

2019 Device Research Conference (DRC 2019)

**Ann Arbor, Michigan, USA
23 – 26 June 2019**



**IEEE Catalog Number: CFP19DRC-POD
ISBN: 978-1-7281-2113-0**

**Copyright © 2019 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP19DRC-POD
ISBN (Print-On-Demand):	978-1-7281-2113-0
ISBN (Online):	978-1-7281-2112-3
ISSN:	1548-3770

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

Table of Contents

Schedule of Events.....31

Session I. PLENARY

9:00 AM Introduction and Awards

9:20 AM I.-1 Plenary Paper.....35
p-Bits for Probabilistic Computing
 Supriyo Datta¹
¹Purdue University, Electrical Engineering Building, West Lafayette, IN 47907, USA

10:20 AM Break

10:40 AM I.-2 Plenary Paper.....N/A
Ga and N-Polar GaN HEMTs for High Power and High Frequency Applications
 Umesh K Mishra
 Professor, ECE Department, UC Santa Barbara and CTO, Transphorm

Session II-A Wide Bandgap Devices I

1:00 PM II_A.-1 Invited Paper.....39
High-K Gate Dielectric GaN MOS-HEMTs with Regrown n+ InGaN Source/Drain
 Han Wui Then, Sansaptak Dasgupta, Marko Radosavljevic, Sanaz Gardner, Seung Hoon Sung, and Paul Fischer
 Intel Corporation, Components Research, Technology and Manufacturing Group, Hillsboro, OR 97124, USA

1:40 PM II_A.-2.....41
Integration of Self-Biased Circulators on GaN/SiC for Ka-band RF application
 Yongjie Cui¹, Yu Cao¹, Manyam Pilla¹, Edward Beam¹, Andy Xie¹, Cathy Lee¹, Andrew Ketterson¹, Michael Roach², Anton Geiler², Michael Geiler², Lee Burns², and Douglas Linkhart²
¹Qorvo, IDP Research, 800 W Renner Road, Richardson, Texas 75080, USA;
²Metamagnetics Inc. 115 Flanders Road, Suite 135, Westborough, MA 01581

2:00 PM II_A.-3 Student Paper43
High Mobility and Drive Current ZnO Thin Film Transistors
 Sang H. Yoo², Enrique D. Gomez² and Thomas N. Jackson¹
 Center for Thin Film Devices and Materials Research Institute, ¹Department of Electrical Engineering,
²Department of Chemical Engineering, Penn State University, University Park, PA 16802, U.S.A.

2:20 PM II_A.-4.....45
Microtransfer-Printed InGaAs/InP HBTs Utilizing a Vertical Metal Sub-Collector Contact
 Andrew D. Carter, Miguel E. Urteaga, Petra Rowell, Joshua Bergman, and Andrea Arias
 Teledyne Scientific & Imaging, 1049 Camino Dos Rios, Thousand Oaks CA 91360

2:40 PM	II_A-5.....47 Towards Vacuum-Less Operation of Nanoscale Vacuum Channel Transistors Girish Rughoobur ¹ , Lay Jain ¹ , and Akintunde I. Akinwande ¹ ¹ Massachusetts Institute of Technology, 77 Massachusetts Ave., Cambridge, MA 02139, USA
---------	--

Session II-B STEEP THRESHOLD/LOGIC I

1:00 PM	II_B.-1 Student Paper.....49 Process Dependent Switching Dynamics of Ferroelectric Hafnium Zirconate Pratyush Pandey, Cristobal Alessandri, and Alan C. Seabaugh University of Notre Dame, Notre Dame, Indiana 46556, USA
1:20 PM	II_B.2 Student Paper.....51 Demonstration and Endurance Improvement of p-channel Hafnia-based Ferroelectric Field Effect Transistors Felix Winkler ¹ , Milan Pešić ² , Claudia Richter ³ , Michael Hoffmann ³ , Thomas Mikolajick ^{1,3} , Johann W. Bartha ¹ ¹ Technische Universität Dresden, Institute of Semiconductors and Microsystems, IHM, Dresden, Germany; ² MDLSoft Inc., Santa Clara, CA, USA; Now with Applied Materials, Santa Clara, CA, USA; ³ Namlab gGmbH, Noethnitzer Str. 64, 01187 Dresden, Germany
1:40 PM	II_B.-3 Student Paper53 Steep Subthreshold Swing Originating from Gate Delay P. Paletti, M. Asghari Heidarlou, K. Gonzalez Serrano, C. Alessandri, and A. Seabaugh University of Notre Dame, Notre Dame, IN 46556, USA
2:00 PM	II_B.-4.....55 Highly-Doped Through-Contact Silicon Epi Design at 3 nm node S. Mittal ¹ , A. Pal, M. Saremi, J. Ferrell, M. Haverty, T. Miyashita, N. Kim, E. M. Bazizi, B. Alexander, A. B. Sachid, B. Ayyagari ¹ Applied Materials, Bangalore, India; Applied Materials, Santa Clara, USA
2:20 PM	II_B.-5 Invited Paper.....57 Ferroelectrics, Negative Capacitance and Depolarization Field: What exactly is negative capacitance? Asif I. Khan School of Electrical and Computer engineering, Georgia Institute of Technology Atlanta, GA 30332

Session III-A 2D AND FLEXIBLE DEVICES I

3:20 PM	III_A.-1 Invited Paper.....59 2D materials in resistive memory and neuromorphic computing system applications Wei D. Lu Electrical Engineering and Computer, Science, University of Michigan
---------	---

4:00 PM	III_A.-2 Student Paper61 Printing h-BN Gate Dielectric for Flexible, Low-hysteresis Carbon Nanotube Thin-Film Transistors at Low Temperature Shiheng Lu ¹ , Jorge A. Cardenas ¹ , Robyn Worsley ² , Nicholas X. Williams ¹ , Joseph B. Andrews ¹ , Cinzia Casiraghi ² and Aaron D. Franklin ^{1, 3*} ¹ Department of Electrical and Computer Engineering, Duke University, Durham NC 27708, USA; ² School of Chemistry, University of Manchester, Manchester M13 9PL, United Kingdom; ³ Department of Chemistry, Duke University, Durham NC 27708, USA
4:20 PM	III_A.-3 Student Paper63 Gigahertz Zinc-Oxide TFT-Based Oscillators Yoni Mehlman, Can Wu, Sigurd Wagner, Naveen Verma, James C. Sturm Princeton University, Department of Electrical Engineering, Princeton, NJ, 08544, USA
4:40 PM	III_A.-4.....65 Vertical Sidewall MoS2 Growth and Transistors Connor J. McClellan, Andrew C. Yu, Ching-Hua Wang, H.-S. Philip Wong, Eric Pop Electrical Engineering, Stanford University, Stanford, CA 94305, USA.
5:00 PM	III_A.-5 Invited Paper.....67 Emerging Low Dimensional Material Devices for Beyond von-Neumann Computing Xiaodong Yan ¹ , Hefei Liu ¹ , Huan Zhao ¹ and Han Wang ¹ ¹ Ming Hsieh Department of Electrical and Computer Engineering, University of Southern California 3737 W Way, Los Angeles, California 90089, United States

