

Dr. MVS Chandrashekar

Associate Professor, Electrical Engineering, citations>5000 h-index: 27
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A. EDUCATION

College/University

Worcester Polytechnic Institute, MA	Electrical Engineering	B.S. 2001
Cornell University, NY	Electrical Engineering	Ph.D. 2007

B. ACADEMIC/PROFESSIONAL APPOINTMENTS

Aug 2015- present	Associate Professor, Electrical Engineering, U. of South Carolina
Jan 2018-Dec 2018	Visiting Professor, ECE, Morgan State University
Jul 2009- Jul 2015	Assistant Professor, Electrical Engineering, U. of South Carolina
Jan 2007-Jun 2009	Postdoctoral Associate, ECE, Cornell University

C. RESEARCH GRANTS

Project	Role	Source	Dates
Pilot: Development of open-source tools for measurement of heart rate in free-living children (\$40K)	PI	NIH COBRE	2021-2022
Development of Al _x Ga _{1-x} N Multiple Quantum Well UVC Laser Structures over Pulsed Lateral Epitaxially Overgrown Low-defect density AlN templates (Khan) (\$100K)	Co-PI	ARO	2021-2022
R21: Validity and Utility of a PATCH to Monitor Free-living Energy Expenditure in Children 3 to 8 Years Old (Armstrong) (\$275K)	Co-PI	NIH	2021-2023
ASPIRE II: Rare-earth free high brightness quantum dot inks for III-nitride pumped light emitters (\$100K)	PI	UofSC	2021-2022
DURIP: E-beam Sub-micron Lithography System for Integrated UVC Applications (Khan) (\$180K)	Co-PI	ARO	2019-2020
Phase I STTR: Tooling and Processing for Low Temperature Homogeneous Epitaxy of 4H-SiC Using Novel Precursors (\$70K)	PI (UofSC)	AFOSR	2020-2020
SC Gear: Advancing defect-controlled nonlinear optical properties for nanocarbon-based photonic devices (\$60K)	PI (UofSC)	SC IDEA	2019-2020
Cubic Boron Nitride: A new extreme semiconductor by ion-beam assisted chemical vapor deposition (\$500K)	PI (UofSC)	AFOSR	2019-2022
Doping cubic boron nitride, an extreme material for power electronics and radiation detection (\$1M)	PI (UofSC)	NSF	2018-2022
Bioinspired Matrices to Enhance Cardiac Differentiation and Maturation of Embryoid Bodies (Jabbarzadeh) (\$130K)	Co-PI	NIH	2018-2020
High Efficiency Micro/Nano-pillar UVC Light Emitting Diodes (Khan) (\$580K)	Co-PI	ARO	2017-2020
Next Generation High-Voltage and High Temperature Power Electronics using AlGaN and ALD Insulators Layers (Khan) (\$100K)	Co-PI	UofSC	2017-2018
ASPIRE 1: High responsivity solar blind ultraviolet detectors for civilian and military applications using Ultra Wide Bandgap AlGaN materials (\$15K)	PI	VPR	2017-2018

Minority Carriers in Graphene/SiC Schottky Emitter Bipolar Phototransistors for High Gain Visible Blind UV Detection (\$370K)	PI	NSF	2017-2021
ASPIRE III: Ferroelectric Characterization of Materials for Energy Storage, Radiation Detection, and Power Electronics (Ploehn) (\$100K)	Co-PI	UofSC	2013-2014
Defect Engineered Subthreshold Graphene Gate SiC MESFET for Emissions Sensing (\$368K)	PI	NSF	2013-2016
High Hydrogen content Graphene Hydride Compounds & High Cross-Section Cladding Coatings for Fast Neutron Detection (\$430K)	PI	DOE NEUP	2012-2016
Epitaxial Graphane for Energy-Efficient Smartgrid Nanoscale Electronics and Hydrogen Storage (\$38K)	PI	SCEEE	2010-2011
Microelectromechanical uncooled infrared sensor using epitaxial graphene (Koley) (\$360K)	Co-PI	NSF	2010-2013
Development of High Quality 4H-SiC Thick Epitaxy for Reliable High Power Electronics Using Chlorinated Precursors (Sudarshan) (\$600K)	Co-PI	ONR	2010-2014

