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TECHNICAL BRIEFS

TRENDS IN DEVICE RESEARCH - IEDM 2015 HIGHLIGHTS



Advanced research trends in devices and their application are always reported at IEDM annually. Scientists and technologists at all levels from industry as well as academia always assemble at IEDM and sharpen their ears to hear the new results and innovations from laboratories around the world. The IEEE EDS Newsletter captures some of the key presentations at IEDM 2015 and is summarized here. These include novel devices using both silicon and hetero structures for various applications including sensing, imaging and Internet of Things (IoT). Full texts of the IEDM papers are available at the IEDM Technical Digest in IEEEExplore (ieeexplore.ieee.org/)

Difficulty seeing nanoscale transistor features? Well, a Penn State researcher has said goodbye to microscopes and hello to atom probe tomography. Tunneling field-effect transistors (TFETs) are promising for ultra-low-power applications, but improvements in their performance and reliability are needed. Critical to TFET performance when they are made from combinations of III-V materials is the need for abrupt and uniform interfaces among the dissimilar materials. Variability at these interfaces, or heterojunctions, reduces device performance and it is difficult to characterize heterojunctions with precision in nanometer-scale devices, but a Penn State team used atom probe tomography and time-of-flight spectroscopy to do so. First they cooled TFET samples to 50° Kelvin. Then, they rapidly heated the heterojunction under study with laser pulses to evaporate layers of atoms from it, one layer at a time. They captured the atoms from each layer in an electric field, and then performed spectroscopic analysis to identify the individual atoms, which constituted each layer. From all this data they built a 3D map of the heterojunction, with a resolution of 2.4 nm. Then, they rested. The study was reported in Paper 14.2, *Tunnel Junction Abruptness, Source Random Dopant Fluctuation and PBTI Induced*

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YOUR COMMENTS SOLICITED

Your comments are most welcome. Please write directly to the Editor-in-Chief of the Newsletter at radhakrishnan@ieee.org



Speakers and attendees at theBrú na Bóinne event (clockwise from bottom left) Prof. Liam Barry (DCU), Dr. Frank Prendergast (DIT), Prof. Tom Ray (DIAS) and a selection of attendees at the reception prior to the talks

The technical meetings will be hosted by the Department of Industrial and Biomedical Electronics, National Technical University “Kharkiv Polytechnic Institute” and by the Department of Computer Engineering, Open International University of Human Development “Ukraine”, Kyiv. The participants will attend scientific lectures, construct devices according to the proposed schemes and demonstrate industrial and household devices such as alarm systems, a small solar power generator, a FM-radio receiver, etc. We plan such events to be held once a year.

ED/AP/MTT/COM/EMC Tomsk Chapter

—by Oleg Stukach

Siberian Conference on Control and Communications SIBCON

The 11th Siberian Conference on Control and Communications (SIBCON) co-sponsored and organized by the joint EDSTomsk chapter, took place in Omsk, Russia, on May 21–23, 2015. This biannual meeting was sponsored by the Russian Foundation for Basic Research with technical co-sponsorship of the IEEE Russia Siberia Section.

Papers reporting various scientific topics were presented at the conference. The technical program consisted of contributed papers oral sessions. Various problems related to semiconductor materials, communication and control theory, sensors, and electron devices, with emphasis on both theory and applications, were considered.

The major goal of the conference was to bring together researchers from various fields, in order to present advances in the state-of-the art communication and control theory and technology. The real value of SIBCON is its role as a platform for personal contact and direct information exchange. Unified perspectives in this interdisciplinary field of advanced research were also achieved. The symposium has moreover proved to be particularly rewarding to every participant, in as much as most of them showed interest in

The joint chapter would like to express their deep appreciation for the support and efforts of Ireland’s Office of Public Works (OPW), which made this event such a huge success. The guided tours were fully subscribed with over 70 people, and these were followed by a reception with food and drinks generously provided by the OPW.

The evening was rounded off with a series of talks by leading Irish experts, Dr. Frank Prendergast (Dublin Institute of Technology), Prof. Tom Ray (Dublin Institute of Advanced Studies) and Prof. Liam Barry (Dublin City University). The speakers explored issues including the influence of light on prehistoric architecture and art, Ireland’s historical connections to the use of light in science and technology, and an analysis of the future crucial importance of photonics in our information society.

