

WINDS

2022 WORKSHOP ON INNOVATIVE NANOSCALE DEVICES AND SYSTEMS

*ROYAL SONESTA KAUA'I RESORT, LIHUE, HI
(ISLAND OF KAUA'I)*

DECEMBER 4 – 9, 2022

PROGRAM



**Sponsored
Topical
Conference**
www.avs.org



Overview

Sun 4.12.	15:00-18:00	Registration ¹ in Kauai Court
	18:00-20:00	Welcome reception in Waialeale Lawn (Kauai Court if rain)

day	time		Session, <i>Invited speaker</i> , Halela'a (Salon 2)	Chair
Mon 5.12.	08:45-09:00		Opening remarks	
	09:00-11:00	AM1	2D Materials I <i>Ferrari, Koshino</i>	Balandin
	11:15-13:15	AM2	Superconductivity I <i>Strunk</i>	Fullerton
	13:15-19:00		Ad hoc session	
	19:00-20:30	PM	Quantum transport	Oiwa
Tue 6.12.	08:30-11:00	AM1	Spintronics <i>Kent, Maekawa, Beard</i>	Lauter
	11:15-12:30	AM2	Topology I <i>Suzuki</i>	Fabian
	12:30-19:00		Ad hoc session	
	19:00-20:45	PM	Oxides & Multiferroics <i>Venkatesan</i>	Conley, Henry
Wed 7.12.	08:30-11:00	AM1	2D Materials II <i>Akinwande, Suk Shin, Mendelson</i>	Jariwala
	11:15-13:45	AM2	2D Devices & Quantum and Spintronics information	Jonker, Perebeinos
	13:45-18:30		Ad hoc session	
	18:30-21:00		Banquet, Waialeale Lawn (Kauai Court if rain)	
Thu 8.12.	09:00-11:00	AM1	Superconductivity II & 2D materials III <i>Gong</i>	Zutic
	11:15-13:15	AM2	Light-matter interactions <i>Blackburn</i>	Ferry
	13:15-19:00		Ad hoc session	
	19:00-20:45	PM	Posters & Topology II <i>Regnault, Garcia-Vergniory</i>	Sverdlov, Gilbert
Fri 9.12.	08:30-11:00	AM1	Wide gap materials & devices	Kochan
	11:15-12:00	AM2	Quantum nanostructures	Rokhinson

¹ Registration will be open each day 30 minutes before the AM1 sessions. On Monday it will be open 60 minutes before the AM1 session.

Program

- General sessions are in Halela'a (Salon 2)
- Regular talks are 15 min = 12 + 3
- Invited talks are 30 min = 25 + 5
- Registration will be open each day 30 minutes before the AM1 session.
On Monday it will be open 60 minutes before AM1.

Monday, December 5

08:45-09:00	Opening remarks (Jaroslav Fabian and Stephen Goodnick)
AM1: 2D Materials and vdW heterostructures I Session chair: Alexander Balandin (UC Riverside, USA)	
09:00-09:30	Andrea Ferrari (U Cambridge, UK) <i>Layered Materials for Optoelectronics and Quantum Technologies</i>
09:30-09:45	Fateme Mahdikhany (U of Arizona, USA) <i>Origin of narrow interlayer exciton photoluminescence in 2D semiconductor heterostructures</i>
09:45-10:00	Hui Zhao (U Kansas, USA) <i>Mixed-dimensional van der Waals heterostructures for generation of long-lived and mobile photocarriers in graphene</i>
10:00-10:30	Mikito Koshino (Osaka U, Japan) <i>Moiré quasicrystals in twisted 2D systems</i>
10:30-10:45	Jaroslav Fabian (U Regensburg, Germany) <i>Proximity effects in vdW heterostructures tuned by the twist angle</i>
10:45-11:00	Berry Jonker (NRL, USA) <i>Interlayer Exciton-Phonon Bound State in Bi_2Se_3 / monolayer WS_2 van der Waals Heterostructures</i>
11:00-11:15	Coffee break

AM2: Superconductivity I: Superconducting diode effect

Session chair: Eric Fullerton (UC San Diego, USA)

11:15-11:45	Christoph Strunk (U Regensburg, Germany) <i>Nonreciprocal Transport in ballistic Al/InAs Josephson Junctions</i>
11:45-12:00	Igor Zutic (SUNY Buffalo, USA) <i>Tunable Planar Josephson Junctions Driven by Time-Dependent Spin-Orbit Coupling</i>
12:00-12:15	Stuart Parkin (MPI Halle, Germany) <i>Chiral spin textures and Josephson Diodes</i>
12:15-12:30	Leonid Rokhinson (Purdue U, USA) <i>Supercurrent non-reciprocity and vortex formation in superconductor heterostructures</i>
12:30-12:45	Gleb Filkenstein (Duke U, USA) <i>Graphene-based Josephson triode</i>
12:45-13:00	Denis Kochan (SAS, Slovakia) <i>Anisotropic vortex squeezing and supercurrent diode effect in non-centrosymmetric Rashba superconductors</i>
13:00-13:15	Ivan Borzenets (U Texas A&M, USA) <i>RF Mediated Vortex Glass to Vortex Liquid Transition in Metallic Josephson Junctions</i>
13:15-19:00	Ad hoc session

PM: Quantum transport

Session chair: Akira Oiwa (Osaka U, Japan)

19:00-19:15	Vladimir Mitin (SUNY Buffalo) <i>Switching based on a one-dimensional electron gas in a Y-shaped device</i>
19:15-19:30	David Ferry (U Arizona, USA) <i>EMC and NEGF</i>
19:30-19:45	Jo Okada (Osaka U, Japan) <i>Modeling of Band-to-band Tunneling in Ultra-thin GaSb and InAs Gate-all-around Nanowire Tunnel FETs</i>
19:45-20:00	Juan Mendez (Sandia NL, USA) <i>Revealing the quantum effects of imperfections on the tunneling rate in δ-layer junctions</i>
20:00-20:15	Gerhard Klimeck (Purdue U, USA) <i>NEMO5, a Multiscale, Multiphysics Nanoelectronics Modeling Tool used for Ultra-Scaled CMOS, 2D Transistor, Topological Materials, and Quantum Computing Devices</i>
20:15-20:30	Yutoku Murakami (Osaka U, Japan) <i>Theoretical Analysis of Tunneling Effect in 4H-SiC Schottky Barrier Diodes Based on Complex Band Structure</i>

Tuesday, December 6

AM1: Spintronics

Session chair: Valeria Lauter (Oak Ridge NL, USA)

08:30-09:00	Andrew Kent (NYU, USA) <i>Spintronics with Ferrimagnetic and Antiferromagnetic Insulators</i>
09:00-09:15	Deepak Singh (U Missouri, USA) <i>NiSi: New research venue for antiferromagnetic spintronics</i>
09:15-09:30	Kenji Hayashida (Hokkaido U, Japan) <i>Theory of Exchange Spin-Orbit Coupling</i>
09:30-10:00	Sadamichi Maekawa (Riken, Japan) <i>Nonreciprocity in spin transport</i>
10:00-10:15	Alexey Kovalev (U Nebraska, USA) <i>Superfluid Spin Transistor</i>
10:15-10:30	Simone Fiorentini (TU Vienna, Austria) <i>Evaluating Spin Transfer Torques in multilayered magnetic tunnel junctions and spin valves</i>
11:30-11:00	Matthew Beard (National Renewable L, USA) <i>Chiral Metal-Halide Organic/Inorganic Hybrid Semiconductors</i>
11:00-11:15	Coffee break

AM2: Topology I

Session chair: Jaroslav Fabian (U Regensburg, USA)

11:15-11:45	Takehito Suzuki (Toho U, Japan) <i>Singular angular magnetoresistance in a nodal semimetal</i>
11:45-12:00	Mathew Gilbert (U Illinois, USA) <i>Pseudogravity in Topological Condensed Matter</i>
12:00-12:15	Ewelina Hankiewicz (Würzburg U, Germany) <i>Quantum anomalies in topological materials</i>
12:15-12:30	Victor Sverdlov (TU Vienna, Austria) <i>Edge State Band Gap Dependencies on the Width of Transition Metal Dichalcogenide Nanoribbons in the 1T' Topological Phase</i>
12:30-19:00	Ad hoc session

PM: Oxides and Multiferroics

Session chair: John Conley (Oregon State U, USA), David Henry (Sandia NL, USA)

19:00-19:30	Thirumalai Venkatesan (U Oklahoma, USA) <i>Robust Resistive and Mem-devices for Neuromorphic Circuits</i>
19:30-19:45	Je Hoon Lee (Sungkyunkwan U, Korea) <i>Interface characteristics of ferroelectric $Hf_{1-x}Zr_xO_2$ on Si with an Al_2O_3 interface layer</i>

Program for 2022 Workshop on Nanoscale Innovative Devices and Systems (WINDS)

19:45-20:00	David Henry (Sandia NL, USA) <i>Ferroelectric microelectronic devices utilizing NbN and Nb electrodes with thin film ferroelectric (Hf,Zr)O₂</i>
20:00-20:15	John Conley (Oregon State U, USA) <i>Internal Photoemission (IPE) Spectroscopy Measurement of Electrode Energy Barriers in Pristine, Woken, and Poled Ferroelectric HZO Devices</i>
20:15-20:30	Alexander Demkov (U Texas at Austin, USA) <i>Si-integrated Ferroelectric Thin Films for Optical Computing</i>
20:30-20:45	Heesoo Lee (Sungkyunkwan U, Korea) <i>BCl₃ plasma treatment of MoS₂ for atomic-layer-deposition of high-k dielectrics</i>

Wednesday, December 7

AM1: 2D Materials and vdW heterostructures II

Session chair: Deep Jariwala (U Pennsylvania, USA)

08:30-09:00	Deji Akinwande (U Texas at Austin, USA) <i>Skintronics and Beyond Based on 2D Materials</i>
09:00-09:15	Shanchuan Liang (U Maryland, USA) <i>Effective voltage control of two-dimensional magnetic insulator</i>
09:15-09:30	Hanan Dery (U Rochester, USA) <i>Hexcitons and excitons in monolayer WSe₂</i>
09:30-10:00	Hyeon Suk Shin (Ulsan National Inst of S&T, Korea) <i>Growth of Single-Crystal Hexagonal Boron Nitride by Chemical Vapor Deposition</i>
10:00-10:15	Vasili Perebeinos (SUNY Buffalo, USA) <i>Phonon limited mobility and phonon drag in h-BN encapsulated monolayer and AB-stacked bilayer graphene</i>
10:15-10:30	Sergey Rumyantsev (CENTERA Labs, Poland) <i>Mobility-fluctuations mechanism of 1/f noise in graphene</i>
10:30-11:00	Noah Mendelson (U Chicago, USA) <i>Quantum Emitters in hBN</i>
11:00-11:15	Coffee break

AM2: 2D Devices & Quantum and spintronics information

Session chairs: Berry Jonker (NRL, USA), Vasili Perebeinos (SUNY Buffalo, USA)

11:15-11:30	Alexander Balandin (UC Riverside, USA) <i>Electrical Gating of the Charge-Density-Waves in Two-Dimensional 1T-TaS₂ Devices – Prospects of Memory Applications</i>
11:30-11:45	Deep Jariwala (U Pennsylvania, USA) <i>Emerging Memory Devices from AlScN Ferroelectric</i>

Program for 2022 Workshop on Nanoscale Innovative Devices and Systems (WINDS)

11:45-12:00	Cody Hayashi (Naval Information Warfare Center Pacific, USA) <i>An Exploration of Liquid Electrolytes to Enable Graphene Electrical Switches with High On-Off Ratios</i>
12:00-12:15	Kazuhiko Matsumoto (Osaka U, Japan) <i>Detection of SARS-CoV-2 Virus by Antigen Modified Integrated Graphene FET Array with Automated Washing System</i>
12:15-12:30	Xuedong Hu (SUNY Buffalo, USA) <i>Adiabatic resonance for fast and robust quantum control</i>
12:30-12:45	Yasuhiro Tokura (U Tsukuba, Japan) <i>Rabi frequency and fidelity of strongly driven electric dipole spin resonance</i>
12:45-13:00	Sahel Ashhab (National Inst. of Information and Communications, Japan) <i>Speed limits for two-qubit gates with weakly anharmonic qubits</i>
13:00-13:15	Sangita Regmi (U Illinois, USA) <i>Dimension-adaptive quantum state tomography with machine learning</i>
13:15-13:30	Zizwe Chase (U Illinois, USA) <i>Implementation of Quantum Algorithms for THz Metasurfaces</i>
13:30-13:45	Mu-Kun Lee (Waseda U, Japan) <i>Reservoir Computing with Spin Waves in a Skyrmion Crystal</i>
13:45-18:30	Ad hoc session

18:30-21:00 Banquet in Luau Grounds (Kauai Court if rain)

Thursday, December 8

AM1: Superconductivity II and 2D Materials III

Session chair: Igor Zutic (SUNY Buffalo, USA)

09:00-09:15	Patrik Recher (TU Braunschweig, Germany) <i>Fraunhofer pattern in the presence of Majorana zero modes</i>
09:15-09:30	Anne Schmidt (Forschungszentrum Jülich, Germany) <i>Topological Insulator Josephson Junctions integrated in superconducting Qubit Circuits</i>
09:30-09:45	Benedikt Scharf (Würzburg U, Germany) <i>Topological Superconductivity in Phase-Controlled Josephson Junctions</i>
09:45-10:00	Chenghao Shen (SUNY Buffalo, USA) <i>Enhanced Spin-Triplet Superconductivity Induced by Spin-Orbit Coupling</i>
10:00-10:15	Kouichi Semba (Nat. Inst. of Information and Communication, Japan) <i>All-nitride superconducting qubits epitaxially grown on silicon substrate</i>

10:15-10:45	Cheng Gong (U Maryland, USA) <i>Efficient Control of Two-Dimensional Magnets</i>
10:45-11:00	Victor Ryzhii (Tohoku U, Japan) <i>Zener-Klein tunneling and transit-time effects in cascade periodic graphene p-i-n structures: amplification and emission of terahertz radiation</i>
11:00-11:15	Coffee break

AM2: Light-matter interactions

Session chair: David Ferry (U Arizona, USA)

11:15-11:45	Jeffrey Blackburn (Nat. Renewable Energy L, USA) <i>Mixed-dimensionality Metal Halide Perovskite Semiconductor Interfaces for Optical Switching and Memory Devices</i>
11:45-12:00	Ian Sellers (U Oklahoma, USA) <i>Evidence of hot carriers in metal halide perovskite solar cells</i>
12:00-12:15	Stephen Goodnick (Arizona State U, USA) <i>Ultrafast carrier relaxation in type I and type II InAs based quantum wells</i>
12:15-12:30	Akira Oiwa (Osaka U, Japan) <i>Enhanced transmission by surface plasmon antenna for single photoelectron trapping in a lateral GaAs quantum dot</i>
12:30-12:45	Detlev Grützmacher (Forschungszentrum Jülich, Germany) <i>Electrically and Optically Pumped SiGeSn Laser on Si</i>
12:45-13:00	Igor Vaskivskyi (Jozef Stefan Institute, Slovenia) <i>Extended ultraviolet (EUV) programmable high-efficiency grating based on a structural metastability in charge-configuration devices based on 1T-TaS₂</i>
13:00-13:15	Alexandra Lobnik (U Maribor, Slovenia) <i>Silica based Nanomaterials for Sensors Applications: Challenges, Opportunities and Risks</i>
13:15-19:00	Ad hoc session

PM: Posters and Topology II

Session chair: Victor Sverdlov (TU Vienna, Austria) and Matthew Gilbert (U Illinois, USA)

19:00-19:05	Anthony Gasbarro (Naval Information Warfare Center Pacific, USA) <i>Two-dimensional Material Transfer Station for Twisted Bi-Layer Graphene and Heterostructures</i>
19:05-19:10	Jun Jiao (Portland State U, USA) <i>Optimized fabrication of graphene-based device patterns via low power, low pressure oxygen plasma etching</i>
19:10-19:15	Sanjaya Lohani (U Illinois, USA) <i>Data-centric artificial intelligence in quantum information science</i>
19:15-19:20	Vladimir Mitin (SUNY Buffalo, USA) <i>Tunable infrared detector for object recognition</i>

19:20-19:25	Jacqueline Echeverria (U Technology Sydney, Australia) <i>Nd-Gd Nanoparticles for Multi-Functional Bioimaging</i>
19:25-19:30	Woo Hui Lee (Sungkyunkwan U, Korea) <i>Electrical characteristics of HfO₂/Y₂O₃ on p-Si_{1-x}Ge_x with various Ge concentrations</i>
19:30-19:35	Gerhard Klimeck (Purdue U, USA) <i>nanoHUB.org: How to enable Rapid Curriculum Innovation through Translation of Research-Based Simulation Tools into Apps</i>
19:45-20:15	Nicolas Regnault (Ecole Normale Supérieure, France) <i>Some news about the insulating phases in twisted bilayer graphene</i>
20:15-20:45	Maia Garcia-Vergniory (MPI Dresden, Germany) <i>Phase transitions in topological materials</i>

Friday, December 9

AM1: Wide gap materials and Devices

Session chair: Denis Kochan (U Regensburg, Germany)

08:30-08:45	Fariborz Kargar (UC Riverside, USA) <i>Modification of Bulk and Surface Phonons in Single-Crystal Diamond via Substitutional Boron Doping</i>
08:45-09:00	Robert Nemanich (Arizona State U, USA) <i>Epitaxial Growth of c-BN on Diamond and Strategies for Power and RF Applications</i>
09:00-09:15	Saulius Marcinkevicius (KTH Royal Inst. of Technol., Sweden) <i>V-defects in InGaN quantum wells: influence on carrier dynamics</i>
09:15-09:30	Wataru Miyazaki (Osaka U, Japan) <i>Tight-Binding and Full-Band Monte Carlo Analysis of the Strain Effects in wurtzite GaN</i>
09:30-09:45	Andrei Slavin (Oakland U, USA) <i>Ultrafast microwave spectrum analysis using sweep-tuned spin-torque nano-oscillators</i>
09:45-10:00	Dragan Mihailovic (Jozef Stefan Institute, Slovenia) <i>Manipulation of fractional charge on the nanoscale in charge configuration memory devices using multi-tip scanning tunneling microscopy</i>
10:00-10:15	Curt Richter (NIST Gaithersburg, USA) <i>Temperature dependence of a capacitorless cryogenic CMOS memory based on impact ionization</i>
10:15-10:30	Alexander Khitun (UC Riverside, USA) <i>Combinatorial logic devices based on a multi-path active ring circuit</i>
10:30-10:45	Sunghwan Cho (Sungkyunkwan U, Korea) <i>Circuit-level Device Modeling for Erase Failure Analysis in Vertical Gate-all-around Charge Trapping Flash Memories</i>

Program for 2022 Workshop on Nanoscale Innovative Devices and Systems (WINDS)

10:45-11:00	Xujiao Gao (Sandia NL, USA) <i>Modeling and Design of Atomic Precision Advanced Manufacturing (APAM) Enabled Bipolar Devices</i>
11:00-11:15	Coffee break
AM2: Quantum nanostructures	
Session chair: Leonid Rokhinson (Purdue U, USA)	
11:15-11:30	Alan Bristow (West Virginia U, USA) <i>Hot-carrier dynamics and transport in type-II quantum wells</i>
11:30-11:45	Denis Mamaluy (Sandia NL, USA) <i>Prediction of two conductivity regimes in δ-layer tunnel junctions</i>
11:45-12:00	Robert Wolkow (U Alberta, Canada) <i>Atom-Defined Silicon Device Elements for Quantum Devices and Ultra-Fast, Ultra-Low Power Classical Circuits</i>
12:00	Closing Remarks