D. PEER REVIEWED JOURNAL PUBLICATIONS (86 TOTAL)

Graduate students/advises in italics

1. *Jahangir, Ifat, M. Ahsan Uddin, Amol K. Singh, M. V. S. Chandrashekhar, and Goutam Koley.* "Graphene/MoS₂ Thin Film based Two Dimensional Barristors with Tunable Schottky Barrier for Sensing Applications." *IEEE Sensors Journal* (2021), DOI: 10.1109/JSEN.2021.3120792
2. *Alam, Md Didarul, Mikhail Gaevski, Mohi Uddin Jewel, Shahab Mollah, Abdullah Mamun, Kamal Hussain, Richard Floyd, Grigory Simin, M. V. S. Chandrashekhar, and Asif Khan.* "Excimer laser liftoff of AlGaIn/GaN HEMTs on thick AlN heat spreaders." *Applied Physics Letters* 119, no. 13 (2021): 132106
3. *Zare, Arezoo, Mo-Rigen He, Michael Straker (MS from MSU Sabbatical), M. V. S. Chandrashekhar, Michael Spencer, Kevin J. Hemker, James W. McCauley, and K. T. Ramesh.* "Mechanical characterization of boron carbide single crystals." *Journal of the American Ceramic Society* (2021), <https://doi.org/10.1111/jace.18065>
4. *Ahmed, Fiaz, Mathew L. Kelley, M. V. S. Chandrashekhar, and Andrew B. Greytak.* "Improved Charge Transport in PbS Quantum Dot Thin Films following Gel Permeation Chromatography Purification." *The Journal of Physical Chemistry C* 125, no. 32 (2021): 17796-17805
5. *Floyd, Richard, Mikhail Gaevski, Kamal Hussain, Abdullah Mamun, M. V. S. Chandrashekhar, Grigory Simin, and Asif Khan.* "Enhanced light extraction efficiency of micropixel geometry AlGaIn DUV light-emitting diodes." *Applied Physics Express* 14, no. 8 (2021): 084002
6. *Kelley, Mathew L., Grigory Simin, Kamal Hussain, Asif Khan, Andrew B. Greytak, and M. V. S. Chandrashekhar.* "Spatially resolved Fourier transform impedance spectroscopy: A technique to rapidly characterize interfaces, applied to a QD/SiC heterojunction." *Applied Physics Letters* 118, no. 22 (2021): 223102
7. *Kelley, Mathew L., Fiaz Ahmed, Sakiru L. Abiodun, Mohammad Usman, Mohi Uddin Jewel, Kamal Hussain, Hans-Conrad zur Loye, M. V. S. Chandrashekhar, and Andrew B. Greytak.* "Photoconductive Thin Films Composed of Environmentally Benign AgBiS₂ Nanocrystal Inks Obtained through a Rapid Phase Transfer Process." *ACS Applied Electronic Materials* 3, no. 4 (2021): 1550-1555
8. *Armstrong, Bridget, M. V. S. Chandrashekhar, R. Glenn Weaver, Benjamin Stone, and Gregory Porceng.* "A TRANSDUCER AGNOSTIC METHOD FOR FREQUENCY DOMAIN DETECTION OF HEART RATES FOR LONG-TERM HEALTH MONITORING." In *ANNALS OF BEHAVIORAL*

MEDICINE, vol. 55, pp. S23-S23. JOURNALS DEPT, 2001 EVANS RD, CARY, NC 27513 USA: OXFORD UNIV PRESS INC, 2021

9. Mollah, Shahab, Kamal Hussain, *Abdullah Mamun*, Mikhail Gaevski, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "High-current recessed gate enhancement-mode ultrawide bandgap Al_xGa_{1-x}N channel MOSHFET with drain current 0.48 A mm⁻¹ and threshold voltage+ 3.6 V." *Applied Physics Express* 14, no. 1 (2021): 014003
10. Lyle, Luke AM, Serdal Okur, *Venkata SN Chava*, *Mathew L. Kelley*, Robert F. Davis, Gary S. Tompa, **M. V. S. Chandrashekhhar**, Andrew B. Greytak, and Lisa M. Porter. "Characterization of Epitaxial β-(Al, Ga, In) 2 O 3-Based Films and Applications as UV Photodetectors." *Journal of Electronic Materials* (2020): 1-9.

2021 FUNCTIONAL MATERIALS DIVISION *Journal of Electronic Materials* BEST PAPER AWARD

11. Mollah, Shahab, Kamal Hussain, *Richard Floyd*, *Abdullah Mamun*, Mikhail Gaevski, **M. V. S. Chandrashekhhar**, Iftikhar Ahmad et al. "High-Temperature Operation of Al_xGa_{1-x}N (x > 0.4) Channel Metal Oxide Semiconductor Heterostructure Field Effect Transistors with High-k Atomic Layer Deposited Gate Oxides." *physica status solidi (a)* (2020): 1900802.
12. *Floyd, Richard*, Mikhail Gaevski, *Md Didarul Alam*, *Samia Islam*, Kamal Hussain, *Abdullah Mamun*, Shahab Mollah, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "An opto-thermal study of high brightness 280 nm emission AlGa_N micropixel light-emitting diode arrays." *Applied Physics Express* 14, no. 1 (2020): 014002.
13. Mollah, Shahab, Mikhail Gaevski, Kamal Hussain, *Abdullah Mamun*, **M. V. S. Chandrashekhhar**, Grigory Simin, and Asif Khan. "Temperature characteristics of high-current UWBG enhancement and depletion mode AlGa_N-channel MOSHFETs." *Applied Physics Letters* 117, no. 23 (2020): 232105
14. Gaevski, Mikhail, Shahab Mollah, Kamal Hussain, *Joshua Letton*, *Abdullah Mamun*, *Mohi Uddin Jewel*, **M. V. S. Chandrashekhhar**, Grigory Simin, and Asif Khan. "Ultrawide bandgap Al_xGa_{1-x}N channel heterostructure field transistors with drain currents exceeding 1.3 A mm⁻¹." *Applied Physics Express* 13, no. 9 (2020): 094002
15. *Straker, Michael (MS from MSU Sabbatical)*, Ankur Chauhan, Mekhola Sinha, W. Adam Phelan, **M. V. S. Chandrashekhhar**, Kevin J. Hemker, Christopher Marvel, and Michael Spencer. "Growth of high purity zone-refined Boron Carbide single crystals by Laser Diode Floating Zone method." *Journal of Crystal Growth* 543 (2020): 125700.
16. *Floyd, Richard*, Kamal Hussain, *Abdullah Mamun*, Mikhail Gaevski, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "Photonics integrated circuits using Al_xGa_{1-x}N based UVC light-emitting diodes, photodetectors and waveguides." *Applied Physics Express* 13, no. 2 (2020): 022003.
17. *Ejebavwo, Otega A (Outside Committee Member)*, Anna A. Berseneva, Corey R. Martin, Gabrielle A. Leith, Shubham Pandey, Amy J. Brandt, Kyoung Chul Park, Abhijai Mathur, Sharfa Farzandh, Vladislav V. Klepov, Brittany J. Heiser, **Mvs Chandrashekhhar**, Stavros G. Karakalos, Mark D. Smith, Simon R. Phillpot, Sophya Garashchuk, Donna A. Chen and Natalia B. Shustova. "Heterometallic multinuclear nodes directing MOF electronic behavior." *Chemical Science* 11, no. 28 (2020): 7379-7389.
18. *Floyd, Richard*, Kamal Hussain, *Abdullah Mamun*, Mikhail Gaevski, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "An Initial Study of UVC Optical Losses for Monolithically Integrated AlGa_N Heterojunction Optoelectronic Devices." *physica status solidi (a)*, <https://doi.org/10.1002/pssa.201900801>
19. *Jewel, Mohi Uddin*, *Md Didarul Alam*, Shahab Mollah, Kamal Hussain, Virginia Wheeler, Charles Eddy, Mikhail Gaevski, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "Trap

