



# 77<sup>TH</sup> DEVICE RESEARCH CONFERENCE

June 23-26, 2019 // University of Michigan, Ann Arbor // Ann Arbor, MI

## POSTER SESSION

Monday, 6:00 pm – 9:00 pm | Michigan League, Ballroom

Paper	Title (Presenter)
P-1	Linear Weight Update in MoS <sub>2</sub> /Graphene Memristive Synapses for Unsupervised Learning (Krishnaprasad)
P-2	Spin-Valley Coupled Caloritronics with Strained Honeycomb Lattices (Sengupta)
P-3	Engineering p-n Junctions in Graphene/Molybdenum Disulfide Heterostructures (Subramanian)
P-4	Cryogenic Characterization of Antiferroelectric Zirconia Down to 50 mK (Wang)
P-5	Electrical Annealing and Stochastic Resonance in Low Barrier Perpendicular Nanomagnets for Oscillatory Neural Networks (Debashis)
P-6	Resistive Switching Early Failure and Gap Identification in Bilayer Selectorless RRAM Applications (Chen)
P-7	Investigation of Reverse Filament Formation in ITO/HfO <sub>2</sub> -Based RRAM (Persson)
P-8	Modeling of Leakage-Assist-Switching in Ferroelectric/Dielectric Stack (Si)
P-9	Role of Transverse Effective Mass in Auger Generation Impacted Planar III-V Tunnel FETs (Ahmed)
P-10	Dynamic Modeling of Hysteresis-Free Negative Capacitance in Ferroelectric/Dielectric Stacks Under Fast Pulsed Voltage Operation (Hoffmann)
P-11	Multi-Contact Phase Change Toggle Logic Device Utilizing Thermal Crosstalk (Khan)
P-12	A Single-Device Embodiment of XNOR Logic: TransiXNOR (Li)
P-13	Neural Network Assisted Compact Model for Accurate Characterization of Cycle-to-Cycle Variations in 2-D h-BN Based RRAM Devices (Rohan)
P-14	First Principles Study of Collector Transit Time Modulation in Double Heterojunction Bipolar Transistors (Sculley)
P-15	Impact Ionization Model for S-NDR Based Threshold Switching Devices (Zou)
P-16	Non-Volatile Capacitance Tuning in Graphene/(Hf,Zr)O <sub>2</sub> /Metal Varactors (Chaganti)
P-17	A Tunable Surface Acoustic Wave Device on Zinc Oxide via Acoustoelectric Interaction with AlGaIn/GaN 2DEG (Bahamonde)
P-18	Tunnel FETs Using Phosphorene/ReS <sub>2</sub> Heterostructures (Balaji)
P-19	Cryogenic Response of HKMG MOSFETs for Quantum Computing Systems (Chakraborty)
P-20	Comparative Evaluation of vdW Materials Based PN Junction and FET for Gas Sensing (Dhara)
P-21	New Device Physics of Cross-Gap Electroluminescence in Unipolar-Doped InGaAs/AlAs RTDs (Fakhimi)
P-22	Atomically Thin p-Doping Layer and Record High Hole Current on WSe <sub>2</sub> (Hung)
P-23	Photoacoustic Detection of Ammonia and Hydrogen Using Plasmonic Absorption in Pt Functionalized GaN Microcantilevers (Khan)
P-24	Large Temperature Coefficient of Resistance in Atomically Thin 2D Devices (Khan)
P-25	First-Principles Study of the Electron and Hole Mobility in Silicene (Khatami)
P-26	Tunnel Barrier Thickness, Interlayer Rotational Alignment, and Top Gating Effects on ReS <sub>2</sub> /hBN/ReS <sub>2</sub> Resonant Interlayer Tunnel Field Effect Transistors (Mohammed)

