

2017 Workshop on Innovative Nanoscale
Devices and Systems

WINDS 2017 Program

November 26th –December 1st, 2017

November 26th 2017 (Sunday)

Registration (15:00-18:00)

BREEZEWAY of HAPUNA BEACH PRINCE HOTEL

Address: 62-100 Kauna'oa Drive Kohala Coast, HI 96743

Tel: 808-880-1111 / Fax: 808-880-3112

Welcome Reception (18:00-21:00)

Luau Grounds of the Mauna Kea Hotel

Address: 62-100 Mauna Kea Beach Drive, Kohala Coast, Hawaii 96743

Tel: 808-882-7222 / Fax: 808-882-5700

Shuttle Service from Hapuna Beach Hotel to Mauna kea Hotel 17:00 ~ 18:00
from Mauna kea Hotel to Hapuna Beach Hotel 21:00 ~ 21:30

Valet Parking is free if driving from Hapuna to Mauna Kea

November 29th 2017 (Wednesday)

Banquet with Reception (18:30-21:00)

THE COURTYARD of HAPUNA BEACH PRINCE HOTEL

November 27th 2017 (Monday)

8:30-8:45 **Welcome Address (Kazuhiko Matsumoto, Stephen Goodnick)**

Session 2D Materials (Berry Jonker, Tomoki Machida)

8:45-9:15 **Curt A. Richter** (NIST, USA)
 "Landau Level Edge-State Transport in Graphene p-n Junctions in the Quantum Hall Regime"

9:15-9:45 **Xiang Zhang / Cheng Gong** (University of California, Berkeley, USA)
 "Discovery of Intrinsic Ferromagnetism in Two-Dimensional van der Waals Crystals"

9:45-10:00 **Tomoki Machida** (The University of Tokyo, Japan)
 "Quantum Transport and Optoelectronic Application in van der Waals Junctions of 2D Materials"

10:00-10:30 **A. Nick Vamivakas** (University of Rochester, USA)
 "Quantum Photonics with van der Waals Heterostructures"

10:30-10:45 **Coffee Break**

10:45-11:15 **Deep Jariwala** (California Institute of Technology, USA)
 "Ultrathin van der Waals Photovoltaics"

11:15-11:30 **Berry Jonker** (Naval Research Laboratory, USA)
 "Ferroelectric Domain Control of Photoluminescence in Monolayer WS₂ / PZT Hybrid Structures"

11:30-11:45 **Athos Petrou** (State University of New York, Buffalo, USA)
 "Exchange Field Induced Valley Splitting Enhancement in WSe₂ and WS₂"

11:45-12:00 **Richard C. Ordonez** (Space and Naval Warfare Systems Center Pacific, USA)
 "Adaptive Control of Graphene Surface Charge Distribution with Suspended Gates in an Electrolytic Gate Dielectric"

Session Solar Cell (Stephen Goodnick)

12:00-12:30 **Joseph M. Luther** (National Renewable Energy Laboratory, USA)
 "Quantum Dots and Perovskites – Realizing the Best of Both Worlds for Revolutionary Optoelectronic Applications"

12:30-12:45 **Stephen Goodnick** (Arizona State University, USA)
 "InGaN Multi-Quantum Well Solar Cells for High Temperature Applications"

12:45-13:15 **Masakazu Sugiyama** (The University of Tokyo, Japan)
 "InGaAs/GaAsP Quantum Well Superlattice for 1.15-eV Middle Cell in 4-Junction Solar Cell"

13:15-13:30 **Takeyoshi Sugaya** (AIST, Japan)
 "High-Efficiency Heterogeneous Multijunction Solar Cells
 Fabricated by Smart Stack Technology Using Metal Nanoparticle Arrays"

Ad hoc Session

Session Oxide & THz (Kazuhiko Matsumoto)

19:00-19:30 **Alexander A. Demkov** (The University of Texas, Austin, USA)
 "Integrated Oxide Heterostructures for Electronics and Photonics"

19:30-20:00 **Masataka Higashiwaki** (NICT, Japan)
 "Recent Achievements in Ga₂O₃ MOSFET Technology"

20:00-20:15 **Taiichi Otsuji** (Tohoku University, Japan)
 "Terahertz Light Emission and Lasing in Graphene-Based van der Waals 2D Heterostructures"

20:15-20:30 **Victor Ryzhii** (Tohoku University, Japan)
 "Concepts of Infrared and Terahertz Photodetectors Based on van der Waals Heterostructures with Graphene Layers"

20:30-21:00 **Jeremy Levy** (University of Pittsburgh, USA)
 "Quantized Ballistic Transport of Electrons and Electron Pairs in an Electron Waveguide"