characterization in ultra-wide bandgap $\text{Al}_{0.65}\text{Ga}_{0.4}\text{N}/\text{Al}_{0.4}\text{Ga}_{0.6}\text{N}$ MOSHFET's with ZrO_2 gate dielectric using optical response and cathodoluminescence." *Applied Physics Letters* 115, no. 21 (2019): 213502.

20. Mollah, Shahab, Mikhail Gaevski, **M. V. S. Chandrashekhhar**, Xuhong Hu, Virginia Wheeler, Kamal Hussain, *Abdullah Mamun* et al. "Ultra-wide bandgap AlGa_N metal oxide semiconductor heterostructure field effect transistors with high-k ALD ZrO₂ dielectric." *Semiconductor Science and Technology* 34, no. 12 (2019): 125001.
21. Mollah, Shahab, Mikhail Gaevski, Kamal Hussain, *Abdullah Mamun*, *Richard Floyd*, Xuhong Hu, **M. V. S. Chandrashekhhar**, Grigory Simin, and Asif Khan. "Current collapse in high-Al channel AlGa_N HFETs." *Applied Physics Express* 12, no. 7 (2019): 074001.
22. *Kelley, Mathew, Joshua A. Letton*, Grigory Simin, *Fiaz Ahmed*, Cole A. Love-Baker, Andrew B. Greytak, and **MVS Chandrashekhhar**. "Photovoltaic and photoconductive action due to PbS quantum dots on graphene/SiC Schottky diodes from NIR to UV." *ACS Applied Electronic Materials* (2019).
23. *Chava, Venkata SN*, Bobby G. Barker Jr, *Anusha Balachandran*, Asif Khan, G. Simin, Andrew B. Greytak, and **M. V. S. Chandrashekhhar**. "High detectivity visible-blind SiF₄ grown epitaxial graphene/SiC Schottky contact bipolar phototransistor." *Applied Physics Letters* 111, no. 24 (2017): 243504.
24. Barker Jr, Bobby G., *Venkata Surya N. Chava*, *Kevin M. Daniels*, **M. V. S. Chandrashekhhar**, and Andrew B. Greytak. "Sub-bandgap response of graphene/SiC Schottky emitter bipolar phototransistor examined by scanning photocurrent microscopy." *2D Materials* 5, no. 1 (2017): 011003.
25. *Jahangir, Ifat*, M. Ahsan Uddin, Amol K. Singh, Goutam Koley, and **M. V. S. Chandrashekhhar**. "Richardson constant and electrostatics in transfer-free CVD grown few-layer MoS₂/graphene barristor with Schottky barrier modulation > 0.6 eV." *Applied Physics Letters* 111, no. 14 (2017): 142101.
26. Muhtadi, Sakib, Seong Mo Hwang, Antwon Coleman, Fatima Asif, Grigory Simin, **M. V. S. Chandrashekhhar**, and Asif Khan. "High electron mobility transistors with Al_{0.65}Ga_{0.35}N channel layers on thick AlN/sapphire templates." *IEEE Electron Device Letters* 38, no. 7 (2017): 914-917.
27. Muhtadi, Sakib, S. Hwang, Antwon Coleman, Fatima Asif, A. Lunev, **M. V. S. Chandrashekhhar**, and Asif Khan. "High temperature operation of n-AlGa_N channel metal semiconductor field effect transistors on low-defect AlN templates." *Applied Physics Letters* 110, no. 19 (2017): 193501.
28. *Jahangir, Ifat*, Goutam Koley, and **M. V. S. Chandrashekhhar**. "Back gated FETs fabricated by large-area, transfer-free growth of a few layer MoS₂ with high electron mobility." *Applied Physics Letters* 110, no. 18 (2017): 182108.
29. Muhtadi, Sakib, S. Hwang, Antwon Coleman, Fatima Asif, A. Lunev, **M. V. S. Chandrashekhhar**, and Asif Khan. "Selective area deposited n-Al_{0.5}Ga_{0.5}N channel field effect transistors with high solar-blind ultraviolet photo-responsivity." *Applied Physics Letters* 110, no. 17 (2017): 171104.
30. *Balachandran, Anusha*, T. S. Sudarshan, and **M. V. S. Chandrashekhhar**. "Basal plane dislocation free recombination layers on low-doped buffer layer for power devices." *Crystal Growth & Design* 17, no. 4 (2017): 1550-1557.
31. Dolgoplova, E.A., Brandt, A.J., Ejegbavwo, O.A., Duke, A.S., Maddumapatabandi, T.D., Galhenage, R.P., Larson, B.W., Reid, O.G., Ammal, S.C., Heyden, A. and **Chandrashekhhar, M.**, 2017. Electronic properties of bimetallic metal-organic frameworks (MOFs): Tailoring the density of electronic states through MOF modularity. *Journal of the American Chemical Society*, 139(14), pp.5201-5209.
32. *Daniels, Kevin M.*, A. Obe, *B. K. Daas*, J. Weidner, C. Williams, T. S. Sudarshan, and *M. V. S. Chandrashekhhar*. "Metal Catalyzed Electrochemical Synthesis of Hydrocarbons from Epitaxial Graphene." *Journal of The Electrochemical Society* 163, no. 5 (2016): E130.