Session III-B OPTOELECTRONICS

3:20 PM	III_B.-1 Invited Paper.....69 III-V Lasers and Integrated Components Directly Grown on Silicon: Options for Integration Kei May Lau Fang Professor of Engineering and Chair Professor Department of Electronic and Computer Engineering, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong
4:00 PM	III_B.-2 Student Paper.....71 High Power Indium Phosphide Photonic Integrated Circuit Platform Hongwei Zhao, Sergio Pinna, Fengqiao Sang, Simone Tommaso Suran Brunelli, Larry A Coldren, Jonathan Klamkin Electrical and Computer Engineering Department, University of California Santa Barbara, Santa Barbara, CA 93106, USA
4:20 PM	III_B.-3 Student Paper73 Back-Gated Phototransistor Fabricated from Low Temperature InP Grown Directly on Amorphous Gate Oxide Debarghya Sarkar ^{1,2} , Sizhe Weng ³ , Yunpeng Xu ¹ , Frank Greer ² and Rehan Kapadia ¹ ¹ Ming Hsieh Dept of Electrical and Computer Engineering, University of Southern California, CA 90089, USA; ² Microdevices Laboratory, NASA Jet Propulsion Laboratory, CA 91109, USA; ³ Dept of Chemical Engineering and Materials Science, University of Southern California, CA 90089, USA

4:40 PM	III_B.-4.....75 Tunnel junctions for vertically integrated multiple nitrides laser diodes M. Siekacz ¹ , G. Muziol ¹ , H. Turski ¹ , K. Nowakowski-Szkudlarek ¹ , M. Hajdel ¹ , M. Zak ¹ , A. Feduniewicz-Zmuda ¹ , P. Wolny ¹ , M. Mikosza ¹ , M. Sawicka ¹ and C. Skierbiszewski ¹ ¹ Institute of High Pressure Physics, Polish Academy of Sciences, Sokolowska 29/37, 01-142 Warsaw, Poland
5:00 PM	III_B.-5 Invited Paper.....77 III-Nitride High-Speed Optoelectronics Daniel Feezell, Arman Rashidi, Morteza Monavarian, Andrew Aragon, Mohsen Nami, Saadat Mishkat-UI-Masabih, and Ashwin Rishinaramangalam Center for High Technology Materials, University of New Mexico, 1313 Goddard St. SE, Albuquerque, NM, 87106,USA

Session IV POSTER SESSION

P-1	Student Paper.....79 Linear Weight Update in MoS₂/Graphene Memristive Synapses for Unsupervised Learning Adithi Krishnaprasad ¹ , Sonali Das ¹ , Nitin Choudhary ¹ , Durjoy Dev ¹ , Hee-Suk Chung ² , Olaleye Aina ³ , Yeonwoong Jung ¹ , Tania Roy ¹ ¹ University of Central Florida, 4000 Central Florida Blvd, Orlando, FL 32826, USA; ² Korea Basic Science Institute, Jeonju, 54907, South Korea; ³ BAE Systems FAST Labs, Columbia, MD 21046, USA.
P-281 Spin-valley coupled caloritronics with strained honeycomb lattices Parijat Sengupta ¹ and Shaloo Rakheja ² ¹ School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, 47907, USA; ² Electrical and Computer Engineering Department, New York University, New York, NY 11201, USA
P-3	Student Paper.....83 Engineering p-n junctions in graphene/molybdenum disulfide heterostructures Shruti Subramanian ¹ , Ke Xu ² , Simon K. Moser ³ , Donna Deng ¹ , Jun Li ⁴ , Randall M. Feenstra ⁴ , Susan K. Fullerton-Shirey ² and Joshua A. Robinson ¹ ¹ Department of Materials Science and Engineering, The Pennsylvania State University, State College, PA, USA; ² Department of Chemical and Petroleum Engineering, University of Pittsburgh, Pittsburgh, PA, USA; ³ Physikalisches Institut, Universität Würzburg, D-97074 Würzburg, Germany; ⁴ Department of Physics, Carnegie Mellon University, Pittsburgh, PA, USA
P-4	Student Paper.....85 Cryogenic Characterization of Antiferroelectric Zirconia down to 50 mK Zheng Wang ¹ , Hanbin Ying ¹ , Nujhat Tasneem ¹ , Anthony Gaskell ¹ , John D. Cressler ¹ , Martin Mourigal ² , Asif I. Khan ¹ ¹ School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA 30332; ² School of Physics, Georgia Institute of Technology, Atlanta, GA 30332
P-5	Student Paper.....87 Electrical Annealing and Stochastic Resonance in Low Barrier Perpendicular Nanomagnets for Oscillatory Neural Networks Punyashloka Debashis, Pramey Upadhyaya and Zhihong Chen School of Electrical and Computer Engineering and Birck Nanotechnology Center Purdue University, West Lafayette, IN 47906, USA