21:00-21:15 **Y. Zhang** (The University of Tokyo, Japan)
 "Enhanced Sensitivity of MEMS-based Terahertz Bolometers by Introducing Two-Dimensional Phononic Crystal Structures"

21:15-21:30 **Shiro Kawabata** (AIST, Japan)
 "Thermal Manipulation of THz Wave from High-Tc Superconducting Emitters"

November 28th 2017 (Tuesday)

Session 2D Materials & Quantum Dot (Taiichi Otsuji)

- 8:30-9:00 **Hui Zhao** (University of Kansas, USA)
"Ultrafast Electron Transfer in van der Waals Multilayers"
- 9:00-9:30 **Yasumitsu Miyata** (Tokyo Metropolitan University, Japan)
"Semiconductor Heterojunctions Based on 2D Materials"
- 9:30-9:45 **Victor I. Klimov** (Los Alamos National Laboratory, USA)
"Recent Advances in Colloidal-Quantum-Dot Lasing: From Zero-Threshold Optical Gain to Solution-Processible Laser Diodes"
- 9:45-10:00 **Akira Oiwa** (Osaka University, Japan)
"Electrical Transport Through a SiGe Self-Assembled Quantum Dot"
- 10:00-10:30 **Saptarshi Das** (Pennsylvania State University, USA)
"2D Materials for Ubiquitous Electronics"
- 10:30-10:45 **Coffee Break**

Session 2D Materials & Quantum Computing (Viktor I Klimov)

- 10:45-11:15 **Hiroki Takesue** (NTT Corporation, Japan)
"A Coherent Ising Machine for Solving Combinatorial Optimization Problems"
- 11:15-11:30 **Kouichi Semba** (NICT, Japan)
"Superradiance Phase Transition in the Presence of Parameter Fluctuations"
- 11:30-12:00 **Robert A. Wolkow** (University of Alberta /National Research Council / Quantum Silicon, Inc., Canada)
"Binary Atomic Silicon Logic for WINDS 2017"
- 12:00-12:15 **Susumu Okada** (University of Tsukuba, Japan)
"Band-Gap Engineering of Graphene Heterostructures via Substitutional Doping with B₃N₃"
- 12:15-12:30 **Atsushi Ando** (AIST, Japan)
"Surface Modification Processes of Transition Metal Dichalcogenides for Field-Effect-Transistor Fabrication"
- 12:30-13:00 **Shintaro Sato** (Fujitsu Laboratories Ltd., Japan)
"Application of Graphene and Graphene Nanoribbons to Electronic Devices"
- 13:00-13:15 **Taichi Inoue** (Osaka Prefecture University, Japan)
"MoS₂/Graphene Stacked Electromechanical Resonator"

Ad hoc Session

Session Molecular & Quantum Dot (David Janes)

- 19:00-19:30 **Naoya Fukui** (The University of Tokyo, Japan)
"Electronic Properties and Charge Transport of Coordination Nanosheet (CONASH)"
- 19:30-19:45 **Yoshio Aso** (Osaka University, Japan)
"Development of Electron-Accepting π -Conjugated Units for Organic Electronics"
- 19:45-20:00 **David B. Janes** (Purdue University, USA)
"Real-Time Measurements of Hydrogen Peroxide Uptake in 2D Cell Cultures Using On-Chip Microelectrode Arrays"
- 20:00-20:30 **Changhee Lee** (Seoul National University, Korea)
"Recent Progress in Quantum Dot LEDs and Their Future Prospects for Displays"
- 20:30-20:45 **William S. Wong** (University of Waterloo, Canada)
"Electrical and Optical Characteristics of Nanowire LEDs Under Mechanical Bending"
- 20:45-21:00 **A. Sachrajda** (National Research Council, Canada)
"Properties of A Few Hole Gated Double Quantum Dot"
- 21:00-21:30 **Alexei O. Orlov** (University of Notre Dame, USA)
"Metal-Insulator-Metal Single Electron Tunneling Transistors Featuring Non-Native Dielectrics"

November 29th 2017 (Wednesday)

Session Spin & Nano Magnet (Josef Weinbub, Wolfgang Porod, Siegfried Selberherr)

