Aleksandr Barannik**, Whispering-Gallery-Mode Sapphire Resonators in the Forms of Cylindrical Disc and Cone for Millimeter-Wave Resistance Measurements of HTS Films, IRE NASU, Kharkiv, Ukraine

The final closing address was done by Prof. Vladimir M. Yakovenko. He announced that the next Symposium, MSMW'07, will be held again in Kharkov in June, 2010. He thanked the participants and organizers for creating an unprecedented forum for scientific discussions and expressed the hope that the MSMW Symposia series will be continued. He also expressed gratitude to international institutions such as IEEE, URSI, and EuMA for their valuable and timely support.

June 30, 2007

On the weekend after the Symposium, the participants were proposed a social program in order to relax after four

days of intensive work and to strengthen the links originated at the Symposium.

On Saturday, June 30, a full-day bus tour was organized from Kharkov to the Experimental Center of the Institute of Ionosphere of NASU&MESU. It is located in a picturesque Ukrainian countryside at the junction of the Mzha and Siverskiy Donets rivers and possesses two radars for the incoherent scattering. The radars of the meter waveband include the biggest in Europe bi-reflector zenith-looking parabolic 100 m in diameter antenna and a full-revolving 25 m in diameter antenna, 3.6 MWt transmitter, high-stability sensitive receiver of 150 K noise temperature and short-wavelength heating test bench. A method of incoherent scattering is based on the scattering of radiowaves by thermal fluctuations of electron density. The method allows one to obtain estimates of electron concentration, ionic and electronic temperatures, plasma drift velocities, ion structure, and collision frequency of ions and electrons with neutral particles. Parameters of ionosphere are determined in the wide range of altitudes from 70 to 1500 km, both below and above the main ionization maximum. After visiting the facilities of the Experimental Center, hosted by the Vice Director of the Institute of Ionosphere of NASU&MESU, Prof. V. Lysenko, and the Center's personnel, a barbecue party was held.

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