

# POSTER SESSION

Monday, 6:00 pm – 9:00 pm | Lagoon Plaza

Paper	Title (Presenter)
P.1	Investigation of Gate Dielectric Composition Effect on AlTiO <sub>2</sub> /AlGaIn/GaN MIS-HEMTs performance (Zhama)
P.2	Energy Efficient Ternary Device in 28-nm CMOS Technology with Excellent Short-Channel Effect Immunity and Variation Tolerance Characteristics (Kim)
P.3	Exploration and Exploitation of Strain Engineering in 2D-FETs (Kumar)
P.4	IsoHEMTs: Boosting Transistor Performance by Isotope Engineering (Ganguly)
P.5	A Noise-robust Optoelectronic Synaptic Array with 2D Materials (Rahman)
P.6	Exploring Physically-formed Edge Contacts for Carbon Nanotube Transistors (Doherty)
P.7	Ferroelectric Induced Multidirectional Polarization in MoS <sub>2</sub> for Memory Applications (Sahoo)
P.8	High Breakdown Electric Field in Ba <sub>1-x</sub> Sr <sub>x</sub> TiO <sub>3</sub> /SiO <sub>2</sub> Dielectric Stack Formed on (010) β-Ga <sub>2</sub> O <sub>3</sub> substrates (Miesle)
P.9	Small Signal Analysis of GaN IMPATT Diodes for W-band and Sub-THz Wave Generation (Li)
P.10	Dual-Layer Ferroelectric MOSFETs for Multi-Level Non-Volatile Memories (Liao)
P.11	The $R_{on} - V_{BK}$ Relationship in β-Ga <sub>2</sub> O <sub>3</sub> Lateral MESFETs Determined Using Physics-Based TCAD Simulation (Ahmed)
P.12	Natural Organic Fructose-based Nonvolatile Resistive Switching Memory for Environmental Sustainability in Computing (Feng)
P.13	III-nitride Optical Thyristor Enabled by the Built-in Piezoelectric Field (Hajdel)
P.14	β-Ga <sub>2</sub> O <sub>3</sub> /Diamond Heterojunction PN Diode: Device Fabrication and TCAD Modelling (Herrera-Rodriguez)
P.15	Normally-off Quasi-vertical GaN FinFET on SiC Substrate with Record Small-signal Current Gain of $f_t = 10.2$ GHz (Sinnwell)
P.16	Demonstration of the β-Ga <sub>2</sub> O <sub>3</sub> Schottky Barrier Diode with a BV over 10 kV and $V_{on}$ of 1 V (Yan)
P.17	Permittivity Characterization of Ferroelectric Thin-Film Hafnium Zirconium Oxide Varactors up to 170 GHz (Abdulazhanov)
P.18	1.7-kV Vertical GaN p-n Diodes with Step-Graded Ion-Implanted Edge Termination (Duan)
P.19	A Fin-p-GaN HEMT for High Threshold Voltage with Enhanced Stability (Shen)
P.20	Ni/TiO <sub>2</sub> /β-Ga <sub>2</sub> O <sub>3</sub> Heterojunction Diodes with NiO Guard Ring Simultaneously Increasing Breakdown Voltage and Reducing Turn-on Voltage (Williams)
P.21	Demonstration of Tunnel Junction Based Cascaded P-down Green LED with High Quantum Efficiency (Rahman)
P.22	High-Speed InGaIn/GaN Superluminescent Diodes for Visible Light Communication Applications (Shen)
P.23	Ionic-Electronic Dynamics in an Electrochemical Gate Stack Towards High Speed Artificial Synapses (Levit)
P.24	Modeling of Variability-aware Memristive Neural Networks (Sasikumar)
P.25	Graphene-based Artificial Dendrites for Expressive Learning in Spiking Neural Networks (Liu)
P.26	Low Power and High Density Ternary-SRAM for Always-on Applications (Choi)
P.27	Controllability of Relaxation Behavior in Ag-based Diffusive Memristors (Chekol)
P.28	Amorphous GaO <sub>3</sub> based Non-Filamentary Memristive Device with Highly Repeatable Multiple Resistance States (Toprak)

