Sabanci Üniversitesi

Sabanci University Microelectronics Workshop
19th-20th June, 2014, Sabanci University, Istanbul, TURKEY

Microelectronic Technology, Circuits, and Systems for Space Applications

We are organizing a Microelectronics Workshop that focuses on microelectronics, from technology to circuits and systems perspective, and its applications on sensing and processing electronic systems for space applications.

Ever increasing space applications are demanding more challenges to be met by microelectronics technology/circuits/systems, especially for autonomous, flexible and reliable systems in space. In this workshop, we aim to address some of following challenges through invited lectures given by world-renowned experts in their respective fields from academia, industries and research institutions.

- **Main Topics**
  1. **Radar and Communication Technologies**
  2. **Electro-Optical Imaging Systems: Technology and Applications**
  3. **Micro and Nano Technologies**
  4. **Terahertz Technology and Systems**
  5. **Packaging, Testing and Qualification**

Scientific Committee
Goutam Chattopadhyay (NASA-JPL, Caltech, USA)
Yasar Gurbuz (Sabanci University, Turkey) (Organizer)
Nafiz Karabudak (Lockheed Martin Corporation, USA)
Manijeh Razeghi (Northwestern University, USA)
Gabriel Rebeiz (UC San Diego, USA)
Hermann Schumacher (University of Ulm, Germany)
Sivananthan Sivalingam (University of Illinois – Chicago, USA)
Bernd Tillack (IHP-Microelectronics, University of Berlin, Germany)

Each talk includes a brief tutorial, current state of the art and future vision of the respective topic and will be interest to technology leaders/managers, engineers, researchers, academicians and students from around the world.

You can register from website: http://sumicro.sabanciuniv.edu

Early Registration (May 9th) price for attendees: $200 and for students $100
Registration price for attendees: $250 and for students: $150
Registration fee includes lectures and coffee breaks.
The workshop will be held at Sabanci University campus in Tuzla - Istanbul, Turkey.

Contact person: Prof. Dr. Yasar Gurbuz (yasar@sabanciuniv.edu)

Workshop Schedule

Sabancı Üniversitesi

Thursday, June 19th		
08:00-08:25	Registration	
08:25	Opening Talk, Prof. Dr. A. Nihat Berker, President, Sabanci University	
08:30	Space Technology Strategy and Initiatives in Turkey, SSM (Undersecretariat for Defense Industries)	
08:50	Anthony W. Jacomb-Hood	State-of-the Art RADAR and Communication Systems in Space
09:40	Prof. Payam Heydari	Millimeter-wave and Terahertz Integrated Circuits in Silicon Technologies: Challenges and Solutions
10:30-11:00	Coffee Break	
11:00	Prof. Hermann Schumacher	SiGe BiCMOS for phased array, RFMEMS, Challenges of passive mm-wave imaging: the need for reconfigurability and complexity in millimeter-wave MMICs
11:50	Prof. Bernd Tillack	SiGe BiCMOS, technology, devices, circuits/systems
12:40-14:00	Lunch	
14:00	Dr. Claudio Lanzieri	Advances in GaAs/GaN Technology and Design for T/R Module Application
14:50	Dr. Isik Kizilyalli	Gallium Nitride (GaN) and Wide Band Gap Semiconductors for Power Electronics
15:40-16:10	Coffee Break	
16:10	Dr. Volker Ziegler	Advanced RF-frontends in communication and radar systems for aerospace applications
17:00	Prof. Manijeh Razeghi	Terahertz to Deep UV ,Science and Technology for Space Application
17:50-18:50	Discussion Session	
19:00-21:00	Dinner and Reception	