33. Chava, Venkata SN, Sabih U. Omar, Gabriel Brown, Shamaita S. Shetu, J. Andrews, T. S. Sudarshan, and M. V. S. Chandrashekhhar. "Evidence of minority carrier injection efficiency > 90% in an epitaxial graphene/SiC Schottky emitter bipolar junction phototransistor for ultraviolet detection." *Applied Physics Letters* 108, no. 4 (2016): 043502
34. Muhtadi, Sakib, Seong Mo Hwang, Antwon L. Coleman, Alexander Lunev, Fatima Asif, V. S. N. Chava, **M. V. S. Chandrashekhhar**, and Asif Khan. "High-speed solar-blind UV photodetectors using high-Al content Al_{0.64}Ga_{0.36}N/Al_{0.34}Ga_{0.66}N multiple quantum wells." *Applied Physics Express* 10, no. 1 (2016): 011004
35. Rana, Tawhid, **M. V. S. Chandrashekhhar**, Kevin Daniels, and Tangali Sudarshan. "SiC Homoepitaxy, Etching and Graphene Epitaxial Growth on SiC Substrates Using a Novel Fluorinated Si Precursor Gas (SiF₄)." *Journal of Electronic Materials* 45, no. 4 (2016): 2019-2024
36. Uddin, Md Ahsan, Amol Singh, Kevin Daniels, Thomas Vogt, **M. V. S. Chandrashekhhar**, and Goutam Koley. "Impedance spectroscopic analysis of nanoparticle functionalized graphene/p-Si Schottky diode sensors." *Japanese Journal of Applied Physics* 55, no. 11 (2016): 110312
37. Rana, Tawhid, **M. V. S. Chandrashekhhar**, Kevin Daniels, and Tangali Sudarshan. "Epitaxial growth of graphene on SiC by Si selective etching using SiF₄ in an inert ambient." *Japanese journal of applied physics* 54, no. 3 (2015): 030304
38. Song, Hai Zheng, **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Effect of C/Si ratio and nitrogen doping on 4H-SiC epitaxial growth using dichlorosilane precursor." In *Materials Science Forum*, vol. 821, pp. 129-132. Trans Tech Publications Ltd, 2015
39. Balachandran, Anusha, Hai Zheng Song, Tangali S. Sudarshan, Shamaita S. Shetu, and **M. V. S. Chandrashekhhar**. "Study of SiC epitaxial growth using tetrafluorosilane and dichlorosilane in vertical hotwall CVD furnace." In *Materials Science Forum*, vol. 821, pp. 137-140. Trans Tech Publications Ltd, 2015
40. Daniels, K. M., S. Shetu, J. Staser, J. Weidner, C. Williams, T. S. Sudarshan, and **M. V. S. Chandrashekhhar**. "Mechanism of electrochemical hydrogenation of epitaxial graphene." *Journal of The Electrochemical Society* 162, no. 4 (2015): E37
41. Song, Haizheng, **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Study of Surface Morphology, Impurity Incorporation and Defect Generation during Homoepitaxial Growth of 4H-SiC Using Dichlorosilane." *ECS Journal of Solid State Science and Technology* 4, no. 3 (2014): P71
42. Omar, Sabih Uddin, Tangali S. Sudarshan, Tawhid A. Rana, Haizheng Song, and **M. V. S. Chandrashekhhar**. "Interface trap-induced nonideality in as-deposited Ni/4H-SiC Schottky barrier diode." *IEEE Transactions on Electron Devices* 62, no. 2 (2014): 615-621
43. Omar, Sabih U., Tangali S. Sudarshan, Tawhid A. Rana, Haizheng Song, and **M. V. S. Chandrashekhhar**. "Large barrier, highly uniform and reproducible Ni-Si/4H-SiC forward Schottky diode characteristics: testing the limits of Tung's model." *Journal of Physics D: Applied Physics* 47, no. 29 (2014): 295102
44. Song, Haizheng, **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Study of Surface Morphology, Impurity Incorporation and Defect Generation during Homoepitaxial Growth of 4H-SiC Using Dichlorosilane." *ECS Journal of Solid State Science and Technology* 4, no. 3 (2014): P71
45. Omar, Sabih U., **M. V. S. Chandrashekhhar**, Iftekhar A. Chowdhury, Tawhid A. Rana, and Tangali S. Sudarshan. "Step dynamics in the homoepitaxial growth of 6H-SiC by chemical vapor deposition on 1 offcut substrate using dichlorosilane as Si precursor." *Journal of Applied Physics* 113, no. 18 (2013): 184904
46. Rana, T., **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Vapor phase surface preparation (etching) of 4H-SiC substrates using tetrafluorosilane (SiF₄) in a hydrogen ambient for SiC epitaxy." *Journal of crystal growth* 380 (2013): 61-67