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|-------------|---|
| 8:30-9:00 | Roland K. Kawakami (The Ohio State University, USA) "Optospintronics and 2D Magnets" |
| 9:00-9:15 | Alexander Khitun (University of California, Riverside, USA) "Magnetometer Based on Spin Wave Interferometer" |
| 9:15-9:30 | Jaroslav Fabian (University of Regensburg, Germany) "Field-Effect Spin-Orbit Valve and Spin Transistor Based on Proximity Bilayer Graphene" |
| 9:30-10:00 | Masashi Shiraishi (Kyoto University, Japan) "Spin Current Propagation in a 2-Dimensional Electron Gas" |
| 10:00-10:15 | Siegfried Selberherr (TU Wien, Austria) "Current in Magnetic Tunnel Junctions at Spin-Dependent Hopping" |
| 10:15-10:30 | Igor Žutić (University at Buffalo, SUNY, USA) "Magnetic Proximity Effects in Two-Dimensional Materials" |
| 10:30-10:45 | Coffee Break |
| 10:45-11:15 | Richard Kiehl (Arizona State University, USA) "Proximity Induced Ferromagnetism in Graphene from a Magnetic-Nanoparticle Array" |
| 11:15-11:30 | Viktor Sverdlov / Siegfried Selberherr (TU Wien, Austria) "A Single-Spin Switch" |
| 11:30-11:45 | Ece Aytan (University of California, Riverside, USA) "Ultraviolet Raman Spectroscopy of NiO: Spin – Phonon Interactions and Implications for Antiferromagnetic Spintronics" |
| 11:45-12:15 | Scott Crooker (Los Alamos National Laboratory, USA) "Light, Spin, and Magnetization in Magnetically-Doped Semiconductor Nanocrystals" |
| 12:15-12:30 | Giorgos Giavaras (University of Tsukuba, Japan) "Spin Resonance in Spin-Orbit-Coupled Quantum Dots in the Weak and Strong Driving Regimes" |
| 12:30-12:45 | David K. Ferry (Arizona State University, USA) "Landauer and NEGF: Plain Talk on the Proper Approach" |
| 12:45-13:00 | Slava V. Rotkin (The Pennsylvania State University, USA) "Novel Polaritonic Modes in Subwavelength Antenna: Applications for Nanotube Plasmonic Sensing" |
| 13:00-13:15 | Josef Weinbub (TU Wien, Austria) "Classical and Quantum Electron Evolution with a Repulsive Dopant" |
| 13:15-13:45 | Roman M. Lutchyn (Station Q, Microsoft Research, Santa Barbara, USA) "Coulomb Blockade Effect in Proximitized Nanowires" |

Ad hoc Session

Banquet with Reception (18:30-21:00)

THE COURTYARD of HAPUNA BEACH PRINCE HOTEL

November 30th 2017 (Thursday)

Session Topological (John F. Conley)

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| 8:30-9:00 | Junji Tominaga (AIST, Japan) "Chalcogenide Phase Change Device with Topological Functionalities" |
| 9:00-9:15 | Taylor L. Hughes (University of Illinois at Urbana-Champaign, USA) "Topological Quadrupole and Octupole Insulators" |
| 9:15-9:30 | Satoshi Fujimoto (Osaka University, Japan) "Geometrically-Induced Transport Phenomena in Weyl Semimetals and Weyl Superconductors" |
| 9:30-10:00 | Masashi Kawasaki (The University of Tokyo, Japan) "Quantum Transport in Heterostructured Topological Materials" |
| 10:00-10:15 | Walter Pötz (Karl-Franzens University of Graz, Austria) "Pure- and Mixed-State Simulation of Dirac Fermion Dynamics in Electromagnetic Textures" |
| 10:15-10:30 | Nina Markovic (Johns Hopkins University, USA) "Patterning Superconductivity in a Topological Insulator" |
| 10:30-10:45 | Coffee Break |

Session Topological & Nano Magnet (Josef Weinbub)

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| 10:45-11:15 | Axel Hoffmann (Argonne National Laboratory, USA) "Topological Quasiparticles: Magnetic Skyrmions" |
| 11:15-11:30 | Vito Scarola (Virginia Tech, USA) "Topological Mott Insulators in Certain Frustrated Lattices" |
| 11:30-11:45 | Wolfgang Porod (University of Notre Dame, USA) "Towards Low-Damping Spin-Wave Media for Magnonics" |
| 11:45-12:15 | E. Albisetti (City University of New York, USA / Politecnico di Milano, Italy) "Towards Reconfigurable Nanomagnonic Devices Based on Patterned Spin-Textures" |
| 12:15-12:30 | Ewelina Hankiewicz (Würzburg University, Germany) "Transport in Topological Insulators and Topological Superconductors" |
| 12:30-12:45 | Leonid P. Rokhinson (Purdue University, USA) "Development of a New Platform to Realize High Order Non-Abelian Excitations" |
| 12:45-13:00 | John F. Conley, Jr. (Oregon State University, USA) "High-Voltage Al ₂ O ₃ /Ta ₂ O ₅ Heterostructure Metal/Insulator/Insulator/Metal (MIIM) Diodes" |