Workshop Schedule

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Friday, June 20th		
08:30	Dr. Goutam Chattopadhyay	THz Technology and Systems
09:20	Dr. Olivier Gravrand	Overview of High Performance Quantum IR Imaging Devices
10:10-10:40		Coffee Break
10:40	Dr. Fikri Aqariden	MCT-based IR Detectors
11:30	Dr. Christel-Loic Tisse	Advances in uncooled micro-bolometers
12:20-13:40		Lunch
13:40	Dr. Frank Schwierz	Graphene Based Nanoelectronics
14:30	Dr. Ray L. Ladbury	Radiation Hardening at the System Levels
15:20-15:50		Coffee Break
15:50	Oswin Ehrmann	Wafer Level System Integration and 3D Packaging
16:40-17:10		Discussion Session
17:10-21:00		Social Event

Topic Details and Corresponding Speakers

1. Radar and Communication Technologies, Circuits and Systems

- T/R Module System/Design
- Phased-Arrays: Basics, Past, and Future Trends
- SiGe BiCMOS Technology for Phased Array Applications
- Advances in GaAs/GaN Technology and Design for T/R Module Applications.

❖ Anthony H. Jacomb-Hood, State-of-the Art RADAR and Communication Systems in Space (Lockheed Martin Corp.)

Anthony W. Jacomb-Hood has a B.A. in electrical sciences from Cambridge University, England and an M.S.E.E. from Syracuse University, Syracuse, NY. He has worked for Lockheed Martin and its predecessor companies (Martin Marietta, GE Aerospace) since 1984. He is currently involved in the development of phased array antenna systems for satellite applications. Previously he was involved in the development of Monolithic Microwave Integrated Circuits and microwave modules for phased arrays and other applications

❖ Prof. Payam Heydari, Millimeter-wave and Terahertz Integrated Circuits in Silicon Technologies: Challenges and Solutions (UC Irvine)

Payam Heydari received his B.S. and M.S. degrees (Honors) in Electrical Engineering from Sharif University of Technology in 1992 and 1995, respectively. He received his Ph.D. degree from the University of Southern California in 2001. He is currently a Full Professor of Electrical Engineering at the University of California, Irvine.

He is the (co)-author of two books, one book chapter, and more than 110 journal and conference papers. He has given Keynote Speech to IEEE GlobalSIP 2013 Symposium on Millimeter Wave Imaging and Communications and served as Invited Distinguished Speaker to the 2014 IEEE Midwest Symp. on Circuits and Systems. He is the Distinguished Lecturer of IEEE Solid-State Circuits Society.

Dr. Heydari is recipient of the Distinguished Engineering Educator Award from Orange County Engineering Council. The Office of Technology Alliances at UCI has named Dr. Heydari one of 10 Outstanding Innovators at the university. He is the co-recipient of the 2009 Business Plan Competition First Place Prize Award and Best Concept Paper Award both from Paul Merage School of Business at UC-Irvine. He is the recipient of the 2010 Faculty of the Year Award from UC-Irvine's Engineering Student Council (ECS), the 2009 School of Engineering Fariborz Maseeh Best Faculty Research Award, the 2007 IEEE Circuits and Systems Society Guillemin-Cauer Award, the 2005 IEEE Circuits and Systems Society Darlington Award, the 2005 National Science Foundation (NSF) CAREER Award, the 2005 Henry Samueli School of Engineering Teaching Excellence Award, the Best Paper Award at the 2000 IEEE Int'l Conference on Computer Design (ICCD), and the 2001 Technical Excellence Award from the Association of Professors and Scholars of Iranian Heritage (APSIH). He was recognized as the 2004 Outstanding Faculty in the EECS Department of the University of California, Irvine. His research on novel low-power multi-purpose multi-antenna RF front-ends received the Low-Power Design Contest Award at the 2008 IEEE Int'l Symposium on Low-Power Electronics and Design (ISLPED).

Dr. Heydari served as the Guest Editor of IEEE Journal of Solid-State Circuits (JSSC), and Associate Editor of IEEE Trans. on Circuits and Systems - I, and served on the Technical Program Committees of Compound Semiconductor IC Symposium (CSICS), Custom Integrated Circuits Conference (CICC), and ISLPED. He served on the Technical Program Committees of and Int'l Symposium on Quality Electronic Design (ISQED), IEEE Design and Test in Europe (DATE) and International Symposium on Physical Design (ISPD). He is the director of the Nanoscale Communication IC (NCIC) Labs.

He is a Senior Member of the IEEE.

❖ Prof. Bernd Tillack, SiGe BiCMOS, technology, devices, circuits/systems (IHP-Microelectronics, University of Berlin)

He received the Ph.D. degree from the University Halle-Merseburg in 1980. In 1981 he joined the IHP Frankfurt (Oder), Germany, as a staff member of the process technology. His research interests include SiGe BiCMOS technology development following the “More than Moore” strategy for embedded system applications. Since 2004 he is in charge of the Si/SiGe process and device technology in the IHP. In 2008 he recevied a Professorship for Si based high frequency technologies at the Berlin Institute of Technology (TU Berlin).

- **Prof. Hermann Schumacher, SiGe BiCMOS for phased array, RFMEMS, Challenges of passive mm-wave imaging: the need for reconfigurability and complexity in millimeter-wave MMICs (University of Ulm)**

  He received the Dr.-Ing. degree in engineering from RWTH Aachen, Aachen, Germany, in 1986. After working for Bellcore, Redbank, NJ, USA, from 1986 to 1990, he joined Ulm University, Ulm, Germany, as a Professor with the School of Engineering and Computer Engineering. He is currently the Director of the Institute of Electron Devicesand Circuits and the Director of the Communications Technology international M.Sc. program. His research interests range from compound semiconductor devices for micro- and millimeter-wave applications to high-frequency microsystems, including low-cost millimeter-wave communication solutions and impulse-radio ultra-wideband techniques for biomedical sensing.

- **Dr. Claudio Lanzieri, Advances in GaAs/GaN Technology and Design for T/R Module Application (Selex ES)**

  He joined Selenia Research Laboratories, Rome, in 1985, where he was responsible for GaAs MMICs research and development activities. He has coauthored more than 100 technical papers in international journals, mainly in the field of semiconductor materials and device fabrication. He is also Head of the SELEX Sistemi Integrati, Rome, (formerly AMS) GaAs Foundry.

2. Electro-Optical Imaging Systems: Technology and Applications

- Detectors and Readout Circuits
- Imaging Systems

❖ Prof. Manijeh Razeghi, Terahertz to Deep UV ,Science and Technology for Space Application (Northwestern University)

Manijeh Razeghi is one of the leading researchers in the field of optoelectronics. Her areas of expertise are in the growth and characterization techniques for III-V and II-VI semiconductor heterojunction multiple quantum well devices and superlattices for photonic and electronic devices. She was responsible for the design and implementation of epitaxial growth techniques such as metalorganic chemical vapor deposition (MOCVD), VPE, MBE and metalorganic molecular beam epitaxy (MOMBE) as well as optical, electrical, and structural characterization of the semiconductor multilayers. She has developed a number of semiconductors, advanced photonic and electronic devices such as lasers, photodetectors, transistors and which are in turn used in fiber optics communication. She holds 50 patents and was awarded the prestigious IBM Europe Science and Technology Prize in 1987. She is the author of "The MOCVD Challenge": Vol 1 (1989) and Vol. 2 (1995), and the co-author of several other books. In addition, she is the author and co-author of more than 700 papers.

❖ Dr. Fikri Aqariden, SiGe BiCMOS for phased array, RFMEMS, Challenges of passive mm-wave imaging: the need for reconfigurability and complexity in millimeter-wave MMICs (EPIR Technologies Inc.)

Dr. Fikri Aqariden is leading the development and the manufacturing of advanced infrared material processing at EPIR Technologies Inc. (EPIR). Dr. Aqariden has 18 years of compound semiconductor growth, material processing and device fabrication. He was previously employed for 12 years by DRS Infrared Technologies in Dallas, TX, where he was the Focal Plane Array Development Manager and the Lead scientist for advanced material growth by molecular beam epitaxy. Dr. Aqariden played key role for obtaining the NASA certification to build flight detectors. He was directly involved in the product development of all staring and scanning 2nd Gen and 3rd Gen Focal Plane Arrays currently employed for infrared imaging, piloting and targeting in the Apache Helicopter, M1 Abrams Main Battle Tank, Bradley Fighting Vehicle, and others. Dr. Aqariden was leading a group of scientists responsible for yield enhancement of all DRS cooled products. Dr. Aqariden has been author, co-author and reviewer of numerous publications and presentations regarding the fabrication of advanced HgCdTe focal plane arrays, lead salt materials growth and device processing and CdZnTe polishing for both infrared and radiation detection.

❖ Dr. Olivier Gravrand, RF, Microwave and THz IC/Systems (CEA-Leti)

Former student of the Ecole Normale Superieure de Lyon, Olivier Gravrand did a PhD in physics applied to earth science (high performance magnetometer design) at the IPGP (Institut de physique du globe de Paris). He then joined the LETI IR group in 2001, in charge of IR detector electro-optical characterization. Since then he has been working on HgCdTe, InSb, InGaAs and 3-5 super-lattice photodiodes, both from the characterization, design and simulation point of view, in close collaboration with the Sofradir Group, leading manufacturer of IR detectors in Europe.

❖ Dr. Christel-Loic Tisse, Advaces in uncooled micro-bolometers (ULIS)

Dr. Christel-Loic Tisse has been the Chief Technical Officer of ULIS S. A. S since November 2013. Dr. Tisse joined ULIS from MTech-Imaging Pte Ltd., a Singapore-based company he co-founded that specialises in offering innovative low-light, night-vision and thermal infrared imaging technologies. From 2008 - 2010, he was a senior research fellow at the Institute for Infocomm Research (A STAR) and at the Interactive and Digital Media Institute. His research investigated solid-state refocusing and visual analytics techniques for exploring semiotic models of visual inference processes. Dr. Tisse also provided consulting activities in the area of co-design of hybrid optical-digital imaging systems and was given an honorary position as consultant advisor at National University of Singapore. Prior to that, Dr. Tisse spent a year with DxO Labs, a fast-growing start-up developing Extended Depth-of-Field (EDoF) technologies for camera phone applications. There, he served as deputy chief scientist and research director of the B2B division. Dr. Tisse earned his PhD in microelectronics from the Laboratory of Computer Science, Robotics and Microelectronics (LIRMM) at the University of Montpellier in 2003.

3. Electro- Micro and Nano Technologies

- MEMS (RFMEMS, inertial, etc.)
- Nanotechnologies/Nanoelectronics
- Large-Scale Graphene for Nanoelectronics

❖ Prof. Bernd Tillack, SiGe BiCMOS, technology, devices, circuits/systems (IHP-Microelectronics, University of Berlin)

He received the Ph.D. degree from the University Halle-Merseburg in 1980. In 1981 he joined the IHP Frankfurt (Oder), Germany, as a staff member of the process technology. His research interests include SiGe BiCMOS technology development following the "More than Moore" strategy for embedded system applications. Since 2004 he is in charge of the Si/SiGe process and device technology in the IHP. In 2008 he recevied a Professorship for Si based high frequency technologies at the Berlin Institute of Technology (TU Berlin).

❖ Prof. Hermann Schumacher, SiGe BiCMOS for phased array, RFMEMS, Challenges of passive mm-wave imaging: the need for reconfigurability and complexity in millimeter-wave MMICs (University of Ulm)

He received the Dr.-Ing. degree in engineering from RWTH Aachen, Aachen, Germany, in 1986. After working for Bellcore, Redbank, NJ, USA, from 1986 to 1990, he joined Ulm University, Ulm, Germany, as a Professor with the School of Engineering and Computer Engineering. He is currently the Director of the Institute of Electron Devicesand Circuits and the Director of the Communications Technology international M.Sc. program. His research interests range from compound semiconductor devices for micro- and millimeter-wave applications to high-frequency microsystems, including low-cost millimeter-wave communication solutions and impulse-radio ultra-wideband techniques for biomedical sensing.

❖ Dr. Volker Ziegler, Advanced RF-frontends in communication and radar systems for aerospace applications (EADS Deutschland GmbH)

Volker Ziegler received his Dipl.-Ing. degree in electrical engineering and his Dr.-Ing. degree (with honors) both from the University of Ulm, Germany, in 1997 and 2001, respectively. From 2002 to 2003, he was member of the "Knowledge Exchange Group for Research and Technology" at the DaimlerChrysler AG in Stuttgart, Germany. During this trainee period, he was working at the University of Michigan, Ann Arbor, USA and at United Monolithic Semiconductors, Orsay, France. Afterwards, he joined EADS Innovation Works, Ottobrunn, Germany, where he became an EADS Expert for "Microwave Technologies and Systems" in 2007. Currently, he is the Head of Team "RF and Waveforms" responsible for the research performed in the field of key microwave technologies and waveforms for advanced radar and communication systems. Volker Ziegler is member of the IEEE MTT-S Technical Coordinating Committee 21 on RF-MEMS and member of the IEEE MTT Antennas & Propagation German Chapter Executive Board. He is an industrial advisor for the ESA Component Technical Board on Microwaves. He served twice as Associated Editor for the "International Journal of Microwave and Wireless Technologies" and authored or co-authored more than 70 papers and holds nine patents

❖ .Dr. Isik Kizilyalli, Gallium Nitride (GaN) and Wide Band Gap Semiconductors for Power Electronics (Avogy)

Isik C. Kizilyalli is the CTO and founder of Avogy. Prior to founding Avogy, he held technical and management positions at Bell Laboratories (AT&T and Lucent Technologies), Agere Systems, Nitronex Corporation, and Alta Devices. His research, development, and commercialization experience covers a broad range of semiconductor materials (Si, GaAs, InP, and GaN), devices, and technologies (CMOS, BiCMOS, HFETs, Detectors, HBT, Photovoltaics). Dr. Kizilyalli is a Fellow of the IEEE and was the recipient of the Distinguished Member of Technical Staff award by the Bell Laboratories. He received a B.S. and Ph.D. degree from the University of Illinois in Urbana in Electrical Engineering. Dr. Kizilyalli has published 100 technical papers and has 45 U.S. patents.

❖ Dr. Frank Schwierz, Graphene Based Nanoelectronics (Technical University Ilmenau)

Dr. Frank Schwierz (Senior Member, IEEE) serves as Privatdozent at TU Ilmenau and is Head of the RF & Nano Device Research Group. He conducts research projects funded by the European Community, German government agencies, and the industry. Together with partners from German universities and industry, he was involved in the

development of the fastest Si-based transistors worldwide in the late 1990s and of Europe's smallest MOSFETs in the early 2000s. He published 200 journal and conference papers, including 30 invited papers. He is the author of the books "Modern Microwave Transistors: Theory, Design, and Performance" and "Nanometer CMOS".

4. Electro- Terahertz Technology and Systems

- **Present and Future of Terahertz Communications**
- **Challenges of passive millimeter wave imaging**

❖ Dr. Goutam Chattopadhyay, THz Technology and Systems (NASA-JPL, Caltech)

Dr. Goutam is a Senior Member of the Engineering Staff at the NASA's Jet Propulsion Laboratory, California Institute of Technology, and a Visiting Professor at the Division of Physics, Mathematics, and Astronomy at the California Institute of Technology, Pasadena, USA. He received the B.E. degree in electronics and telecommunication engineering from the Bengal Engineering College, Calcutta University, Calcutta, India, in 1987, the M.S. degree in electrical engineering from the University of Virginia, Charlottesville, in 1994, and the Ph.D. degree in electrical engineering from the California Institute of Technology (Caltech), Pasadena, in 1999. From 1987 until 1992, he was a Design Engineer with the Tata Institute of Fundamental Research (TIFR), Pune, India. His research interests include microwave, millimeter-, and sub-millimeter- wave heterodyne and direct detector receivers, frequency sources and mixers in the terahertz region, antennas, SIS mixer technology, direct detector bolometer instruments, and high frequency radars. He has more than 150 publications in international journals and conferences and holds several patents. Among various awards and honors, he was the recipient of the Best Undergraduate Gold Medal from the University of Calcutta in 1987, the Jawaharlal Nehru Fellowship Award from the Government of India in 1992, and the IEEE MTT-S Graduate Fellowship Award in 1997. He also received more than 25 NASA technical achievement and new technology invention awards. He is a Fellow of IEEE.

❖ Prof. Hermann Schumacher, SiGe BiCMOS for phased array, RFMEMS, Challenges of passive mm-wave imaging: the need for reconfigurability and complexity in millimeter-wave MMICs (University of Ulm)

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❖ Prof. Payam Heydari, Millimeter-wave and Terahertz Integrated Circuits in Silicon Technologies: Challenges and Solutions (UC Irvine)

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He is a Senior Member of the IEEE.

5. Packaging, Testing and Qualification

- **Reliability, Radiation Hardness**
- **Testing & Qualification**
- **Packaging & 3D Integration**

❖ **Dr. Ray L. Ladbury, Radiation Hardening at the System Level (NASA Goddard Space Flight Center Radiation Effects and Analysis Group)**

Ray Ladbury was born and raised in Colorado. He graduated with a B.S. in physics from Colorado State University and with a PhD in experimental particle physics from the University of Colorado. After graduating with his doctorate, he served in the Savannah region of Togo, West Africa as a Science Teacher Trainer. After returning to the United States, he taught physics, math and science pedagogy in Kentucky's Appalachian region at Pikeville College and worked as an editor at Physics Today Magazine. Ray started work in radiation hardness assurance at Hughes Space and Communications in El Segundo, CA and moved to NASA Goddard Space Flight Center, were he has served since 2000. Ray's research has included contributions in testing of complex microelectronic components and statistical modeling for radiation hardness assurance. He lives in Mt. Airy, MD with his wife, Michelle.

❖ **Oswin Ehrmann, Wafer Level System Integration and 3D Packaging (Head of Department Wafer Level System Integration (WLSI), Berlin, Germany)**

Mr. Ehrmann received the M.S. degree in physics from the Technical University of Berlin (TUB), Germany. In 1987, he joined the Research Center, Microperipheric Technologies, Faculty of Electrical Engineering, TUB, where he had worked in the development of sputtered metallizations for packaging applications. Since 1994, he has been the head of the High Density Interconnect and Wafer Level Packaging Department, Fraunhofer IZM, Berlin. Mr. Ehrmann is a member of IMAPS

Transportation

Venue Location: Sabanci Universitesi, Orta Mahalle, Universite Caddesi, No:27 Tuzla, 34956, Istanbul, TURKEY

From city centers(Taksim and Kadıköy) with Shuttles

http://www.sabanciuniv.edu/en/transportation/shuttle-hours

From Sabiha Gokcen Airport(SAW) with Taxi (9km)

Istanbul From Atatürk Airport (IST) with Taxi (75km)

Accomodation

There are limited number of rooms available on Campus Hotel and Guest Houses: Contact EDU for availability.

Nearest Recommended Hotels:

Crowne Plaza Istanbul Asia http://english.cpistanbulasia.com/
Divan İstanbul Asia http://www.divan.com.tr/ENG/Hotel-Destinations/Divan-Istanbul-Asia/
Ramada Plaza Asia (Kocaeli) http://en.ramadaplazaistanbulasiaairport.com/
Lifeport Hotel(Kocaeli) http://www.lifeport.com.tr/

Taksim Hotels (Nearest to Shuttle Departure Point)

The Marmara Taksim http://taksim.themarmarahotels.com/
Taxim Hill http://www.taximhill.com/
Taksim Metropark Hotel http://www.taksimmetropark.com/english/
Taksim 15 Suites http://www.taksim15.com/
CVK Hotels Taksim http://www.cvkhotels.com/default_eng.asp

Sabanci University, Taksim Shuttle Departure Point https://goo.gl/maps/9B76U