47. Sudarshan, Tangali S., Tawhid Rana, Haizheng Song, and **M. V. S. Chandrashekhhar**. "Trade-Off between Parasitic Deposition and SiC Homoepitaxial Growth Rate Using Halogenated Si-Precursors." *ECS Journal of Solid State Science and Technology* 2, no. 8 (2013): N3079
48. *Shetu, Shamaita S., S. U. Omar, K. M. Daniels, B. Daas, J. Andrews, S. Ma, T. S. Sudarshan, and M. V. S. Chandrashekhhar*. "Si-atom kinetics in defect mediated growth of multilayer epitaxial graphene films on 6H-SiC." *Journal of applied physics* 114, no. 16 (2013): 164903
49. Coletti, Camilla, Steven Forti, Alessandro Principi, Konstantin V. Emtsev, Alexei A. Zakharov, *Kevin M. Daniels, Biplob K. Daas, M. V. S. Chandrashekhhar*, T. Ouisse, D. Chaussende, A. H. MacDonald, M. Polini, and U. Starke. "Revealing the electronic band structure of trilayer graphene on SiC: An angle-resolved photoemission study." *Physical Review B* 88, no. 15 (2013): 155439
(EDITORS CHOICE FEATURED ON HOMEPAGE)
50. *Daniels, Kevin M., Shamaita Shetu, John Staser, John W. Weidner, Christopher Williams, Tangali Sudarshan, and M. V. S. Chandrashekhhar*. "Electrochemical hydrogenation of dimensional carbon." *ECS Transactions* 58, no. 4 (2013): 439
51. Rana, Tawhid, Hai Zheng Song, **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Comparison of 4H silicon carbide epitaxial growths at various growth pressures using dichlorosilane and silane gases." In *Materials Science Forum*, vol. 717, pp. 117-120. Trans Tech Publications Ltd, 2012
52. Rana, Tawhid, Hai Zheng Song, **M. V. S. Chandrashekhhar**, and Tangali S. Sudarshan. "Behavior of particles in the growth reactor and their effect on silicon carbide epitaxial growth." In *Materials Science Forum*, vol. 717, pp. 153-156. Trans Tech Publications Ltd, 2012
53. *Daniels, Kevin M., Biplob K. Daas, Nishtha Srivastava, Christopher Williams, Randall M. Feenstra, Tangali S. Sudarshan, and M. V. S. Chandrashekhhar*. "Evidence of electrochemical graphene functionalization by Raman spectroscopy." In *Materials Science Forum*, vol. 717, pp. 661-664. Trans Tech Publications Ltd, 2012
54. *Daas, Biplob K., W. K. Nomani, Kevin M. Daniels, Tangali S. Sudarshan, Goutam Koley, and M. V. S. Chandrashekhhar*. "Molecular gas adsorption induced carrier transport studies of epitaxial graphene using IR reflection spectroscopy." In *Materials Science Forum*, vol. 717, pp. 665-668. Trans Tech Publications Ltd, 2012
55. *Daas, Biplob K., Kevin M. Daniels, S. Shetu, Tangali S. Sudarshan, and M. V. S. Chandrashekhhar*. "Study of epitaxial graphene on non-polar 6H-SiC faces." In *Materials Science Forum*, vol. 717, pp. 633-636. Trans Tech Publications Ltd, 2012
56. *Daas, B. K., Sabih U. Omar, S. Shetu, Kevin M. Daniels, S. Ma, T. S. Sudarshan, and M. V. S. Chandrashekhhar*. "Comparison of epitaxial graphene growth on polar and nonpolar 6H-SiC faces: on the growth of multilayer films." *Crystal growth & design* 12, no. 7 (2012): 3379-3387
57. **Chandrashekhhar, M. V. S.**, Iftekhar Chowdhury, Pavel Kaminski, Roman Kozlowski, P. B. Klein, and Tangali Sudarshan. "High purity semi-insulating 4H-SiC epitaxial layers by defect-competition epitaxy: controlling Si vacancies." *Applied Physics Express* 5, no. 2 (2012): 025502
58. *Daniels, Kevin M., B. K. Daas, N. Srivastava, C. Williams, R. M. Feenstra, T. S. Sudarshan, and M. V. S. Chandrashekhhar*. "Evidences of electrochemical graphene functionalization and substrate dependence by Raman and scanning tunneling spectroscopies." *Journal of Applied Physics* 111, no. 11 (2012): 114306
- (THIS PAPER WAS ONE OF THE FEATURED HIGHLIGHTS ON J. APPL. PHYS. HOMEPAGE FOR 3 MOS. IN 2012. Top 20 downloaded articles on JAP Jul. and Aug. 2012).
59. *Daas, B. K., M. M. Islam, Iftekhar A. Chowdhury, Feng Zhao, T. S. Sudarshan, and M. V. S. Chandrashekhhar*. "Doping dependence of thermal oxidation on n-type 4H-SiC." *IEEE transactions on electron devices* 58, no. 1 (2010): 115-121