P-6	Student Paper.....89 Resistive Switching Early Failure and Gap Identification in Bilayer Selectorless RRAM Applications Ying-Chen Chen ¹ , Szu-Tung Hu ² , Chao-Cheng Lin ³ , Jack C. Lee ¹ ¹ Department of Electrical and Computer Engineering, The University of Texas at Austin, Austin, Texas, USA; ² Material Science and Engineering Program, The University of Texas at Austin, Austin, TX 78712, USA; ³ Taiwan Semiconductor Research Institute, TSRI, Hsinchu, Taiwan
P-791 Investigation of Reverse Filament Formation in ITO/HfO₂-based RRAM Karl-Magnus Persson ¹ , Mamidala Saketh Ram ¹ , Mattias Borg ¹ , Lars-Erik Wernersson ¹ ¹ Lund University, Department of Electrical- and Informations Technology, Box 118, SE-22100, Sweden
P-893 Modeling of Leakage-Assist-Switching in Ferroelectric/Dielectric Stack Mengwei Si, Xiao Lyu, and Peide D. Ye School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47906, U.S.A.
P-9	Student Paper.....95 Role of transverse effective mass in Auger generation impacted planar III-V Tunnel FETs Sheikh Z. Ahmed ¹ , Yaohua Tan ² , and Avik W. Ghosh ^{1,3} ¹ Charles L. Brown Department of Electrical and Computer Engineering, University of Virginia, Charlottesville, Virginia, USA. ² Synopsys, San Jose, California; ³ Department of Physics, University of Virginia, Charlottesville, Virginia, USA
P-10	Student Paper.....97 Dynamic modeling of hysteresis-free negative capacitance in ferroelectric/dielectric stacks under fast pulsed voltage operation M. Hoffmann ¹ , S. Slesazeck ¹ and T. Mikolajick ^{1,2} ¹ NaMLab gGmbH, Noethnitzer Str. 64, Dresden, D-01187, Germany; ² Chair of Nanoelectronic Materials, TU Dresden, Dresden, D-01069, Germany
P-11	Student Paper.....99 Multi-contact Phase Change Toggle Logic Device Utilizing Thermal Crosstalk Raihan Sayeed Khan ¹ , Nadim H. Kan'an ¹ , Jake Scoggin ¹ , Helena Silva ¹ and Ali Gokirmak ¹ ¹ University of Connecticut, Storrs, CT 06269, USA
P-12	Student Paper.....101 A Single-Device Embodiment of XNOR Logic: TransiXNOR Xiang Li ¹ , Mingda Li ¹ , Alyosha Molnar ^{1,3} , Debdeep Jena ^{1,2,3} , and Huili Grace Xing ^{1,2,3} ¹ School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; ² Department of Materials Science and Engineering, Cornell University, Ithaca, NY 14853, USA; ³ Kavli Institute at Cornell for Nanoscale Science, Ithaca, NY 14853, USA
P-13	Student Paper.....103 Neural Network Assisted Compact Model for Accurate Characterization of Cycle-to-cycle Variations in 2-D h-BN based RRAM devices Jacob N. Rohan, Pingping Zhuang, SS Teja Nibhanupudi, Sanjay K. Banerjee, Jaydeep P. Kulkarni ECE Department, University of Texas at Austin, 2501 Speedway, Austin, TX 78712, USA

P-14	Student Paper.....105 First Principles Study of Collector Transit Time Modulation in Double Heterojunction Bipolar Transistors Jonathan P. Sculley ¹ , Yihao Fang ² , Brian Markman ² , Miguel E. Urteaga ³ , Andy D. Carter ³ , Mark J. W. Rodwell ² and Paul D. Yoder ¹ ¹ School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, 30332, USA; ² Department of Electrical and Computer Engineering, University of California, Santa Barbara, 93106, USA; ³ Teledyne Scientific and Imaging, 1049 Camino Dos Rios, Thousand Oaks, CA, 91360, USA
P-15	Student Paper.....107 Impact Ionization Model for S-NDR based Threshold Switching Devices Yuezhong Zou ¹ , Darshil K. Gala ¹ , and James A. Bain ¹ ¹ Dept. of Electrical & Computer Engineering, Carnegie Mellon University, Pittsburgh, PA 15213, USA
P-16	Student Paper.....109 Non-volatile Capacitance Tuning in Graphene/(Hf,Zr)O₂/Metal Varactors V. R. Saran Kumar Chaganti ¹ , Yao Zhang ² and Steven J. Koester ¹ ¹ ECE Department, University of Minnesota, 200 Union St SE, Minneapolis, MN 55455; ² Department of Chemistry, University of Minnesota, 207 Pleasant St SE, Minneapolis, MN 55455
P-17	Student Paper.....111 A Tunable Surface Acoustic Wave Device on Zinc Oxide via acoustoelectric interaction with AlGaIn/GaN 2DEG José A. Bahamonde ¹ , Harish Krishnaswamy ¹ , and Ioannis Kyriassis ¹ ¹ Columbia University, 500 west 120th Street, New York, NY/10027, U.S.A.
P-18	Student Paper.....113 Tunnel FETs using Phosphorene/ReS₂ heterostructures Y. Balaji ^{1,2} , Q. Smets ² , D. Lin ² , I. Asselberghs ² , I. Radu ² and G. Groeseneken ^{1,2} ¹ Department of Electrical Engineering, KU Leuven, 3001 Leuven, Belgium; ² IMEC, 3001 Leuven, Belgium
P-19	Student Paper.....115 Cryogenic Response of HKMG MOSFETs for Quantum Computing Systems Wriddhi Chakraborty, Kai Ni, Sourav Dutta, Benjamin Grisafe, Jeffrey Smith and Suman Datta University of Notre Dame, Notre Dame, IN 46556, USA
P-20	Student Paper.....117 Comparative Evaluation of vdW Materials Based PN Junction and FET for Gas Sensing Sushovan Dhara ^{1,2} , Kartikey Thakar ³ , Sayantan Ghosh ³ , Abin Varghese ³ , Suddhasatta Mahapatra ¹ , and Saurabh Lodha ³ ¹ Department of Physics, ² Department of MEMS and ³ Department of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai-400076, India.

P-21	Student Paper.....119 New Device Physics of Cross-Gap Electroluminescence in Unipolar-Doped InGaAs/AlAs RTDs P. Fakhimi ¹ , W-D. Zhang ² , T.A. Growden ³ , E.R. Brown ² , R. Droopad ⁴ , K.M. Hansen ² , and P. R. Berger ¹ ¹ Dept. of Electrical and Computer Engineering, Ohio State Univ., Columbus, OH 43210, USA; ² Dept. of Physics, Wright State Univ., Dayton, OH 45435, USA; ³ NAS-NRC Postdoctoral Research Fellow at the U.S. Naval Research Laboratory, Washington, DC 20375, USA; ⁴ Ingram School of Engineering, Texas State Univ., San Marcos, TX 78666, USA
P-22121 Atomically Thin p-doping Layer and Record High Hole Current on WSe₂ Terry Y.T. Hung ^{1,2} , Chin-Sheng Pang ^{1,2} , Xiangkai Liu ^{1,2} , Dmitry Zemlyanov ¹ and Zhihong Chen ^{1,2} ¹ ECE Dept & ² Birck Nanotechnology Center, Purdue University, West Lafayette, IN 47906
P-23	Student Paper.....123 Photoacoustic Detection of Ammonia and Hydrogen Using Plasmonic Absorption in Pt Functionalized GaN Microcantilevers Digangana Khan ¹ , Durga Gajula ² , Hongmei Li ¹ , Ferhat Bayram ¹ and Goutam Koley ¹ ¹ Clemson University, 101 Calhoun Dr., Clemson, SC 29634, US; ² Georgia Institute of Technology, 225 N Ave NW, Atlanta, GA 30332, US
P-24	Student Paper.....125 Large Temperature Coefficient of Resistance in Atomically Thin 2D Devices Asir Intisar Khan, Kevin Brenner, Kirby K.H. Smithe, Michal J. Mleczko and Eric Pop* ¹ Electrical Engineering, Stanford University, Stanford, CA 94305, USA
P-25	Student Paper.....127 First-principles Study of the Electron and Hole Mobility in Silicane Mohammad Mahdi Khatami ^{1,2} , Gautam Gaddemane ¹ , Maarten L. Van de Put ¹ , Massimo V. Fischetti ¹ , Mohammad Kazem Moravvej-Farshi ² , Mahdi Pourfath ³ , and William G. Vandenberghe ¹ ¹ Department of Material science and Engineering, The University of Texas at Dallas, Richardson, Texas 75080; ² Department of Electrical and Computer Engineering, Tarbiat Modares University, Tehran 14115-111, Iran; ³ School of Electrical and Computer Engineering, University of Tehran, Tehran 14395-515, Iran
P-26	Student Paper.....129 Tunnel Barrier Thickness, Interlayer Rotational Alignment, and Top Gating Effects on ReS₂/hBN/ReS₂ Resonant Interlayer Tunnel Field Effect Transistors Omar B. Mohammed ¹ , Leonard F. Register ¹ , and Sanjay K. Banerjee ¹ ¹ Microelectronics Research Center and Determent of ECE, The University of Texas at Austin, Austin, TX 78758, USA
P-27131 Depleted Graphene-Oxide-Semiconductor Junctions for High Energy Radiation Detection Isaac Ruiz ¹ , Thomas E. Beechem ¹ , Gyorgy Vizkelethy ¹ , Paul M. Thelen ¹ , Joshua Shank ¹ , Stephen W. Howell ² and Michael D. Goldflam ¹ ¹ Sandia National Laboratories, P.O. Box 5800, Albuquerque, NM 87123, USA; ² Naval Surface Warfare Center, 300 Highway 361, Crane, IN 47522, USA