Ad hoc Session

Poster Session (19:00-21:30)

November 30th 2017 (Thursday) Continued 1/2

Poster Session (19:00-21:30)

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| P-1 | D.Vasileska (Arizona State University, USA) "Cu Migration During Light-Soaking Experiments" |
| P-2 | Takuya Igarashi (Tohoku University, Japan) "Computational Analysis of Chemical Mechanical Polishing Process for GaN Substrate with Step Structure" |
| P-3 | Naoki Takahashi (Tohoku University, Japan) "Molecular Dynamics Study on Chemical Wear Process of Amorphous Silica in Humidity Environment" |
| P-4 | Miho Nakamura (Tohoku University, Japan) "Effect of Tribochemical Reactions on Super-Low Friction Properties of Carbon Nitride Thin Films as Investigated by Tight-Binding Quantum Chemical Molecular Dynamics Simulations" |
| P-5 | Haruka Omachi (Nagoya University, Japan) "Oxidative Degradation of Carbon Nanotubes and Extraction of Encapsulated 1D Materials" |
| P-6 | Tomohiro Yamaguchi (RIKEN, Japan) "Tunnel Barrier Formation in Suspended Multi-Walled Carbon Nanotubes by Ga Focused Ion Beam Irradiation." |
| P-7 | Shinichi Hirose (Fujitsu Laboratories Ltd., Japan) "High Thermal Conductivity of Carbon Nanotube Sheets for Future Thermal Interface Materials" |
| P-8 | Manaho Matsubara (University of Tsukuba, Japan) "Geometric Structures of Al Nanoparticles Adsorbed on Graphene Under an External Electric Field" |
| P-9 | Mina Maruyama (University of Tsukuba, Japan) "Coexistence of Dirac Cones and Kagome Flat Bands in Porous Graphene" |
| P-10 | Yanlin Gao (University of Tsukuba, Japan) "Electrostatic Potential Properties of Edge-Functionalized Graphene Nanoribbon Under the External Electric Field" |
| P-11 | Hideyuki Jippo (Fujitsu Laboratories Ltd., Japan) "Bottom-Up Approach for Edge-Fluorinated Graphene Nanoribbons" |
| P-12 | Nguyen Thanh Cuong (NIMS/University of Tsukuba, Japan) "High Thermoelectric Power in B ₃ N ₃ -doped Graphene" |
| P-13 | Eun Kyu Kim (Hanyang University, Korea) "Controllable Tunneling of Electron and Hole in van der Waals Assembly" |
| P-14 | Chang-Soo Park (Hanyang University, Korea) "Ferromagnetic and Semiconducting Properties from Cobalt Oxide Adsorbed Graphene" |
| P-15 | Yuhei Takaguchi (Tokyo Metropolitan University, Japan) "Electric Double Layer Light Emitting Diode of WSe ₂ /MoSe ₂ In-Plane Heterostructures" |
| P-16 | Shintaro Yoshimura (Tokyo Metropolitan University, Japan) "Growth and Characterization of Re-Doped MoS ₂ Monolayers" |
| P-17 | Yu Kobayashi (Tokyo Metropolitan University, Japan) "Growth and Characterization of Transition Metal Dichalcogenides Using Halide-Assisted MOCVD" |
| P-18 | Felix Jaetae Seo (Hampton University, USA) "Cubic Nonlinearity of Transition Metal Dichalcogenides Atomic layer" |
| P-19 | Felix Jaetae Seo (Hampton University, USA) "Phonon and Intensity induced Exciton Dephasing of TMDC Atomic Layer" |
| P-20 | Felix Jaetae Seo (Hampton University, USA) "Piezoelectricity of 2-Dimensional MoS ₂ /WSe ₂ Heterostructure" |

November 30th 2017 (Thursday) Continued 2/2

Poster Session (19:00-21:30) Continued

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| P-21 | Yasuhide Ohno (Tokushima University, Japan) "Electrical Characteristics of Positively and Negatively Charged Protein Adsorption to Epitaxial Graphene Film on SiC Substrate" |
| P-22 | G. T. Adamashvili (Technical University of Georgia, USA) "Surface Resonance Soliton in Phosphorene" |
| P-23 | Daiki Yoshikawa (Osaka Prefecture University, Japan) "Amplitude Control of MoS ₂ Cantilever by Electrostatic Driving" |
| P-24 | David B. Janes (Purdue University, USA) "Universality of Self-Heating in Disordered Transparent Conductor Networks" |
| P-25 | Ryuji Takahashi (RIKEN, Japan) "Landau-Zener Tunneling Problem for Particles in Periodic Systems" |
| P-26 | Tomosuke Aono (Ibaraki University, Japan) "Nuclear Spin Polarization and Resistively-Detected Nuclear Magnetic Resonance in Quantum Point Contact" |
| P-27 | Walter Pötz (Karl-Franzens University of Graz, Austria) "Numerical Simulation of s- and p-Wave Superconductor Heterostructures within the (1+1)D Bogoliubov-de Gennes Equation" |
| P-28 | Aymen Yangui (The University of Tokyo, Japan) "Thermionic Cooling Devices Based On AlGaAs/GaAs Heterostructures" |
| P-29 | Yasuyuki Sanari (Kyoto University, Japan) "Field-Induced Crystallization of Ge ₂ Sb ₂ Te ₅ Amorphous Studied by Strong THz Pulses" |
| P-30 | Peng Zhang (Michigan State University, USA) "Inverse Tunneling of Free Vacuum Electrons into a Solid" |
| P-31 | Yasushi Shoji (The University of Tokyo, Japan) "Growth and Characterization of GaSb Quantum Nanostructures by Solid-Source Molecular Beam Epitaxy" |
| P-32 | Sim-Hoon Youk (SPRC, Chonbuk National University, Korea) "Effect of Sulfur Passivation Using Aqueous and Alcoholic Ammonium Sulfide Solutions on the Specific Contact Resistivity of Ni Contact to InAs Layer Epitaxially Grown on In _{0.56} Ga _{0.47} As Epilayer." |
| P-33 | Han-Soo Jang (SPRC, Chonbuk National University, Korea) "Microstructural and Electrical Properties of Ni Stanogermanides Formed on Ge _{0.92} Sn _{0.08} Epilayer Grown on Si(100) Substrate" |
| P-34 | Katsuhisa Yoshida (The University of Tokyo, Japan) "Numerical Study of Quantum Efficiency of Quantum-Dot Intermediate-Band Solar Cells under Infrared Light Illumination" |
| P-35 | Jongsoon Park (Samsung Electronics / Sungkyunkwan University, Republic of Korea) "A Method of Predicting Pattern with Etch Rate of Non-Pattern Wafer Using Ion Beam Etching" |
| P-36 | Felix Jaetae Seo (Hampton University, USA) "A Single Atom Shift in 2D MoS ₂ Supercell" |

December 1st 2017 (Friday)

Session Quantum Computing (Koji Ishibashi, Matthew Gilbert)

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| 8:30-9:00 | Gregory D. Fuchs (Cornell University, USA) "Quantum Control Over Diamond Qubits Using a Mechanical Resonator" |
| 9:00-9:15 | Matthew J. Gilbert (University of Illinois, USA) "Modular Anomalies in (2+1) and (3+1)-Dimensional Edge Theories" |
| 9:15-9:45 | Satoshi Moriyama (NIMS, Japan) "Quantum Dots and Spin Qubits based on Silicon Tunnel Field-effect Transistors" |
| 9:45-10:00 | Fumiki Yoshihara (NICT, Japan) "Superconducting Qubit-Oscillator Circuit Beyond the Ultrastrong-Coupling Regime" |
| 10:00-10:30 | Thomas Schäpers (JARA-FIT Jülich-Aachen Research Alliance, Germany) "Helical States and Spin-Orbit Coupling in InAs Nanowire-Based Devices" |
| 10:30-10:45 | Coffee Break |
| 10:45-11:00 | Koji Ishibashi (RIKEN, Japan) "Nanowire Quantum Dots Coupled with a Superconducting Microwave Resonator" |
| 11:00-11:15 | Yukimi Kanai (Nara Women's University, Japan) "Full Counting Statistics Theory for Cross Correlation of Quantum Entanglement Current Noise in Double S/N/N Capacitively-Coupled Single Electron Transistor with Ohmic Impedance in Coulomb Blockade Regime" |
| 11:15-11:30 | Denis Mamaluy (Sandia National Laboratories, USA) "Beyond Moore's Computing (BMC): Fundamental Downscaling Limit of Field-effect Transistors and New Possibilities for Continued Increase of Computing Power" |

Session Roughness & Friction (Matthew Gilbert)

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| 11:30-11:45 | D. Vasileska (Arizona State University, USA) "The Role of Interface Roughness on the Electron Mobility in Nanoscale Devices: A Green's Function Approach" |
| 11:45-12:00 | Fumiya Nakamura (Tohoku University, Japan) "Study on Low Friction of Silicon Carbide under Water Lubrication: Molecular Dynamics Analysis" |
| 12:00-12:15 | Closing Remarks |