60. Daas, B. K., K. M. Daniels, T. S. Sudarshan, and **M. V. S. Chandrashekhhar**. "Polariton enhanced infrared reflection of epitaxial graphene." *Journal of applied physics* 110, no. 11 (2011): 113114
61. Chowdhury, Iftekhar, **M. V. S. Chandrasekhar**, Paul B. Klein, Joshua D. Caldwell, and Tangali Sudarshan. "High growth rate 4H-SiC epitaxial growth using dichlorosilane in a hot-wall CVD reactor." *Journal of Crystal Growth* 316, no. 1 (2011): 60-66
62. Thomas, Tiju, Xiaomei Guo, Junxia Shi, Lori A. Lepak, **M. V. S. Chandrashekhhar**, Kewen Li, Francis J. DiSalvo, and Michael G. Spencer. "Gallium nitride powders: Mechanism of ammonothermal synthesis, ball-mill assisted rare earth doping and uniform electrophoretic deposition." *Journal of Crystal Growth* 316, no. 1 (2011): 90-96
63. Wang, Haining, Jared H. Strait, Paul A. George, Shriram Shivaraman, Virgil B. Shields, **MVS Chandrashekhhar**, Jeonghyun Hwang et al. "Ultrafast relaxation dynamics of hot optical phonons in graphene." *Applied Physics Letters* 96, no. 8 (2010): 081917
64. Qazi, Muhammad, Mohammad WK Nomani, **M. V. S. Chandrashekhhar**, Virgil B. Shields, Michael G. Spencer, and Goutam Koley. "Molecular adsorption behavior of epitaxial graphene grown on 6H-sic faces." *Applied Physics Express* 3, no. 7 (2010): 075101
65. Thomas, Tiju, Xiaomei Guo, **M. V. S. Chandrashekhhar**, Carl B. Poitras, William Shaff, Mark Dreibelbis, Jesse Reiherzer et al. "Purification and mechanical nanosizing of Eu-doped GaN." *Journal of crystal growth* 311, no. 19 (2009): 4402-4407
66. Qazi, Muhammad, Jie Liu, **M. V. S. Chandrashekhhar**, and Goutam Koley. "Surface electronic property of SiC correlated with NO₂ adsorption." *Journal of Applied Physics* 106, no. 9 (2009): 094901
67. Shivaraman, Shriram, Robert A. Barton, Xun Yu, Jonathan Alden, Lihong Herman, **M. V. S. Chandrashekhhar**, Jiwoong Park et al. "Free-standing epitaxial graphene." *Nano letters* 9, no. 9 (2009): 3100-3105
68. Strait, Jared H., Paul A. George, Jahan Dawlaty, Shriram Shivaraman, **Mvs Chandrashekhhar**, Farhan Rana, and Michael G. Spencer. "Emission of terahertz radiation from SiC." *Applied Physics Letters* 95, no. 5 (2009): 051912
69. Shivaraman, Shriram, **M. V. S. Chandrashekhhar**, John J. Boeckl, and Michael G. Spencer. "Thickness estimation of epitaxial graphene on SiC using attenuation of substrate Raman intensity." *Journal of electronic materials* 38, no. 6 (2009): 725-730
70. Lu, Jie, Chris I. Thomas, **M. V. S. Chandrashekhhar**, and Michael G. Spencer. "Measurement of spontaneous polarization charge in C-face 3 C-SiC/6 H-SiC heterostructure with two-dimensional electron gas by capacitance-voltage method." (2009): 106108
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86. **Chandrashekhar, M. V. S.**, Christopher I. Thomas, Hui Li, Michael G. Spencer, and Amit Lal. "Demonstration of a 4H SiC betavoltaic cell." *Applied Physics Letters* 88, no. 3 (2006): 033506.

E. PATENTS (10 TOTAL ISSUED/PENDING)

1. Kelley, Mathew, Andrew B. Greytak, **M. V. S. Chandrashekhar**, and Joshua Letton. "Photovoltaic Junctions and Methods of Production." U.S. Patent Application 16/857,687, filed December 31, 2020
2. **Chandrashekhar, M. V. S.**, Joshua Letton, Travis Williams, Abdulganiyu Ajilore, and Michael Spencer. "Laser induced graphitization of boron carbide in air." U.S. Patent 10,981,836, issued April 20, 2021
3. Chava, Venkata Surya N., **M. V. S. Chandrashekhar**, and Anusha Balachandran. "Voltage tunable solar blindness in tfs grown eg/sic schottky contact bipolar phototransistors." U.S. Patent Application 16/624,402, filed April 16, 2020
4. Balachandran, Anusha, **M. V. S. Chandrashekhar**, and Tangali S. Sudarshan. "Elimination of Basal Plane Dislocation and Pinning the Conversion Point Below the Epilayer Interface for SiC Power Device Applications." U.S. Patent Application 16/487,287, filed February 20, 2020

5. Jahangir, Ifat, Goutam Koley, and **M. V. S. Chandrashekhar**. "Synthesis and fabrication of transition metal dichalcogenide structures." U.S. Patent 10,777,410, issued September 15, 2020.
6. **Chandrashekhar, M. V. S.**, Tangali S. Sudarshan, Sabih U. Omar, Gabriel Brown, and Shamaita S. Shetu. "Optically switched graphene/4H-SiC junction bipolar transistor." U.S. Patent 9,966,491, issued May 8, 2018
7. Spencer, Michael, and **M. V. S. Chandrashekhar**. "Betavoltaic battery with a shallow junction and a method for making same." U.S. Patent 8,017,412, issued September 13, 2011.
8. Spencer, Michael, **M. V. S. Chandrashekhar**, and Chris Thomas. "Nuclear batteries." U.S. Patent 8,134,216, issued March 13, 2012
9. Spencer, Michael, and **M. V. S. Chandrashekhar**. "High power density betavoltaic battery." U.S. Patent 8,487,392, issued July 16, 2013
10. **Chandrashekhar, M. V. S.**, Christopher Ian Thomas, and Michael G. Spencer. "Betavoltaic cell." U.S. Patent 7,663,288, issued February 16, 2010

F. TEACHING EXPERIENCE (13 DISTINCT COURSES)

ELCT 101: Introduction to Electrical Engineering (3 Credit Hours) 2009-2016

This was a fresh preparation that went through several iterations. The successful model was a practice/community-based re-envisioning of the freshman experience. This success led to a lot of press University-wide and may serve as a format for a summer distance learning offering for freshman engineering. Future iterations by other instructors have used this modular approach.