~ Jonathan Terry, Editor

ED/AES/AP/MTT/GRS/NPS East Ukraine Chapter

—by Nikolay Cherpak, Mikhail Balaban, Ganna Veselovska

In the last few months, members of our chapter took part in several technical meetings organized at O. Ya.

Usikov Institute for Radiophysics and Electronics of the National Academy of Sciences of Ukraine (IRE NASU). During the meetings half-hour lectures on electronic devices and signal processing were given.

The Chapter has arranged several meetings in the framework of the “Engineers Demonstrating Science: an Engineer Teacher Connection” (EDS-ETC) program. Our partners are:

- National Technical University “Kharkiv Polytechnic Institute” (www.kpi.kharkov.ua/en),
- National Technical University of Ukraine “Kyiv Polytechnic Institute” (www.kpi.ua/en),
- Open International University of Human Development “Ukraine” (www.en.vmurol.com.ua),
- IEEE Section Ukraine (www.ieee.org.ua)

These events will be organized as a series of two technical meetings for pupils, students, as well as for leading scientists and lecturers of technical Universities of Ukraine. They will be held in Kyiv, capital city, and Kharkiv which is the major scientific, higher education and research center of Ukraine, known as a “smart city” of Eastern Europe.



Participants of the SIBCON'2015 Conference

sharing experiences and opinions in a cultural and historical perspective. That brought additional value to the conference which has thus been memorable.

The conference as a whole has demonstrated continuing interest in analysis and control methods for the considered problems. The SIBCON conference has furthermore been a great opportunity to realize a useful and productive bridge between the experienced IEEE members, National Instruments R&D employees, and the new incomers, and a starting point for innovative business ventures and relationships between NI and EDS members.

Omsk, the ancient town of Siberia, witnessed many exciting events in Russian history and still plays a very important role in its scientific and cultural life. The participants have moreover had the opportunity to enjoy the historical sites, as well as the beauties of the city in the famous "Dark Days" season.

We are very pleased that SIBCON conference has already gained the status of a significant and well-known event in Siberia. All information about SIBCON event can be found on our home page: <http://chapters.comsoc.org/tomsk/sibcon>. We hope you might consider participating at the next SIBCON. Please join us. We are sure you will not be disappointed.

IEEE Republic of Macedonia EDS/IMS/SSCS

—by *Goce L. Arsov*

Dr. Simon Deleonibus, IEEE Fellow, Region 8 SRC Chair, Chief Scientist of CEA/LETI (France) and IEEE EDS Distinguished Lecturer, visited the University SS Cyril and Methodius in Skopje, on the invitation of the IEEE Republic of Macedonia EDS/IMS/SSCS Joint Chapter Chair, Professor Goce L. Arsov. On September 23rd in the conference room of the Faculty of Electrical Engineering and IT, Dr. Deleonibus gave a DL on More Moore and More than Moore working on 3D, which was organized by the IEEE

Republic of Macedonia EDS/IMS/SSCS Joint chapter and co-sponsored by the Republic of Macedonia IES/IAS/PELS Joint Chapter.

On the same day the Chapter also organized a DL delivered by Professor Jan Van der Spiegel, Vice President and DL of the IEEE Solid State Circuits Society.

Besides giving the lecture, Dr. Deleonibus was also a keynote speaker at the 12th International Conference on Electronics, Telecommunications, Informatics and Automatics, ETAI2015, held in Ohrid, September, 24–26, 2015.

~*Daniel Tomaszewski, Editor*

ASIA & PACIFIC (REGION 10)

ED University of Chinese Academy of Sciences (UCAS)

—by *Lingfei Wang*

The Beijing Student Branch Chapter held "The 1st Academic Exchanges Conference for Young Researchers" in UCAS Yanqi Lake campus, August 29–30, 2015. The UCAS is the first graduate school in China with the ratification of the State Council and the newest Yanqi Lake campus employed in 2013, with very beautiful scenery and located near the Asia-Pacific Economic Cooperation



Dr. Simon Deleonibus receiving a Certificate of Appreciation from the EDS/IMS/SSCS Chapter Chair, Prof. Goce L. Arsov; University SS Cyril and Methodius in Skopje, September 26, 2015