P-28	<p>.....133</p> <p>Field Effect and Raman Characterization of Self-Assembled MoS₂ Nanoscrolls Simran Shahi¹, Maomao Liu¹, Hemendra Nath Jaiswal¹, Licheng Xiao¹, Sichen Wei², Hyun Kim³, Seok Joon Yun³, Young Hee Lee³, Fei Yao², and Huamin Li¹ ¹Department of Electrical Engineering, University at Buffalo, Buffalo, New York, 14260, USA; ²Department of Materials Design and Innovation, University at Buffalo, Buffalo, New York, 14260, USA; ³Center for Integrated Nanostructure Physics (CINAP), Institute for Basic Science (IBS), Suwon 16419, Korea</p>
P-29	<p>.....135</p> <p>About the interplay between contact and channel resistance in MoS₂ and its impact on mobility extraction Ruijing Zhou and Joerg Appenzeller Birck Nanotechnology Center, Purdue University, West Lafayette, IN 47906, USA</p>
P-30	<p>Student Paper.....137</p> <p>Full In-Place Printing of Flexible Electrolyte-Gated CNT-TFTs Jorge A. Cardenas¹, Shiheng Lu¹, Nicholas X. Williams¹, Aaron D. Franklin^{1,2} ¹Department of Electrical and Computer Engineering, Duke University, Durham NC 27708, USA; ²Department of Chemistry, Duke University, Durham NC 27708, USA</p>
P-31	<p>Student Paper.....139</p> <p>High-performance ultrathin body TiO₂ TFTs with record on/off current ratio and subthreshold swing Jie Zhang, Guangyang Lin, Peng Cui and Yuping Zeng Department of electrical and computer engineering, University of Delaware, 139 The Green, Newark, Delaware, 19716, USA</p>
P-32	<p>Student Paper.....141</p> <p>Analyzing and Increasing Yield of ZnO Thin-Film Transistors for Large-area Sensing Systems by Preventing Process-Induced Gate Dielectric Breakdown Zhiwu Zheng, Levent E. Aygun, Yoni Mehlman, Sigurd Wagner, Naveen Verma and James C. Sturm Princeton University, Department of Electrical Engineering, Princeton, New Jersey, 08544, USA</p>
P-33	<p>.....143</p> <p>Current Scaling in Single and Multiple Fin Static Induction Transistors with Sub- Micron Fin Width Jaeyi Chun and Srabanti Chowdhury Department of Electrical Engineering, Stanford University, Stanford, CA 94305, United States</p>
P-34	<p>.....145</p> <p>Pulsed characteristics for high current, large area GaN/AlN resonant tunneling diodes T.A. Growden¹, D.F. Storm², E.M. Cornuelle³, L.M Whitaker³, B.P. Downey², W-D. Zhang⁴, J.W. Daulton⁵, R. Molnar⁵, E.R. Brown⁴, P.R. Berger³, and D.J. Meyer² ¹NAS-NRC Postdoctoral Fellow at U.S. Naval Research Laboratory, Washington, DC 20375, USA; ²U.S. Naval Research Laboratory, Code 6852, 4555 Overlook Ave. SW, Washington, DC 20375, USA; ³Ohio State Univ., Dept. of Electrical and Computer Engineering, 2015 Neil Ave., Columbus, OH 43210, USA; ⁴Wright State Univ., Dept. of Physics, 3640 Colonel Glenn Hwy., Dayton, OH 45435, USA; ⁵Lincoln Laboratory, Massachusetts Institute of Technology, 244 Wood St., Lexington, MA 02421, USA</p>

P-35	<p>.....147</p> <p>Characteristics of P-channel GaN MOSFET up to 300 °C Sang-Woo Han¹, Jianan Song¹, and Rongming Chu¹ ¹Department of Electrical Engineering, The Pennsylvania State University, University Park, PA 16802</p>	147
P-36	<p>.....149</p> <p>Reduction of Saturation Voltage in InGaAs-Channel/InGaN-Drain Vertical FETs and the role of traps at the InGaAs/InGaN junction Shalini Lal, Jing Lu, Brian J. Thibeault, Man Hoi Wong, Chris G. Van de Walle, Steven P. DenBaars and Umesh K. Mishra University of California Santa Barbara, Santa Barbara, CA 93106, USA</p>	149
P-37	<p>.....151</p> <p>Comparison of field plated and non-field plated Schottky barrier diodes in HVPE grown β-Ga₂O₃ Shivam Sharma, Ke Zeng, Abhishek Vaidya, and Uttam Singiseti Electrical Engineering Department, University at Buffalo (SUNY), Buffalo, NY, 14260, USA</p>	151
P-38	<p>.....153</p> <p>Surface states in AlGaIn/GaN high electron mobility transistors: Energy profiling using channel photocurrent spectroscopy Yury Turkulets and Ilan Shalish Ben Gurion University, Beer Sheva 8410501, Israel</p>	153
P-39	<p>.....155</p> <p>Diamond Metal-Semiconductor Field Effect Transistor for High Temperature Applications Yuelin Wu¹, Cristian Herrera¹, Aaron Hardy², Matthias Muehle², Tom Zimmermann¹, and Timothy A. Grotjohn^{1,2} ¹Michigan State University, East Lansing, MI, USA; ²Fraunhofer USA Center for Coatings and Diamond Technologies, East Lansing, MI, USA</p>	155
P-40	<p>.....157</p> <p>Student Paper.....157 RF Performance of 130 nm Al_{0.75}Ga_{0.25}N/Al_{0.6}Ga_{0.4}N HFETs with MBE-Regrown Contacts Hao Xue¹, Choong Hee Lee¹, Kamal Hussian², Towhidur Razzak¹, Mamun Abdullah², Zhanbo Xia¹, Shahadat Hasan Sohel¹, Asif Khan², Siddharth Rajan¹, Wu Lu¹ ¹Department of Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio, 43210, USA; ²College of Engineering and Computing, University of South Carolina, 301 Main Street Columbia, SC 29208</p>	157
P-41	<p>.....159</p> <p>Student Paper.....159 Barrier Height Stability and Reverse Leakage Mechanisms in Ni/Ga₂O₃ (001) Schottky Barrier Diodes Wenshen Li¹, Kazuki Nomoto¹, Zongyang Hu¹, Debdeep Jena^{1,2,3} and Huili Grace Xing^{1,2,3} ¹School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; ²Department of Material Science and Engineering, Cornell University, Ithaca, NY 14853, USA; ³Kavli Institute at Cornell for Nanoscale Science, Cornell University, Ithaca, NY 14853, USA</p>	159