Paper	Title (Presenter)
P-27	Depleted Graphene-Oxide-Semiconductor Junctions for High Energy Radiation Detection (Ruiz)
P-28	Field Effect and Raman Characterization of Self-Assembled MoS <sub>2</sub> Nanoscrolls (Shahi)
P-29	About the Interplay Between Contact and Channel Resistance in MoS <sub>2</sub> and Its Impact on Mobility Extraction (Zhou)
P-30	Full In-Place Printing of Flexible Electrolyte-Gated CNT-TFTs (Cardenas)
P-31	High-Performance Ultrathin Body TiO <sub>2</sub> TFTs with Record on/off Current Ratio and Subthreshold Swing (Zhang)
P-32	Analyzing and Increasing Yield of ZnO Thin-Film Transistors for Large-Area Sensing Systems by Preventing Process-Induced Gate Dielectric Breakdown (Zheng)
P-33	Current Scaling in Single and Multiple Fin Static Induction Transistors with Sub-Micron Fin Width (Chun)
P-34	Pulsed Characteristics for High Current, Large Area GaN/AlN Resonant Tunneling Diodes (Growden)
P-35	Characteristics of P-Channel GaN MOSFET up to 300 °C (Han)
P-36	Reduction of Saturation Voltage in InGaAs-Channel/InGaIn-Drain Vertical FETs and the Role of Traps at the InGaAs/InGaN Junction (Lal)
P-37	Comparison of Field Plated and Non-Field Plated Schottky Barrier Diodes in HVPE Grown β-Ga <sub>2</sub> O <sub>3</sub> (Sharma)
P-38	Surface States in AlGaIn/GaN High Electron Mobility Transistors: Energy Profiling Using Channel Photocurrent Spectroscopy (Turkulets)
P-39	Diamond Metal-Semiconductor Field Effect Transistor for High Temperature Applications (Wu)
P-40	RF Performance of 130 nm Al <sub>0.75</sub> Ga <sub>0.25</sub> N/Al <sub>0.6</sub> Ga <sub>0.4</sub> N HFETs with MBE-Regrown Contacts (Xue)
P-41	Barrier Height Stability and Reverse Leakage Mechanisms in Ni/Ga <sub>2</sub> O <sub>3</sub> (001) Schottky Barrier Diodes (Li)
P-42	Vertical GaN Superjunction FinFET: A Novel Device Enabling Multi-Kilovolt and Megahertz Power Switching (Xiao)
P-43	Tunable WSe <sub>2</sub> Phototransistor Enabled by Electrostatically Doped Lateral p-n Homojunction (Ghosh)
P-44	Defect Characterization of InAs/InGaAs Quantum Dot Photodetector Grown on GaAs-on-V-Grooved-Si Substrate (Huang)
P-45	Waveguide Uni-Travelling-Carrier Photodiodes for mmW Signal Generation: Space-Charge Impedance and Efficiency Limitations (Isaac)
P-46	Flexible Organic Light-Emitting Diodes with Efficiency Improvement by Dielectric-Metal-Dielectric Anode (Jeong)
P-47	Efficient InGaIn p-Contacts for Deep-UV Light Emitting Diodes (Lee)
P-48	Ultrathin Metal Film Transparent Conductor for Efficient Light Coupling in Organic Light Emitting Diode (Park)
P-49	High-Responsivity Flexible Photodetectors Based on MOVPE-MoS <sub>2</sub> (Schneider)
P-50	Photo-Amplification in Bipolar WSe <sub>2</sub> Transistors with Electrostatic Gating (Thakar)

Paper	Title (Presenter)
P-51	We=100nm InP/InGaAs DHBT with Self-Aligned MOCVD Regrown p-GaAs Extrinsic Base Exhibiting 1Ω-μm <sup>2</sup> Base Contact Resistivity (Fang)
P-52	Ultrathin HfN Multilayer Gate Insulator Formation with High Dielectric Constant Induced by Interface Polarization (Ohmi)
P-53	InP MOSFETs Exhibiting Record 70 mV/dec Subthreshold Swing (Tseng)
P-54	True Random Number Generator Using Superconducting Qubits (Ash-Saki)
P-55	Solving the Maximum Independent Set Problem Using Coupled Relaxation Oscillators (Bashar)

## SPECIAL THANKS

### CONFERENCE DINNER RECEPTION & RUMP SESSIONS

- ▶ Teledyne Technologies Inc.

### CONFERENCE SUPPORT

- ▶ Lake Shore Cryotronics, Inc.
- ▶ Qorvo US, Inc.
- ▶ National Science Foundation
- ▶ Office of Naval Research
- ▶ University of Michigan

### CO-SPONSOR

- ▶ Materials Research Society

### TECHNICAL CO-SPONSOR

- ▶ IEEE Electron Devices Society

## EXHIBITORS

### SUNDAY

6:00 pm – 8:00 pm

### TUESDAY

9:00 am – 12:00 pm  
1:30 pm – 4:00 pm

### MONDAY

9:00 am – 12:00 pm  
1:30 pm – 4:00 pm  
6:00 pm – 9:00 pm





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## PROGRAM OVERVIEW

### SUNDAY

12:00 pm–5:00 pm	Registration	Michigan League, Concourse
1:00 pm–5:00 pm	Short Course: Fundamentals of 5G Device and Circuit Technology	Michigan League, Vandenberg
3:00 pm	Refreshment Break	Michigan League, Concourse
6:00 pm–8:00 pm	Welcome Reception	Michigan League, Ballroom

### MONDAY

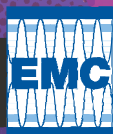
8:00 am–5:00 pm	Registration	Michigan League, Concourse
9:00 am	Session I. Plenary	Rackham Building, Amphitheatre
9:20 am	Introduction and Awards	
9:20 am	p-Bits for Probabilistic Computing (Datta)	
10:20 am	Refreshment Break	Michigan League, Ballroom
10:40 am	Ga and N-Polar GaN HEMTs for High Power and High Frequency Applications (Mishra)	
11:40 am	Lunch (Not provided by Conference)	
1:00 pm	Session II-A. Wide Bandgap Devices I	Michigan League, Hussey
1:00 pm	INVITED High-K Gate Dielectric GaN MOS-HEMTs with Regrown n+ InGaN Source/Drain (Then)	
1:40 pm	Integration of Self-Biased Circulators on GaN/SiC for Ka-Band RF Application (Cui)	
2:00 pm	High Mobility and Drive Current ZnO Thin Film Transistors (Yoo)	
2:20 pm	Microtransfer-Printed InGaAs/InP HBTs Utilizing a Vertical Metal Sub-Collector Contact (Carter)	
2:40 pm	Towards Vacuum-Less Operation of Nanoscale Vacuum Channel Transistors (Rughoobur)	
1:00 pm	Session II-B. Steep Threshold/Logic I	Michigan League, Vandenberg
1:00 pm	Process Dependent Switching Dynamics of Ferroelectric Hafnium Zirconate (Pandey)	
1:20 pm	Demonstration and Endurance Improvement of p-Channel Hafnia-Based Ferroelectric Field Effect Transistors (Winkler)	
1:40 pm	Steep Subthreshold Swing Originating from Gate Delay (Paletti)	
2:00 pm	Highly-Doped Through-Contact Silicon Epi Design at 3 nm Node (Mittal)	
2:20 pm	INVITED Ferroelectrics, Negative Capacitance and Depolarization Field: What Exactly is Negative Capacitance? (Khan)	
3:00 pm	Refreshment Break	Michigan League, Ballroom
3:20 pm	Session III-A. 2D and Flexible Devices I	Michigan League, Hussey
3:20 pm	INVITED Carbon Nanotube Based High Performance and Low Power CMOS and Optoelectronic Devices (Peng)	
4:00 pm	Printing h-BN Gate Dielectric for Flexible, Low-Hysteresis Carbon Nanotube Thin-Film Transistors at Low Temperature (Lu)	
4:20 pm	Gigahertz Zinc-Oxide TFT-Based Oscillators (Mehman)	
4:40 pm	Vertical Sidewall MoS <sub>2</sub> Growth and Transistors (McClellan)	
5:00 pm	INVITED Emerging Low Dimensional Material Devices for Beyond von-Neumann Computing (Wang)	
3:20 pm	Session III-B. Optoelectronics	Michigan League, Vandenberg
3:20 pm	INVITED III-V Lasers and Integrated Components Directly Grown on Silicon: Options for Integration (Lau)	
4:00 pm	High Power Indium Phosphide Photonic Integrated Circuit Platform (Zhao)	
4:20 pm	Back-Gated Phototransistor Fabricated from Low Temperature InP Grown Directly on Amorphous Gate Oxide (Sarkar)	
4:40 pm	Tunnel Junctions for Vertically Integrated Multiple Nitrides Laser Diodes (Siekacz)	
5:00 pm	INVITED III-Nitride High-Speed Optoelectronics (Feezell)	
6:00 pm–9:00 pm	Poster Session	Michigan League, Ballroom

### TUESDAY

8:00 am–5:00 pm	Registration	Michigan League, Concourse
8:40 am	Session V. Plenary	Rackham Building, Amphitheatre
8:40 am	Electronic Technologies for Enabling Artificial Intelligence at the Edge (Ionescu)	
9:40 am	Refreshment Break	Michigan League, Ballroom
10:00 am	Session VI-A. Memory/Neuromorphic I	Michigan League, Hussey
10:00 am	Ferroelectric Tunneling Junctions for Neurosynaptic Computing (Ryu)	
10:20 am	Artificial Neuron Using Ag/2D-MoS <sub>2</sub> /Au Threshold Switching Memristor (Dev)	
10:40 am	Fundamental Limit on Network Size Scaling of Oscillatory Neural Networks Due to PrMnO <sub>3</sub> Based Oscillator Phase Noise (Saraswat)	
11:00 am	INVITED Phase-Change Memory Enables Energy-Efficient Brain-Inspired Computing (Le Gallo)	
10:00 am	Session VI-B. Quantum Devices	Michigan League, Vandenberg
10:00 am	INVITED Si/SiGe Quantum Dot Spin Qubits (Eriksson)	
10:40 am	Demonstration of FETs with 3D Dirac Semimetal, Cd <sub>3</sub> As <sub>2</sub> (Shoron)	
11:00 am	A Novel ESD Clamp Based on the VO <sub>2</sub> Insulator-Metal Transition (Bohaichuk)	
11:20 am	Top-Gated Atomic Precision Phosphorous Doped Silicon Single Electron Transistor with Low Thermal Budget Gate Dielectric (Anderson)	
11:40 am	Lunch (Not provided by Conference)	
1:00 pm	Session VII-A. Memory/Neuromorphic II	Michigan League, Hussey
1:00 pm	INVITED Variants of Ferroelectric Hafnium Oxide Based Nonvolatile Memories (Mikolajick)	
1:40 pm	Sheet-Rich Silk-Base RRAM with Low Switching Voltages and Improved Reliabilities (Sharbati)	
2:00 pm	WSe <sub>2</sub> Based Valley-Coupled-Spintronic Devices for Low Power Non-Volatile Memories (Thirumala)	
2:20 pm	Dynamic (BiSb <sub>1-x</sub> ) <sub>2</sub> Te <sub>3</sub> Synaptic Devices with Programmable Spatio-Temporal Responses (Wan)	
2:40 pm	In-Memory Solution of Linear Systems with Crosspoint Arrays without Iterations (Sun)	
1:00 pm	Session VII-B. Wide Bandgap Devices II	Michigan League, Vandenberg
1:00 pm	INVITED GaN Integrated Circuits for Power Electronics (Fichtenbaum)	
1:40 pm	Self-Aligned Gate Thin-Channel $\beta$ -Ga <sub>2</sub> O <sub>3</sub> MOSFETs (Liddy)	
2:00 pm	Polarization Recovery Behavior of Hf <sub>0.5</sub> Zr <sub>0.5</sub> O <sub>2</sub> on Gallium Nitride HEMT Heterostructures (Wu)	
2:20 pm	Epitaxial Passivation of Delta Doped $\beta$ -Ga <sub>2</sub> O <sub>3</sub> Field Effect Transistors (Joishi)	
2:40 pm	LATE NEWS Enhancement-Mode Current Aperture Vertical Ga <sub>2</sub> O <sub>3</sub> MOSFETs (Wong)	
3:20 pm	Refreshment Break	Michigan League, Ballroom
3:40 pm	Session VIII-A. 2D and Flexible Devices II	Michigan League, Hussey
3:40 pm	New Observations in Contact Scaling for 2D FETs (Cheng)	
4:00 pm	Flexible Top-Gated Monolayer MoS <sub>2</sub> Transistors with High Mobility (Daus)	
4:20 pm	Atomic Layer Etching (ALE) of WSe <sub>2</sub> Yielding High Mobility p-FETs (Nipane)	
4:40 pm	INVITED Efficient Optoelectronics with 2D Materials (Lemme)	
3:40 pm	Session VIII-B. Wide Bandgap Devices III	Michigan League, Vandenberg
3:40 pm	INVITED Process Technologies for GaN High Voltage Devices (Kachi)	
4:20 pm	Impact of Gate Oxide Thickness on Electrical Characteristics of 1200 V 4H-SiC Planar-Gate Power MOSFETs (Agarwal)	
4:40 pm	Metal/BaTiO <sub>3</sub> / $\beta$ -Ga <sub>2</sub> O <sub>3</sub> Dielectric Heterojunction Diode with 5.6 MV/cm Breakdown Field (Xia)	
5:00 pm	LATE NEWS Buried Tunnel Junction for P-Down Nitride Laser Diodes (Turski)	
6:00 pm	Conference Dinner Reception	University of Michigan Museum of Art
8:30 pm	Rump Session 1: What will be the Ultimate Applications of 2D Materials?	Michigan League, Hussey
8:30 pm	Rump Session 2: Quantum Computation: What Device Platform will Reign Supreme?	Michigan League, Vandenberg

### WEDNESDAY

7:30 am–5:00 pm	Registration	Michigan League, Concourse
8:20 am	Session IX. EMC/DRC Plenary Session	Lydia Mendelssohn Theatre
8:20 am	EMC Awards Ceremony	
8:30 am	Programmable Quantum Materials (Basov)	
9:20 am	Refreshment Break	Michigan League, Ballroom
10:10 am	Session X. Steep Threshold/Logic II	Michigan League, Vandenberg
10:10 am	Significance of Multi and Few Domain Ferroelectric Switching Dynamics for Steep-Slope Non-Hysteretic Ferroelectric Field Effect Transistor (Gomez)	
10:30 am	3D-Stacked Strained SiGe/Ge Gate-All-Around (GAA) Structure Fabricated by 3D Ge Condensation (Suh)	
10:50 am	High Performance and Yield for Super Steep Retrograde Wells (SSRW) by Well Implant / Si-Based Epitaxy on Advanced Technology FinFETs (Rana)	
11:10 am	Experimental Calibration of the Temperature Dependence of the Heterojunction Bandgap in III-V Tunneling Devices (Bizindavyi)	



All DRC attendees may attend  
Wednesday EMC technical sessions.