Paper	Title (Presenter)
P.29	RRAM Based On-Sensor Visual Data Preprocessing for Efficient Image Classification (Kumar)
P.30	Precise $V_{TH}$ Control of MFSFET with 5 nm-thick FeNd-HfO <sub>2</sub> Realized by Kr-Plasma Sputtering for Pt Gate Electrode Deposition (Ohmi)
P.31	Evaluation of Schottky Barrier Height at Silicide/Silicon Interface of a Silicon Nanowire with Modulation Acceptor Doped Dielectric Shell (Nagarajan)
P.32	Reducing the Tunneling Barrier Thickness of Bilayer Ferroelectric Tunnel Junctions with Metallic Electrodes (Lancaster)
P.33	Analysis of Polarization Switching in HZO/ZrO <sub>2</sub> (HZZ) Nanolaminates based on Sub-lattice Phase-field Model (Kim)
P.34	Overcoming the Low Cell Current Bottleneck of 3D NAND Flash Memory Array with Novel Device Design (Huang)
P.35	5nm FinFET Cryogenic SRAM Evaluation for Quantum Computing (Parihar)
P.36	Freely Suspended Platinum Diselenide Membranes without Polymer Support for Piezoresistive Pressure Sensing (Lukas)
P.37	Ga <sub>2</sub> O <sub>3</sub> Heterojunction PN Diodes with Suppressed Background Carrier Concentration for Improved Breakdown Voltage (Dong)
P.38	ScAlN Based Ferroelectric Field Effect Transistors with ITO Channel (Mondal)
P.39	Large-Signal Modeling of GaN HEMTs using Fermi Kinetics and Commercial Hydrodynamics Transport (White)
P.40	Reconfigurable Superconducting Logic Using Multi-Gate Switching of a Nano-Cryotron (Alam)

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- ▶ Materials Research Society

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- ▶ IEEE Electron Devices Society

## VISIT THE EXHIBIT

### LAGOON PLAZA

Sunday, 6:00 pm to 8:00 pm  
Monday, 3:00 pm to 9:00 pm  
Tuesday, 10:00 am to 4:00 pm



81<sup>ST</sup> DEVICE RESEARCH CONFERENCE

June 25-28, 2023 // University of California, Santa Barbara // Santa Barbara, California



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# 81<sup>ST</sup> DEVICE RESEARCH CONFERENCE

# PROGRAM OVERVIEW

## SUNDAY

12:00 pm–5:00 pm **Registration** **Corwin Lobby**

1:00 pm–5:00 pm **Short Course** **Santa Barbara Harbor**  
Two-Dimensional Materials for the Semiconductor Industry

6:00 pm–8:00 pm **Welcome Reception** **Lagoon Plaza**

## MONDAY

8:00 am–5:00 pm **Registration** **Corwin Lobby**

9:00 am Introduction and Awards **Corwin West**

9:20 am **Plenary** **Corwin West**  
EPI (Electronic Photonic Integration) by EPI (Epitaxy) (Lau)

10:20 am Coffee Break **Lagoon Plaza**

10:40 am **Plenary** **Corwin West**  
25 Years of Development—From Esoteric Quantum Transport Theory to Wide Adoption in Atomistic Device Simulation (Klimeck)

11:40 am Lunch (Not provided by Conference)

### Session 1: 2D Electronics 1 **Corwin East**

1:00 pm **INVITED** Crystal growth and applications of new 2D dielectric materials (Zdenek)

1:40 pm fMAX Exceeding 3 GHz in Self-Aligned Zinc-Oxide Thin-Film Transistors with Micron-Scale Gate Length (Ma)

2:00 pm Local Back-Gate Monolayer MoS<sub>2</sub> Transistors with Channel Lengths Down to 50 nm and EOT ~ 1 nm Showing Improved Ion using Post-Metal Anneal (Jaikissoon)

2:20 pm High-Performance WS<sub>2</sub> MOSFETs with Bi/Sb Composite Contacts (Wen)

2:40 pm High performance monolayer WSe<sub>2</sub> devices through defect engineering and doping (Tan)

### Session 2: WBG 1: Electronics **Corwin West**

1:00 pm Multi-Channel  $\beta$ -Ga<sub>2</sub>O<sub>3</sub>/(Al<sub>0.2</sub>Ga<sub>0.8</sub>)<sub>2</sub>O<sub>3</sub> MODFETs (Dheenan)

1:20 pm First GaN/AlN p-channel FinHFETs on Single-Crystal AlN Substrates (Zhang)

1:40 pm Large-scale vertically stacked ultrawide bandgap oxides for CMOS IC (Yuvaraja)

2:00 pm  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> FinFETs by MacEtch: temperature dependent I-V characteristics (Ren)

2:20 pm **INVITED** Complex oxide membranes as dielectrics for 2D electronics (Jalan)

3:00 pm Coffee Break **Lagoon Plaza**

### Session 3: 2D Electronics II **Corwin East**

3:20 pm A mobility study of monolayer MoS<sub>2</sub> on low- $\kappa$ /high- $\kappa$  dielectrics (Sun)

3:40 pm Up to 100-fold Improvement of Threshold Voltage Stability in ITO Transistors (Wahid)

4:00 pm Hysteresis and thermal stability in FETs with exotic Bi<sub>2</sub>Se<sub>3</sub> and MnAl<sub>2</sub>Si<sub>4</sub> insulators (Illarionov)

4:20 pm Drift of Schottky Barrier Height in Phase Change Materials (Nir-Harwood)

4:40 pm Ultra Steep Slope Cryogenic MOSFETs Based on Bilayer Graphene (Icking)

### Session 4: WBG II: Power **Corwin West**

3:20 pm **INVITED** Gallium oxides devices for GW/MV transmission and high power switched mode RF amplifiers (Singsetti)

4:00 pm GaN-on-GaN PN Power Diode with a Breakdown Voltage of 7.86 kV (Xu)

4:20 pm **INVITED** GaN Super-Heterojunction Power Switches for Improved Voltage Handling and Radiation Hardness (Chu)

5:00 pm First Demonstration of 15A/1.4 kV Large Area Trench  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> Schottky Barrier Diode with High- $\kappa$  RESURF (Roy)

6:00 pm–9:00 pm **Poster Session** **Lagoon Plaza**

## TUESDAY

8:00 am–5:00 pm **Registration** **Corwin Lobby**

9:00 am **Plenary** **Corwin West**  
Integrated Printed and Flexible Electronic Systems (Arias)

10:00 am Coffee Break **Lagoon Plaza**

### Session 5: Flexible Electronics **Corwin East**

10:20 am **INVITED** Carbon-based nanomaterial inks for print-in-place, recyclable, and water-based electronics (Franklin)

11:00 am Flexible CMOS electronics based on 2D p-type WSe<sub>2</sub> and n-type MoS<sub>2</sub> (Piacentini)

11:20 am **INVITED** Quantum transport simulations for the next decade: Exploiting quantum topology in emerging 2D-devices (Muralidharan)

12:00 pm Fully Integrated Flexible RF Detectors in MoS<sub>2</sub> and Graphene based MMIC (Palacios)

### Session 6: WBG III: RF Device **Corwin West**

10:20 am AlN/GaN HEMT with 14.1 W/mm Output Power Density at 10 GHz (Cheng)

10:40 am Temperature dependent properties of high-speed 15-GHz epitaxial AlN FBARs (Zhao)

11:00 am First Demonstration of GaN RF HEMTs on Engineered Substrate (Yadav)

11:20 am Fully Epitaxial, Reconfigurable Ferroelectric ScAlN/AlGaIn/GaN HEMTs (Wang)

11:40 am **LATE NEWS**

12:00 pm **LATE NEWS**

12:20 pm Lunch (Not provided by Conference)

### Session 7: Emerging Devices I **Corwin East**

1:20 pm **INVITED** Josephson parametric amplifiers for rapid, high-fidelity measurement of solid-state qubits (Shankar)

2:00 pm The D4-TFT: A Point-of-Care Carbon Nanotube BioFET for Ultrasensitive Detection of Biomarkers (Albarghouthi)

2:20 pm Ultra-compact ternary content-addressable memory cell based on single ambipolar two-dimensional floating-gate transistor (Cai)

2:40 pm Multifunctional Resistance Switching in Monolayer Hexagonal Boron Nitride Atomistor (Yang)

### Session 8: WBG IV: HEMT **Corwin West**

1:20 pm W-band fully passivated AlN/GaN HEMT device with 56% power-added efficiency and 780 mW/mm output power density at 94 GHz (Arkun)

1:40 pm AlN/Al<sub>0.25</sub>Ga<sub>0.75</sub>N/AlN Quantum Well HEMTs with  $fT/f_{max}$  of 67/166 GHz (Kim)

2:00 pm 90 nm GaN Technology for Millimeter-Wave Power Applications to W-Band and Beyond (Srivastava)

2:20 pm **INVITED** Recent Advances in GaN HEMT Modeling using Fermi Kinetics Transport (Miller)

3:00 pm Coffee Break **Lagoon Plaza**

### Session 9: Emerging Devices II **Corwin East**

3:20 pm Graded AlGaIn/GaN heterojunction bipolar transistors with 101 kA/cm<sup>2</sup> collector current density using patterned area regrown base contacts (Joishi)

3:40 pm GaN/AlN Resonant Tunneling Field Effect Transistors (Encomendero)

4:00 pm Heterogenous integration of 3D vertically stacked metal-oxide transistors (Yuvaraja)

4:20 pm **LATE NEWS**

### Session 10: Optoelectronics **Corwin West**

3:20 pm Size dependent characteristics of AlGaIn-based ultraviolet micro-LEDs (Yao)

3:40 pm Lattice-Matched InAsSbBi Photodetectors for Long-Wave Infrared Sensing (White)

4:00 pm Enhanced injection efficiency in double-color III-Nitride LEDs (Chilpala)

4:20 pm **LATE NEWS**

6:00 pm **Conference Dinner Reception** **Goleta Beach**

8:30 pm **Rump Session** **Corwin West**  
What makes a good device paper and how do you measure its impact? (Franklin, Naeemi, Peterson, Richter, Rodwell)

## WEDNESDAY

7:30 am–5:00 pm **Registration** **Corwin Lobby**

8:20 am **EMC Plenary\*** **Music Building, Lotte Lehmann**  
Suboxide Molecular-Beam Epitaxy

9:20 am Coffee Break **Lagoon Plaza**

### Session 11: Memory **Corwin West**

10:00 am FeFET-Based Synaptic Cross-Bar Arrays for Deep Neural Networks: Impact of Ferroelectric Thickness on Device-Circuit Non-Idealities and System Accuracy (Wang)

10:20 am Origin of Polarization Charges Probed in Bulk Si:HfO<sub>2</sub> FeFET (Dahan)

10:40 am Solving optimization tasks power-efficiently exploiting VO<sub>2</sub>'s phase-change properties with Oscillating Neural Networks (Maher)

11:00 am Domain Wall Magnetic Tunnel Junction Artificial Neuron with Tunable Stochasticity for Computing on the Edge (Leonard)

11:20 am **INVITED** Computational Associative Memory Powered by Ferroelectric Memory (Ni)

12:00 pm Lunch (Not provided by Conference)

### Session 12: Wide Bandgap III - III-N HEMTs **Corwin West**

1:00 pm **INVITED** Radiation Effects in AlGaIn/GaN HEMTs and Gallium Oxide Diodes (Fleetwood)

1:40 pm Single-Event Burnout by Cf-252 Irradiation in Vertical  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> Diodes with Pt and PtOx Schottky Contacts and High Permittivity Dielectric Field Plate (Islam)

2:00 pm Technology scaling effects on SRAM-PUF reliability under ionizing radiation (Surendranathan)

2:20 pm Fast switching (<10 ns) characteristics and long stress (190 h) operation of NO<sub>2</sub>-doped p-channel diamond MOSFETs (Saha)

\*DRC PARTICIPANTS CAN ATTEND BOTH DRC AND EMC SESSIONS ON WEDNESDAY