P-42	<p>.....161</p> <p>Vertical GaN Superjunction FinFET: A Novel Device Enabling Multi-Kilovolt and Megahertz Power Switching</p> <p>Ming Xiao¹, Ruizhe Zhang¹, Garrett Schlenvogt², Thomas Jokinen², Han Wang³ and Yuhao Zhang¹</p> <p>¹Virginia Polytechnic Institute and State University, Blacksburg, VA, 24060, USA; ²Silvaco Inc., North Chelmsford, MA, 01863, USA ³University of Southern California, Los Angeles, CA, 90007, USA</p>	161
P-43	<p>Student Paper.....163</p> <p>Tunable WSe₂ phototransistor enabled by electrostatically doped lateral p-n homojunction</p> <p>Sayantan Ghosh¹, Sushovan Dhara^{2,3,4}, Abin Varghese^{1,4}, Kartikey Thakar¹, Saurabh Lodha¹</p> <p>¹Department of Electrical Engineering, ²Department of MEMS, ³Department of Physics IIT Bombay, Mumbai, 400076, India</p>	163
P-44	<p>Student Paper.....165</p> <p>Defect characterization of InAs/InGaAs quantum dot photodetector grown on GaAs-on-V-grooved-Si substrate</p> <p>Jian Huang¹, Yating Wan², Daehwan Jung^{2,3}, Justin Norman⁴, Chen Shang⁴, Qiang Li⁵, Kei May Lau⁵, Arthur C. Gossard^{2,4}, John E. Bowers^{2,4}, and Baile Chen¹</p> <p>¹Optoelectronic Device Laboratory, School of Information Science and Technology, ShanghaiTech University, Shanghai 201210, China; ²Institute for Energy Efficiency, University of California Santa Barbara, Santa Barbara, California 93106, USA; ³Center for Opto-Electronics Materials and Devices, Korea Institute of Science and Technology, Seoul, 02792, South Korea; ⁴Materials Department, University of California Santa Barbara, Santa Barbara, California 93106, USA; ⁵Department of Electronic and Computer Engineering, Hong Kong University of Science & Technology, Clear Water Bay, Hong Kong</p>	165
P-45	<p>Student Paper.....167</p> <p>Waveguide Uni-Traveling-Carrier Photodiodes for mmW Signal Generation: Space-Charge Impedance and Efficiency Limitations</p> <p>Brandon Isaac¹, Yuan Liu², Sergio Pinna², Larry Coldren^{1,2} and Jonathan Klamkin²</p> <p>¹Materials Department, University of California, Santa Barbara, California 93106, USA; ²Electrical and Computer Engineering Department, University of California, Santa Barbara, California 93106, USA</p>	167
P-46	<p>.....169</p> <p>Flexible organic light-emitting diodes with efficiency improvement by dielectric-metal-dielectric anode</p> <p>Changyeong Jeong, Yongbum Park, and L. Jay Guo</p> <p>Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI 48109, USA</p>	169
P-47	<p>Student Paper.....171</p> <p>Efficient InGaN p-Contacts for deep-UV Light Emitting Diodes</p> <p>Kevin Lee¹, Shyam Bharadwaj¹, Vladimir Protasenko¹, Huili (Grace) Xing^{1,2} and Debdeep Jena^{1,2}</p> <p>¹School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; ²Department of Material Science and Engineering, Cornell University, Ithaca, NY 14853, USA</p>	171

P-48	<p>.....173</p> <p>Ultrathin Metal Film Transparent Conductor for Efficient Light Coupling in Organic Light Emitting Diode</p> <p>Yong-Bum Park¹, Changyeong Jeong¹, and L. Jay Guo¹</p> <p>¹Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan 48105, USA</p>
P-49	<p>Student Paper.....175</p> <p>High-Responsivity Flexible Photodetectors based on MOVPE-MoS₂</p> <p>Daniel S. Schneider¹, Annika Grundmann², Andreas Bablich³, Vikram Passi¹, Satender Kataria², Holger Kalisch², Michael Heuken^{2,4}, Andrei Vescan², Daniel Neumaier¹ and Max C. Lemme^{1,2}</p> <p>¹Advanced Microelectronic Center Aachen (AMICA), AMO GmbH, 52074 Aachen, Germany; ²RWTH Aachen University, 52074 Aachen, Germany; ³University of Siegen, 57076 Siegen, Germany; ⁴AIXTRON SE, 52134 Herzogenrath, Germany</p>
P-50	<p>Student Paper.....177</p> <p>Photo-amplification in Bipolar WSe₂ Transistors with Electrostatic Gating</p> <p>Kartikey Thakar and Saurabh Lodha</p> <p>Department of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai - 400076. India</p>
P-51	<p>Late News.....179</p> <p>We=100nm InP/InGaAs DHBT with Self-aligned MOCVD Regrown p-GaAs Extrinsic Base Exhibiting 1Ω-μm² Base Contact Resistivity</p> <p>Yihao Fang, Hsin-Ying Tseng, and Mark J.W. Rodwell</p> <p>ECE, University of California Santa Barbara, Santa Barbara, CA, 93106, USA</p>
P-52	<p>Late News.....181</p> <p>Ultrathin HfN Multilayer Gate Insulator Formation with High Dielectric Constant Induced by Interface Polarization</p> <p>Shun-ichiro Ohmi, Yizhe Ding, and Sohya Kudoh</p> <p>Department of Electrical and Electronic Engineering, Tokyo Institute of Technology J2-72, 4259 Nagatsuta, Midori-ku, Yokohama 226-8502, Japan</p>
P-53	<p>Late News.....183</p> <p>InP MOSFETs Exhibiting Record 70 mV/dec Subthreshold Swing</p> <p>Hsin-Ying Tseng, Yihao Fang, Shibo Zhong and Mark J.W. Rodwell</p> <p>ECE, University of California Santa Barbara, Santa Barbara, CA, 93106, USA</p>
P-54	<p>Late News.....185</p> <p>True Random Number Generator using Superconducting Qubits</p> <p>Abdullah Ash- Saki, Mahabubul Alam, and Swaroop Ghosh</p> <p>Pennsylvania State University, University Park, PA 16802, USA</p>
P-55	<p>Late News.....187</p> <p>Solving the Maximum Independent Set Problem using Coupled Relaxation Oscillators</p> <p>Mohammad Khairul Bashar, Richard Hrdy, Antik Mallick, Farzad Farnoud (Hassanzadeh), and Nikhil Shukla</p> <p>University of Virginia, Charlottesville, Virginia 22904, USA</p>

P-56	Late News.....189 Ultra-high responsivity and photovoltaic effect based on vertical transport in multi-layer α-In₂Se₃ Roop K. Mech, Neha Mohta, Rangarajan Muralidharan and Digbijoy N. Nath Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bengaluru, Karnataka
-------------	--

Session V PLENARY

8:40 AM	V_-1 Plenary Paper.....N/A Electronic Technologies for Enabling Artificial Intelligence at the Edge Adrian Mihai Ionescu EPFL, Switzerland
----------------	---

Session VI-A MEMORY/NEUROMORPHIC I

10:00 AM	VI_A.-1 Student Paper.....193 Ferroelectric Tunneling Junctions for Neurosynaptic Computing Hoonan Ryu ¹ , Haonan Wu ¹ , Fubo Rao ¹ , and Wenjuan Zhu ¹ ¹ University of Illinois at Urbana-Champaign, 208 North Wright Street, Urbana, IL 61801, USA
10:20 AM	VI_A.-2 Student Paper.....195 Artificial Neuron using Ag/2D-MoS₂/Au Threshold Switching Memristor Durjoy Dev ¹ , Adithi Krishnaprasad ¹ , Zhezhi He ¹ , Sonali Das ¹ , Mashiyat Sumaiya Shawkat ¹ , Madison Manley ¹ , Olaleye Aina ² , Deliang Fan ¹ , Yeonwoong Jung ¹ and Tania Roy ¹ ¹ University of Central Florida, 4000 Central Florida Blvd, Orlando FL 32826, USA; ² BAE Systems FAST Labs, Columbia, MD 21046, USA
10:40 AM	VI_A.-3 Student Paper.....197 Fundamental Limit on Network Size Scaling of Oscillatory Neural Networks due to PrMnO₃ based Oscillator Phase Noise Vivek Saraswat ¹ , Sandip Lashkare ¹ , Pankaj Kumbhare ¹ and Udayan Ganguly ¹ ¹ Department of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai, India
11:00 AM	VI_A.-4 Invited Paper.....199 Phase-change memory enables energy-efficient brain-inspired computing Manuel Le Gallo ¹ , Abu Sebastian ¹ and Evangelos Eleftheriou ¹ ¹ IBM Research-Zurich, Säumerstrasse 4, 8803 Rüschlikon, Switzerland

Session VI-B QUANTUM DEVICES

10:00 AM	VI_B.-1 Invited Paper.....N/A Si/SiGe Quantum Dot Spin Qubits Mark A. Eriksson ¹ ¹ Wisconsin Institute for Quantum Information and Department of Physics, University of Wisconsin-Madison
-----------------	--

10:40 AM	VI_B.-2 Student Paper.....203 Demonstration of FETs with 3D Dirac Semimetal, Cd3As2 Omor Shoron ¹ , Timo Schumann ¹ , Manik Goyal ¹ , David Kealhofer ² , and Susanne Stemmer ¹ ¹ Materials Department, University of California Santa Barbara; ² Department of Physics, University of California Santa Barbara
11:00 AM	VI_B.-3 Student Paper.....205 A Novel ESD Clamp Based on the VO2 Insulator-Metal Transition Stephanie M. Bohaichuk ¹ , Mario M. Pelella ² , Yifei Sun ³ , Zhen Zhang ³ , Shriram Ramanathan ³ , Eric Pop ¹ ¹ Stanford University, Stanford, CA 94305, USA; ² ON Semiconductor, Santa Clara, CA 95054 USA; ³ Purdue University, West Lafayette, IN 47097 USA
11:20 AM	VI_B.-4.....207 Top-gated atomic precision phosphorous doped silicon single electron transistor with low thermal budget gate dielectric E. M. Anderson, L. Maurer, L. Tracy, S. W. Smith, P. Lu, A. M. Katzenmeyer, A.D. Baczewski, D. M. Campbell, M. T. Marshall, D. R. Ward, T.-M. Lu, and S. Misra Sandia National Laboratories, P.O. Box 5800, Albuquerque, NM 87185, USA
11:40 AM	VI_B.-5 Late News.....209 Field-plated Ga2O3 Trench Schottky Barrier Diodes with a Record High Figure-of-merit of 0.78 GW/cm2 Wenshen Li ¹ , Kazuki Nomoto ¹ , Zongyang Hu ¹ , Debdeep Jena ^{1,2,3} and Huili Grace Xing ^{1,2,3} ¹ School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; ² Department of Material Science and Engineering, Cornell University, Ithaca, NY 14853, USA; ³ Kavli Institute at Cornell for Nanoscale Science, Cornell University, Ithaca, NY 14853, USA

Session VII-A MEMORY/NEUROMORPIC II

1:00 PM	VII_A.-1 Invited Paper.....211 Variants of Ferroelectric Hafnium Oxide based Nonvolatile Memories T. Mikolajick ^{1,2} , H. Mulaosmanovic ¹ , M. Hoffmann ¹ , B.Max ² , T. Mittmann ¹ , U. Schroeder ¹ , and S. Slesazek ¹ ¹ NaMLab gGmbH, Noethnitzer Str. 64, Dresden, D-01187, Germany; ² Chair of Nanoelectronic Materials, TU Dresden, Dresden, D-01069, Germany
1:40 PM	VII_A.-2 Student Paper.....213 Sheet-rich Silk-base RRAM with Low Switching Voltages and Improved Reliabilities Mohammad T. Sharbati ¹ , Se Youn Cho ² , Golnaz Najaf Tomaraei ² , Qingzhou Wan ¹ , Joshua Schlea ¹ , Mostafa Bedewy ² , and Feng Xiong ¹ ¹ Dept. of Electrical and Computer Engineering, ² Dept. of Industrial Engineering, University of Pittsburgh 3700 O'Hara St., Pittsburgh, PA 15261, United States of America
2:00 PM	VII_A.-3 Student Paper.....215 WSe2 based Valley-Coupled-Spintronic Devices for Low Power Non-Volatile Memories S. Thirumala ¹ , T. Hung ^{1,2} , A. Raha ³ , N. Thakuria ¹ , K. Cho ¹ , V. Raghunathan ¹ , Z. Chen ^{1,2} and S. Gupta ¹ ¹ Electrical and Computer Engineering and ² Birck Nanotechnology Center, Purdue Univ.; ³ Intel Corp.

2:20 PM VII_A.-4 Student Paper.....217
Dynamic (BixSb1-x)2Te3 Synaptic Devices with Programmable Spatio-Temporal Responses
 Qingzhou Wan¹, Peng Zhang², Qiming Shao², Mohammad T. Sharbati¹, John R. Erickson¹, Kang L. Wang² and Feng Xiong¹
¹Dept. of ECE, University of Pittsburgh, Pittsburgh, PA 15261, USA; ²Dept. of ECE, University of California, Los Angeles, Los Angeles, CA 90095, USA

2:40 PM VII_A.-5 Invited Paper.....219
In-memory solution of linear systems with crosspoint arrays without iterations
 Z. Sun, G. Pedretti, E. Ambrosi, A. Bricalli, W. Wang and D. Ielmini
 Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Piazza L. da Vinci 32, 20133 Milano, 20133, Italy

Session VII-B WIDE BANDGAP DEVICES II

1:00 PM VII_B.-1 Invited Paper.....221
GaN Integrated Circuits for Power Electronics
 Nick Fichtenbaum
 Navitas Semiconductor, Inc.

1:40 PM VII_B.-2.....223
Self-Aligned Gate Thin-Channel β -Ga2O3 MOSFETs
 Kyle J. Liddy¹, Nolan S. Hendricks², Andrew J. Green², Andreas Popp³, Miles T. Lindquist¹, Kevin D. Leedy², Stephen E. Tetlak², Neil A. Moser², Günter Wagner³, Kelson D. Chabak², Gregg H. Jessen²
¹KBRWyle, Sensors Directorate, 2241 Avionics Circle, WPAFB, Ohio 45433 USA; ²Air Force Research Laboratory, Sensors Directorate, 2241 Avionics Circle, WPAFB, Ohio 45433 USA; ³Leibniz-Institute für Kristallzüchtung, Max-Born-Str.2, D-12489 Berlin, Germany

2:00 PM VII_B.-3.....225
Polarization Recovery Behavior of Hf0.5Zr0.5O2 on Gallium Nitride HEMT Heterostructures
 Chunlei Wu, Nikhita Shaju, Hansheng Ye, Benjamin Grisafe, Suman Datta, and Patrick Fay
 Department of Electrical Engineering, University of Notre Dame, Notre Dame, IN 46556, USA

2:20 PM VII_B.-4 Student Paper.....227
Epitaxial passivation of delta doped β -Ga2O3 field effect transistors
 Chandan Joishi^{1, 2}, Zhanbo Xia¹, Shahadat H. Sohel¹, Saurabh Lodha², Siddharth Rajan^{1,3}
¹Department of Electrical and Computer Engineering, The Ohio State University, Columbus, OH 43210, USA; ²Department of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai 400076, India; ³Department of Materials Science and Engineering, The Ohio State University, Columbus, OH 43210, USA

2:40 PM VII_B.-5 Late News.....229
Enhancement-Mode Current Aperture Vertical Ga2O3 MOSFETs
 Man Hoi Wong¹, Hisashi Murakami², Yoshinao Kumagai² and Masataka Higashiwaki¹
¹National Institute of Information and Communications Technology, Koganei, Tokyo 184-8795, Japan; ²Department of Applied Chemistry, Tokyo University of Agriculture and Technology, Koganei, Tokyo 184-8588, Japan

Session VIII-A 2D AND FLEXIBLE DEVICES II

- 3:40 PM VIII_A.-1 Student Paper.....231**
New Observations in Contact Scaling for 2D FETs
Zhihui Cheng¹, Hattan Abuzaid¹, Yifei Yu², Shreya Singh¹, Linyou Cao², Aaron D. Franklin^{1,3}
¹Duke University, Department of Electrical & Computer Engineering, Durham, NC 27708, USA; ²Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC, 27695, USA; ³Duke University, Department of Chemistry, Durham, NC 27708, USA
- 4:00 PM VIII_A.-2.....233**
Flexible Top-Gated Monolayer MoS₂ Transistors with High Mobility
Alwin Daus, Sam Vaziri, Kevin Brenner, Ryan W. Grady, Alvin U. Tang and Eric Pop
Electrical Engineering, Stanford University, Stanford, CA 94305, USA
- 4:20 PM VIII_A.-3 Student Paper.....235**
Atomic Layer Etching (ALE) of WSe₂ Yielding High Mobility p-FETs
Ankur Nipane¹, Punnu Jose Sebastian¹, Younghun Jung¹, Min Sup Choi^{1,2}, Abhinandan Borah¹, Won Jong Yoo², James Hone¹, and James T. Teherani¹
¹Columbia University, New York, NY 10027, United States; ²Sungkyunkwan University, Suwon, Gyeonggi-do 16419, Republic of Korea
- 4:40 PM VIII_A.-4 Invited Paper.....237**
Efficient Optoelectronics with 2D Materials
Max C. Lemme^{1,2}
¹Advanced Microelectronic Center Aachen (AMICA), AMO GmbH, 52074 Aachen, Germany; ²RWTH Aachen University, Chair of Electronic Devices, 52074 Aachen, Germany

Session VIII-B WIDE BANDGAP DEVICES III

- 3:40 PM VIII_B.-1 Invited Paper.....239**
Process Technologies for GaN High Voltage Devices
Tetsu Kachi¹, Tetsuo Narita², Hideki Sakurai^{1,3} and Jun Suda¹
¹Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8601, Japan; ²Toyota Central R&D Labs., Inc., Nagakute, Aichi 480-1191, Japan; ³ULVAC Inc., Chigasaki, Kanagawa 253-8543, Japan
- 4:20 PM VIII_B.-2 Student Paper.....241**
Impact of Gate Oxide Thickness on Electrical Characteristics of 1200 V 4H-SiC Planar-Gate Power MOSFETs
Aditi Agarwal, Kijeong Han and B. Jayant Baliga
North Carolina State University, MRC Building, 2410 Campus Shore Dr, Raleigh, NC 27606, USA
- 4:40 PM VIII_B.-3 Student Paper.....243**
Metal/BaTiO₃/β-Ga₂O₃ Dielectric Heterojunction Diode with 5.6 MV/cm Breakdown Field
Zhanbo Xia¹, Caiyu Wang¹, Hareesh Chandrasekar¹, Wyatt Moore¹, Aidan Lee², Nidhin Kurian Kalarickal¹, Fengyuan Yang², Siddharth Rajan^{1,3}
¹Department of Electrical and Computer Engineering, The Ohio State University, USA; ²Department of Physics, The Ohio State University, USA; ³Department of Materials Science and Engineering, The Ohio State University, USA

5:00 PM VIII_B.-4 Late News.....245
Buried tunnel junction for p-down nitride laser diodes
 Henryk Turski¹, Marcin Siekacz¹, Grzegorz Muziol¹, Mikolaj Zak¹, Shyam Bharadwaj^{1,2},
 Mikolaj Chlipala¹, Krzesimir Nowakowski-Szkudlarek¹, Mateusz Hajdel¹, Huili Grace
 Xing², Debdeep Jena² and Czeslaw Skierbiszewski¹
¹Institute of High Pressure Physics, Polish Academy of Sciences, Sokolowska 29/37, 01-
 142 Warsaw, Poland; ²Cornell University, Ithaca, NY 14853, USA

RUMP SESSIONS

8:30 PM R.1
What will be the Ultimate Applications of 2D Materials?.....N/A
 Session Moderators:

8:30 PM R.2
Quantum Computation: What Device Platform will Reign Supreme?.....N/A
 Session Moderators:

Session IX EMC/DRC PLENARY SESSION

8:30 AM IX_-1 Plenary Paper.....N/A
Programmable Quantum Materials
 Dmitri N. Basov, Columbia University

Session X STEEP THRESHOLD/LOGIC II

10:10 AM X_-1 Student Paper.....251
**Significance of Multi and Few Domain Ferroelectric Switching Dynamics for Steep-
 Slope Non-Hysteretic Ferroelectric Field Effect Transistor**
 J. Gomez¹, S. Dutta¹, K. Ni¹, B. Grisafe¹, J. Smith¹, A. Khan² and S. Datta¹
¹University of Notre Dame, Notre Dame, IN 46545, USA

10:30 AM X_-2 Student Paper.....253
**3D-stacked Strained SiGe/Ge Gate-All-Around (GAA) Structure Fabricated by 3D
 Ge Condensation**
 Junkyo Suh¹, Andrew C. Meng², Marc Jaikissoon¹, Michael Braun², Taeho R. Kim², Ann
 F. Marshall², Anahita Pakzad³, Paul C. McIntyre² and Krishna C. Saraswat^{1,2}
¹Electrical Engineering Dept., Stanford University, Stanford, CA 94305, USA; ²Material
 Science & Engineering Dept., Stanford University, Stanford, CA 94305, USA; ³Gatan Inc.,
 Pleasanton, CA 94588, USA.

10:50 AM X_-3.....255
**High Performance and Yield for Super Steep Retrograde Wells (SSRW) by Well
 Implant / Si-based Epitaxy on Advanced Technology FinFETs**
 U. Rana, D. P. Brunco, S. Raman, D.H. Triyoso, M.W. Stoker, J. B. Johnson, L.
 Pantisano, K. D. Seo, M., Zhao, A. Reznicek, R. Krishnan, B. Moser, J. Freeman, L.
 Jang, E. Kaganer,
 GLOBALFOUNDRIES, 400 Stone Break Rd Ext, Malta, NY 12110, USA.

11:10 AM	X_-4 Student Paper257 Experimental calibration of the temperature dependence of the heterojunction bandgap in III-V tunneling devices J. Bizindavyi ^{1,2} , A. S. Verhulst ² , Q. Smets ² , B. Sorée ^{1,2,3} , and G. Groeseneken ^{1,2} ¹ Department of Electrical Engineering, KU Leuven, Kasteelpark Arenberg 10, 3001 Leuven, Belgium; ² imec, Kapeldreef 75, 3001 Leuven, Belgium; ³ Department of Physics, Universiteit Antwerpen, Groenenborgerlaan 171, 2020 Antwerpen, Belgium
	Author Index259

61st ELECTRONIC MATERIALS CONFERENCE WEDNESDAY PM SESSIONS

SESSION H: Chalcogenide Quantum Materials

1:30 PM	H01 Invited Paper Observation of Valley Coupled Topological Current in 2D TMDs Terry Y.T. Hung, Kerem Y. Camsari, Shengjiao Zhang, Pramey Upadhyaya and <u>Zhihong Chen</u> ; School of Electrical and Computer Engineering and Birck Nanotechnology Center , Purdue University, Lafayette, Indiana, United States
2:10 PM	H02 (Student) Probing Topological Surface States in Bi₂Te₃–Bi₂Se₃ and Bi₂Te₃–Sb₂Te₃ Alloy Films <u>Gregory Cunningham</u> ¹ , Christian Greenhill ² , Rachel S. Goldman ³ , Theresa P. Ginley ⁴ and Stephanie Law ⁵ ; ¹ Electrical Engineering, University of Michigan–Ann Arbor, Southfield, Michigan, United States; ² Materials Science & Engineering , University of Michigan, Ann Arbor, Michigan, United States; ³ Department of Materials Science and Engineering, University of Michigan, Ann Arbor, Michigan, United States; ⁴ Material Science and Engineering , University of Delaware, Newark, Delaware, United States; ⁵ University of Delaware, Newark, Delaware, United States
2:30 PM	H03 Effect of Spin-Orbit Coupling and Magnetic Strength on Weyl Semimetallic and Chern Insulating Phase of Magnetic Bi₂MnX₄ (X= Se, Te) <u>Sugata Chowdhury</u> ; MML, NIST, Gaithersburg, Maryland, United States
2:50 PM	H04 Epitaxial Growth and Characterization of Chromium Selenide Thin Films on c-Al₂O₃(0001) <u>Anupam Roy</u> , Tanmoy Pramanik, Rik Dey, Amritesh Rai and Sanjay Banerjee; Microelectronics Research Center, The University of Texas at Austin, Austin, Texas, United States
3:10 PM	REFRESHMENT BREAK
3:30 PM	H05 Invited Paper Rotationally Controlled van der Waals Heterostructures—Electron Physics and Device Applications G W. Burg, Kyoungwan Kim, Hema C. Movva and <u>Emanuel Tutuc</u> ; Department of Electrical and Computer Engineering, The University of Texas at Austin, Austin, Texas, United States
4:10 PM	H06 Moiré Excitons in WS₂/WSe₂ Heterostructures <u>Feng Wang</u> ^{1,2} , Chenhao Jin ¹ , Emma Regan ¹ and Danqing Wang ¹ ; ¹ Physics, UC Berkeley, Berkeley, California, United States;