ELCT222: Signals and Systems (3 Credit Hours) 2011-present

This was a fresh preparation to emphasize frequency response and respond to the needs of upper class courses (e.g. ELCT301 below). I have incorporated the use of in-class lab exercises using the Analog Discovery Kit that enabled seamless transition to online learning during the pandemic without dilution of the practical aspects of the course. Students also build a heart rate monitor, a very tangible application of analog signal processing. For their final projects on computer-based signal processing, they previously wrote a music visualizer, although currently, I am implementing a new project on extraction of heart rate from their measured heart rate signals.

ELCT780: Advanced Semiconductor Physics (3 Credit Hours) 2011-2012

This fresh preparation was created for my graduate students. There was an emphasis on solid-state physics, and led to students from chemistry and physics also taking the course.

ELCT 782: Power Semiconductor Devices (3 Credit Hours) 2012-2012

This fresh preparation was also created by me for my graduate students based on Prof. Baliga's seminal textbook on power semiconductors.

ELCT 301: Electronics Laboratory (3 Credit Hours) 2011-2011

This is an intermediate electronic lab taught based on my colleague Prof. Enrico Santi's course materials.

ELCT402-404: Capstone Senior Design (3 Credit Hours) 2013-2017

This sequence was taught based on an existing model created by my colleague Prof. Roger Dougal. I helped him transition from the 1 semester (402) sequence to the 2 semester (403/4) sequence, which was challenging. In addition to creating new projects each semester and overseeing the teams, I also came up with new teaching materials for the classroom portion of the course.

ELCT221: Circuits (3 Credit Hours) 2013-2013

This was taught by assisting my colleague Prof. Grigory Simin (instructor of record) as a backup professor for labs, exams, and certain lectures.

ENCP499: NSF NEU Funded Course on Nanotechnology (3 Credit Hours) 2012-2012

This course was taught assisting Prof. Navid Saleh (PI). This was an experimental course that served as an introduction to nanoscience. I was engaged with preparation of course materials and a few lectures.

ELCT582: Semiconductor Laboratory (3 Credit Hours) 2015-2015

This was a fresh preparation. Graduate/undergraduate students learned about semiconductor fabrication, and went into the clean room to build silicon p-n diodes from the wafer level up. Being taught over the summer was ideal training for PhD students in the microelectronics group, while undergraduates were able to take advantage of the summer elective.

ELCT371: Electronics (3 Credit Hours) 2019-present

This course was expanded upon by me, with Dr. Moinul Islam's materials. I have changed the emphasis on BJT's to MOSFET's a widely used contemporary technology, particularly in the context of digital logic circuits, as well as class-D amplifiers in electric vehicles. I have also added materials on op-amp design using MOSFET's, current mirrors, active loads, and for Spring 2021, cascode circuits. I have incorporated the use of the Analog Discovery kit to measure and validate small signal models in class.

ELCT763: Semiconductor Device Modeling and Simulation (3 Credit Hours) 2021-present

This course was created by my colleague Prof. Grigory Simin and me to provide our graduate students an overview of computer modeling in solving electrical engineering problems. My portion is on the use of Matlab to model light extraction of LEDs, and its relation to the circuit behavior of the device.

ELCT871: Advances in Semiconductor Devices (3 Credit Hours) 2021-present

This course was co-taught by me colleagues Profs. Grigory Simin, Krishna Mandal and me to provide our graduate students in microelectronics an overview of contemporary advances in semiconductors, with an emphasis on power devices. My portion of the class was on SiC heteropolytype junctions.

G. MAJOR MENTORING EXPERIENCE (out of >20 PhD committees)

Mathew Kelley, PhD Chemistry 2021 (Postdoctoral associate NIST, Gaithersberg, MD)

Dissertation: Colloidal Semiconductor Quantum Dots: Solution Processing and Heterostructure Based Optoelectronics (Co-advised with Prof. Andrew Greytak through NSF IGERT)

Surya Chava, PhD Electrical Engineering 2018 (Postdoctoral associate U. Texas El Paso)

Dissertation: Photodetection using wide bandgap materials

Anusha Balachandran, PhD Electrical Engineering 2017 (Intel, Hillsboro, OR)

Dissertation: Growth and characterization of defects in SiC

Ifat Jahangir, PhD Electrical Engineering 2017 (Intel, Hillsboro, OR)

Dissertation: MoS₂ and graphene based electronic devices

Joey Andrews, BS Electrical Engineering 2016 (Assistant Professor, U. Wisconsin- Madison)

Topic: Epitaxial graphene and SiC for power electronics

Hani Gomez, BS Electrical Engineering 2015 (PhD, 2021 U. California Berkeley)

Topic: Epitaxial Graphene for emissions sensing

Sabih Omar, PhD Electrical Engineering 2014 (Intel, Hillsboro, OR)

Dissertation: On the role of minority carriers and inhomogeneity in Schottky junctions.

Shamaita Shithi, PhD Electrical Engineering 2014 (Intel, Hillsboro, OR)

Dissertation: Defects in Epitaxial Graphene

Kevin Daniels, PhD Electrical Engineering 2014 (Assistant Professor, U. Maryland College Park)

Dissertation: Electrochemistry of Low Dimensional Carbon Defects

Biplob K. Daas, PhD Electrical Engineering 2012 (Intel, Hillsboro, OR)

Dissertation: Plasmonics in Epitaxial Graphene

H. SERVICE AND OUTREACH

Greater Community

Judging at St. Andrews Middle School Science Fair	2010-2011
Unique Perspectives Tour (Invited) at Columbia Museum of Art, Columbia, SC	2013
Teacher science standards content training (with College of Education)	2017
K-12 outreach activities-summer camps	2017-present

Professional Community

NSF panel/ad-hoc reviewer ECCS/EPMD, DMR/EPM, SBIR Program	2009-present
AIP, ECS, ACS, TMS journal reviewer	2009-present
DOE NEUP Proposal reviewer	2012-present
Electronic Materials Conference (EMC) organizing committee SiC/Graphene	2017-present
Conference session chair for EMC, IEEE	2015-present

University Level

Magellan UofSC Undergraduate Research Scholarship Panel	2009-2017
PhD and thesis committees for Chemistry, EE, Physics, depts. (>20)	2009-present
McNair/Carolina UofSC Honors College Scholar Reviewer	2011-present
ASPIRE UofSC Internal Grant Program reviewer	2016-present
SPARC UofSC Graduate fellowship program reviewer	2016-present
Faculty Senate	2016-2018
Scholastic standards and petitions committee	2018-present
NSF Graduate Research Fellowship Program committee	2017-present

College of Engineering and Computing

Liaison for UofSC Connect Graduation with Distinction	2013-2015
Undergraduate recruitment	2017-present
Graduate student recruitment	2018-present
Academic standards and petitions committee	2019-present

Department of Electrical Engineering

Chair-Scholarship Committee	2009-2013
Chair-Outreach and Recruitment	2013-2016
Undergraduate Committee	2014-present
Independent outreach activities	2019-present
Graduate school resource for undergraduates	2019-present

I. RECENT PRESENTATIONS (20 OUT OF >100)

1. *Abdullah Mamun*, Kamal Hussain, *Mohi Uddin Jewel*, Shahab Mollah, Kenny Huynh, Michael Evan Liao, Tingyu Bai, Yee Rui Koh, Zhe Cheng, Md Shafkat Bin Hoque, Luke Yates, John Gaskins, John Tomko, Iftikhar Ahmad, Mikhail Gaevski, **MVS Chandrashekhhar**, Grigory Simin, Mark S Goorsky, Samuel Graham, Patrick Hopkins, Asif Khan, "Thick AlN Templates By MOCVD for the Thermal Management of III-N Electronics" presented at the 2021 ECS Meeting
2. Shahab Mollah, Mikhail Gaevski, Kamal Hussain, *Abdullah Mamun*, **MVS Chandrashekhhar**, Grigory Simin, Asif Khan, "Temperature Effect on Performance of Enhancement Mode Al_{0.4}Ga_{0.6}N-Channel Moshfets with Hybrid Oxide", presented at the 2021 ECS Meeting
3. Shahab Mollah, Mikhail Gaevski, Mohammad K. Hussain, *Abdullah Mamun*, **MVS Chandrashekhhar**, Grigory Simin and Asif Khan, "Study of Temperature Effect on Performance of Ultrawide Bandgap Al_{0.4}Ga_{0.6}N-Channel Depletion and Enhancement Mode MOSHFETs with ZrO₂/Al₂O₃ Gate Insulator", presented at the 2021 Electronic Materials Conference,

4. *Fiaz Ahmed, Mohi Uddin Jewel, Shahab Mollah, Joshua Letton, Abdullah Mamun, Mikhail Gaevski, Grigory Simin, Andrew Greytak, MVS Chandrashekhar* and Asif Khan, "Imaging Photocurrent Distributions from Sub- Bandgap Defects by Polarity Resolved Scanning Photocurrent Microscopy (SPCM) in III-Nitride Devices", presented at the 2021 Electronic Materials Conference
5. *Mathew Kelley, Grigory Simin, Mohammad K. Hussain, Asif Khan, Andrew Greytak and MVS Chandrashekhar*, "Spatially Resolved Fourier Transform Impedance Spectroscopy—A Technique to Rapidly Characterize Composite Interfaces and a Study of Quantum Dot/Epitaxial Graphene/SiC Optoelectronic Devices", presented at the 2021 Electronic Materials Conference
6. *Md Didarul Alam, Mikhail Gaevski, Mohi Uddin Jewel, Shahab Mollah, Abdullah Mamun, Mohammad K. Hussain, MVS Chandrashekhar* and Asif Khan, "Influence of Buffer Layer Thickness and Type on Laser Lift-Off of AlGaIn/GaN HEMTs Epilayers on Sapphire Substrates", presented at the 2021 Electronic Materials Conference
7. *Mohi Uddin Jewel, Shahab Mollah, Mikhail Gaevski, Mohammad K. Hussain, Abdullah Mamun, Grigory Simin, MVS Chandrashekhar* and Asif Khan, "Comparative Study of Slow Current Transients in Al_{0.4}Ga_{0.6}N Channel MOSHFET's with Back Barriers", presented at the 2021 Electronic Materials Conference
8. **MVS Chandrashekhar**, "Incorporating QD paints with UWBG materials for advanced IR detection and solar cells" invited talk at Workshop on Compound Semiconductor Materials and Devices, Palm Springs, CA (2021)
9. **MVS Chandrashekhar**, "Ultra-wide bandgap photodetection concepts", **Invited talk**, 236th Meeting of the Electrochemical Society, Atlanta, GA (2019)
10. **MVS Chandrashekhar**, "Float zone growth of single crystal boron carbide and applications" invited talk at Workshop on Compound Semiconductor Materials and Devices, Jacksonville, FL (2019)
11. *Fiaz Ahmed, