TuAT1 Technical Session, Parleys 1

Modeling & Simulation

Chair: Kotlyar, Roza

Co-Chair: Roper, Donald

10:30-12:00, Paper TuAT1.1 ***Invited***

Joule Heating and Thermal Transport in 2D Materials for Device Applications

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Aksamija, Zlatan (University of Utah)

Zlatan Akšamija is an associate professor of Materials Science and Engineering who studies heat transport and dissipation in nanostructured materials and devices. He received his B.S., M.S., and Ph.D. in Electrical Engineering in 2003, 2005 and 2009, respectively, all from the University of Illinois at Urbana/Champaign. From 2009 to 2013, Zlatan was a Computing Innovation Postdoctoral Fellow in the ECE department at the University of Wisconsin-Madison. In 2013, Zlatan became an Assistant Professor in the Electrical and Computer Engineering Department at the University of Massachusetts-Amherst and founded the NanoEnergy lab. He was promoted to Associate Professor with tenure in 2019 and joined the Materials Science and Engineering Department at the University of Utah in 2022.

10:30-12:00, Paper TuAT1.2

Atomistic Materials and TCAD Device Modeling and Simulation of Ultrawide Bandgap (UWBG) Materials and UWBG Heterointerfaces

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Ohiri, Ugonna (Northrop Grumman Systems Corporation), Guo, Xiangyi (Northrop Grumman Corporation)

Dr. Ugonna Ohiri (Ugo) is a Senior R&D Technologist in the Future Technical Leaders (FTL) Program at Northrop Grumman Mission Systems (NGMS). He joined NGMS in 2018, focusing his research on silicon (Si) microelectronics, carbon nanotubes (CNTs), two-dimensional (2D) materials, ultrawide bandgap materials (UWBG) and devices, and other high-impact research topics. Ugo is a Technical Lead for numerous internal UWBG-related projects and has served as a Principal Investigator & Program Manager for DARPA, ONR, and AFRL R&D programs. Ugo received his B.S. degree in Computer Engineering from the University of Maryland Baltimore County (UMBC) and his M.S. and Ph.D. in Electrical & Computer Engineering from Duke University.

10:30-12:00, Paper TuAT1.3

Geometric Sensitivity of Mode Hybridization in Symmetric and Asymmetric Nanoscale Dimers

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Roper, Keith (Utah State University), Romo, Ricardo (PachTech USA Inc)

Dr. Roper is an elected Fellow of the American Institute for Medical and Biological Engineering. From 1994-2001, he worked at Merck & Co. to develop vaccines against *S. pneumonia*, *H. influenzae*, and *HIV* as Engineering Associate (1994-97) and Research Fellow (1997-2001). From 2001-2008 he was Assistant Professor at University of Utah. From 2008-2010 he was Chief Technical Officer at Celux Scientific. From 2008-2012, he was Associate Professor at University of Arkansas where he held the Charles W. Oxford Professorship. From 2012-2016, he was Program Director and Program Leader at the U.S. National Science Foundation. From 2016-2018 he was Associate Director, Microelectronics-Photonics Graduate Program at University of Arkansas. From 2018-2019, he was Professor at University of Arkansas. From 2019 to the present he is Professor at Utah State University (Logan, Utah, U.S.A.).He coauthored two textbooks: *Separation Process Principles, Chemical & Biochemical Operations.* 2010. 3rd Ed. Wiley and *Separation Process Principles with Applications Using Process Simulators.* 2016. 4th Ed. Wiley. He co-edited *Soft Matter and Biomaterials on the Nanoscale. The WSPC Reference on Functional Nanomaterials – Part I Volume 4: Nanomedicine: Nanoscale soft materials in nano/bio medicine. World Scientific Publishing Company.*Hackensack, NJ.

In 2018, Dr. Roper was named member of the National Academies of Science, Engineering, and Medicine Committee on Pharmaceuticals. In 2020-2021, he was President of The Institute of Biological Engineering. In 2024, he served on the U.S. National Science Foundation Division of Chemical, Bioengineering, Environmental, and Transport Systems Committee of Visitors. He co-organized numerous federal agency and interagency workshops, solicitations, site visits, panels, research and teaching collaborations, and a briefing to the U.S. Congress. Dr. Roper is a member of American Chemical Society and IEEE.

Dr. Roper has authored or coauthored more than 84 peer-reviewed articles, 17 published proceedings, 170 presentations, 6 book chapters, 4 U.S. patents, 1 E.P. patent, and 9 U.S. patent applications. He has given 107 invited lectures. His NanoBioPhotonics Laboratory studies viral gene vectors and electrodynamics of nano-, bio-, and meta-materials. From 2020-2022, his laboratory monitored COVID-19 for the State of Utah and Utah State University. He has received numerous awards for research, teaching, mentoring, and service. He is an ad-hoc reviewer for leading journals. Dr Roper received the B.S. in chemical engineering from Brigham Young University (Provo, Utah, U.S.A.) and the Ph.D. in chemical engineering from the University of Wisconsin-Madison (Madison, Wisconsin, U.S.A.).

10:30-12:00, Paper TuAT1.4

Full Three-Dimensional Monte Carlo Device Simulation of Scaled β-Ga2O3 Based MOSFETs

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Ahmed, Shaikh (Southern Illinois University at Carbondale), Alalawi, Aqeel (Southern Illinois University Carbondale), Almenshad, Salim (Southern Illinois University Carbondale)

10:30-12:00, Paper TuAT1.5. ***Invited***

Role of Simulation and Modelling Augmented Metrology in Integration of Advanced Functional Materials in Emerging Logic and Memories

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Pesic, Milan (Applied Materials Inc), Larcher, Luca (Applied Materials)

Bastien Beltrando received a degree in Microelectronic Engineering from Polytech of Marseille (France) and he is currently an Application Engineer at Applied Materials. He is supporting the development of the Ginestra® modeling framework and its application to advanced/emerging logic memory devices. Current research interests include the study and modeling of different next-gen device technologies including their reliability. Up to now, he co-authored 9 technical papers and 3 patents.

TuBT1 Technical Session, Parleys 1

Modeling & Simulation II

Chair: Roper, Donald — Utah State University

Co-Chair: Kotlyar, Roza — Stardust Materials

13:00-15:00, Paper TuBT1.1. ***Invited***

Self-Heating Effects and Reliability Concerns in 28nm FD SOI Devices at Cryogenic Temperatures

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Vasileska, Dragica (Arizona State University, Tempe, AZ), Wang, Ziyi (Onsemi), Povolotskyi, Michael (Jacobs Engineering), Wirth, Gilson (UFRGS)

Dragica Vasileska (IEEE Fellow) is a Professor of Electrical Engineering at Arizona State University: She received B.S.E.E. and M.S.E.E. Degree from the University Sts Cyril and Methodius (Skopje, Republic of North Macedonia) in 1985 and 1991, respectively, and a Ph.D. Degree from Arizona State University in 1995. Her research interests include semiconductor device physics and semiconductor device modelling, with strong emphasis on quantum transport and Monte Carlo device simulations. Recently, her research interests also include modelling metastability and reliability of solar cells. Prof. Vasileska published over 400 papers in prestigious scientific journals, conference proceedings, has given numerous invited talks and is a co-author on three books and an editor of two books. Prof. Vasileska is a recipient of the 1998 NSF CAREER Award. Her students have won numerous awards at prestigious international scientific conferences.

13:00-15:00, Paper TuBT1.2

High Performance Pocket Doped SiGe/GaAs TFET for Improved Ambipolarity and RF Characteristics

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Zahoor, Furqan (King Fahd University of Petroleum and Minerals), Bashir, Faisal (King Faisal University), Alzahrani, Ali S (King Faisal University)

13:00-15:00, Paper TuBT1.3

Performance of Sub-Micron $CuBi_2O_4$ Solar Cell with Graphene Oxide Hole Transport Material

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Das, Sandip (Kennesaw State University)

13:00-15:00, Paper TuBT1.4

Simulation Study of the Subthreshold Characteristics of Cryogenic UTBB FDSOI with Interface Traps and Back-Gate Operation

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Chang, Ming-Yu (National Cheng Kung University), Chang, Wei-Chieh (National Cheng Kung University, Department of Electrical Enginee), Wang, Yeong-Her (National Cheng Kung University), Chiang, Meng Hsueh (National Cheng Kung University)

This work is supported by the National Science and Technology Council, Taiwan.
Ming-Yu Chang, Wei-Chieh Chang, Yeon-Her Wang and Meng-Hsueh Chiang are with the Department of Electrical Engineering, National Cheng Kung University, Taiwan.
The presenter, Ming-Yu Chang, is a phD student in the Department of Electrical Engineering, National Cheng Kung University.

13:00-15:00, Paper TuBT1.5. ***Invited***

Dynamical Characteristics of a Nano-Ionic Solid Electrolyte FET Using a LSTM Model

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Gaurav, Ankit (Indian Institute of Technology Roorkee), Song, Xiaoyao (University of Sheffield), Manhas, Sanjeev (Indian Institute of Technology Roorkee), De Souza, Maria Merlyne (The University of Sheffield)

13:00-15:00, Paper TuBT1.6. ***Invited***

First-Principles Simulation and Materials Screening for Spin Orbit Torque in Two Dimensional Van Der Waals Heterostructures

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Klimeck, Gerhard (Purdue University), Nikonov, Dmitri (Intel)

Gerhard Klimeck is the Elmore Chaired Professor of Electrical and Computer Engineering at Purdue University and leads two research centers in Purdue's Discovery Park. He is also Vice President for Academic Information Technology and Deputy CIO. Previously he worked at the central research Laboratory of Texas Instruments and NASA/JPL/Caltech. His research interest is in computational nanoelectronics, high performance computing, and data analytics.

TuCT1 Technical Session, Parleys 1

Modeling & Simulation III

Chair: Kotlyar, Roza

Co-Chair: Roper, Donald

15:20-17:30, Paper TuCT1.1. ***Invited***

Fully-Atomistic Modelling of Valence Change Memory Cells

Mladenović, Marko (ETH Zurich), Kaniselvan, Manasa (ETH Zurich), Luisier, Mathieu (ETH Zurich)

Dr. Marko Mladenović has completed his BSc, MSc, and PhD studies at the University od Belgrade. Shortly after obtaining his PhD in 2017, he moved to EPFL to work on simulations of halide perovskites. In 2021, he moved to ETH Zurich, where he has been mainly working on simulation of valence change memory cells. His broader research interests include materials for energy conversation and electronic devices, and his expertise lies in atomistic simulations and electronic structure calculations, notably in Kinetic Monte Carlo and Density Functional Theory methods.

15:20-17:30, Paper TuCT1.2. ***Invited***

Threshold Switching Created VIA in Nanocircuitries: Theory and Experiment

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Borra, Vamsi (Youngstown State University), Karpov, Victor (The University of Toledo), Shvydka, Diana (The Ohio State University), Georgiev, Daniel (University of Toledo)

VAMSI BORRA (Senior Member, IEEE) is an assistant professor at Youngstown State University. He earned his bachelor's degree in Electronics and Communication Engineering from Jawaharlal Nehru Technological University before coming to YSU for his master's in Electrical and Computer Engineering. He then went on to the University of Toledo, where he earned his Ph.D. in Electrical Engineering. His research interests include characterization and fabrication of electronics materials, controlled whisker growth, thin-film fabrication and characterization, printed electronics and condensed matter physics-related research.

15:20-17:30, Paper TuCT1.3

Tuning Thermal Boundary Conductance of 2D-Substrate Interfaces by Electrostatic Forces

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Makumi, Sylvester Wambua (University of Utah), Belanger, Aidan (University of Utah), Aksamija, Zlatan (University of Utah)

Sylvester Wambua Makumi earned his Bachelor of Education in Mathematics and Physics from Kenyatta University, Kenya in 2012. He further pursued a Master of Science in Physics at Kenyatta University and Uppsala University, Sweden, where he conducted research on the nanomechanical and electrical conductivity of CVD graphene and graduated in 2017.

Currently, he is a graduate student at the University of Utah, focusing on materials science and engineering. His research involves studying electrothermal transport in 2D materials and their heterostructures, utilizing MATLAB modeling and first-principles calculations in DFT.

15:20-17:30, Paper TuCT1.4

Electronic Transport and Optical Spectra of Organic Electronic Materials

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Duhandzic, Muhamed (University of Utah), Aksamija, Zlatan (University of Utah)

15:20-17:30, Paper TuCT1.5. ***Invited***

Modeling and Simulation of Quantum Transport Properties of Semiconductor Nanosheets

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Mori, Nobuya (Osaka University), Okada, Jo (Osaka University), Tanaka, Hajime (Osaka University), Iwata, Jun-Ichi (University of Tsukuba), Oshiyama, Atsushi (The University of Tokyo), Mil'nikov, Gennady (Osaka University)

Nobuya Mori received his Ph.D. from Osaka University, Osaka, Japan, in 1991. Since 2015, he has been a professor in the Graduate School of Engineering, Osaka University. He is also an Honorary Professor in the School of Physics and Astronomy, the University of Nottingham, UK.

15:20-17:30, Paper TuCT1.6. ***Invited***

First Principles Modeling of High Field Transport in Ultra-Wide Bandgap Materials

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Shoemaker, Jonah (Arizona State University), Goodnick, Stephen (Arizona State University), Saraniti, Marco (Arizona State University), Singh, Arunima (Arizona State University)

Stephen M. Goodnick is currently Professor of Electrical Engineering at Arizona State University. He received hisPh.D. degrees in electrical engineering from Colorado State University, Fort Collins, in 1983, respectively. He was an Alexander von Humboldt Fellow with the Technical University of Munich, Munich, Germany, and the University of Modena, Modena, Italy, in 1985 and 1986, respectively. He served as Chair and Professor of Electrical Engineering with Arizona State University, Tempe, from 1996 to 2005. He served as Associate Vice President for Research for Arizona State University from 2006-2008, and presently serves as Deputy Director of ASU Lightworksas well as the DOE ULTRA Energy Frontier Research Center. He is also a Hans Fischer Senior Fellow with the Institute for Advanced Studies at the Technical University of Munich. Professionally, he served as President (2012-2013) of the IEEE Nanotechnology Council, and served as President of IEEE Eta Kappa Nu Electrical and Computer Engineering Honor Society Board of Governors, 2011-2012. Some of his main

research contributions include analysis of surface roughness at the Si/SiO_2interface, Monte Carlo simulation of ultrafast carrier relaxation in quantum confined systems, global modeling of high frequency and energy conversion devices, full-band simulation of semiconductor devices, transport in nanostructures, and fabrication and characterization of nanoscale semiconductor devices. He has published over 450 journal articles, books, book chapters, and conference proceeding, and is a Fellow of IEEE (2004) and AAAS (2022) for contributions to carrier transport fundamentals and semiconductor devices.

WeAT1 Technical Session, Parleys 1 m

Modeling & Simulation IV

Chair: Kotlyar, Roza Stardust Materials

Co-Chair: Roper, Donald Utah State University

10:30-12:00, Paper WeAT1.1. ***Invited***

Electron Transport Simulation with Dual Potentials Electrodynamics

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Belling, Samuel (University of Wisconsin - Madison), Avazpour, Laleh (University of Wisconsin - Madison), Knezevic, Irena (University of Wisconsin - Madison)

Irena Knezevic is a Vilas Distinguished Achievement Professor and the Patricia and Michael Splinter Professor of Electrical and Computer Engineering at the University of Wisconsin–Madison. She received her PhD in electrical engineering from Arizona State University in 2004 and has been a faculty member at UW-Madison ever since. She works in the field of computational nanoscience and has published on topics spanning quantum and semiclassical electronic transport in semiconductor devices, thermal transport at the nanoscale and nanostructured thermoelectrics, quantum cascade lasers, transient and high-frequency phenomena in nanomaterials, nanophotonics and nanoplasmonics, nonlinear optics, and exciton transport in photovoltaics. Knezevic has published over 100 papers in peer-reviewed journals and received a number of awards, among them the 2006 NSF CAREER and 2009 AFOSR YIP awards, the 2020 UW-Madison Chancellor's Distinguished Teaching Award, and the 2019

American Physical Society Outstanding Referee Award. She has served on the Advisory Board of the International Workshop of Computational Nanotechnology, IEEE Nanotechnology Council's Modeling and Simulation Technical Committee, and has also been an associate editor for the Journal of Computational Electronics and AIP Advances.

10:30-12:00, Paper WeAT1.2. ***Invited***

Young's Modulus of Ultrathin Metals Calculated Using Molecular Dynamics

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Mukesh, Sagarika (IBM), Toy, Jennifer (UC Berkely)

Dr. Sagarika Mukesh is a highly skilled Design and Simulation Engineer at IBM Quantum, based in Yorktown Heights, NY. With a Ph.D. in Electrical and Computer Engineering from Georgia Institute of Technology, her experience spans over 15 years, with expertise in RF circuit design for quantum processors, CMOS device design, and electromagnetic theory. Dr. Mukesh has significant experience in both academia and industry, including her role as a Device Design and Modelling Engineer at IBM Research. Her research has been extensively published, she holds multiple patents, and she is also an active contributor to professional organizations and conferences.

10:30-12:00, Paper WeAT1.3. ***Invited***

Low-Energy Photon Emission by Quantum Čerenkov Effect in Graphene

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Pierantoni, Luca (Università Politecnica Delle Marche), Mencarelli, Davide (Università Politecnica Delle Marche), Zampa, Gian Marco (Università Politecnica Delle Marche)

Luca Pierantoni is Full Professor of electromagnetic fields with the Polytechnic University of Marche (UnivPM), Ancona. His research interests are in the development of computational techniques for the multiphysics modeling of nano-to-meso-scale devices/systems. He is NTC Vice-President (VP) for the Educational Activities and Senior Editor of TNANO. He has been Distinguished Lecturer for the NTC and MTT-S. He has got 15European projects.

10:30-12:00, Paper WeAT1.4. ***Invited***

DNA Charge Transport with DOS-Dependent Decoherence Model

Mohammad, Hashem (Kuwait University)

Hashem Mohammad received his bachelor's degree in electrical engineering from Kuwait University in 2013. He worked at the Kuwait Institute for Scientific Research as a research assistant in the Renewable Energy program from 2013-2015. Afterwards, Hashem earned a scholarship from Kuwait University to pursue Master's and Ph.D. in Electrical Engineering at the University of Washington - Seattle (2015-2022). His research is focused on nanotechnology, specifically in modeling charge transport in nanoscale devices. His research interests include atomistic modeling of nanoscale devices and materials, Modeling quantum electron transport in DNA and biomolecules, Molecular electronics, and device physics. Since earning his Ph.D., he has taken up a position as an Assistant professor at the Electrical Engineering department at Kuwait University (Fall 2022-Present).

10:30-12:00, Paper WeAT1.5

GFET Dynamic Performance at 77 K and Circuit Design Proposals Suitable for Low-Temperature Microwave Applications

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Valdez Sandoval, Leslie (Instituto Politécnico Nacional), Ramírez García, Eloy (Instituto Politécnico Nacional), Mavredakis, Nikolaos (Universitat Aut`onoma De Barcelona), Lepilliet, Silvie (University of Lille), Jimenez, David (Universitat Autònoma De Barcelona), Happy, Henri (University of Lille), Pacheco Sanchez, Anibal (Universitat Autònoma De Barcelona)
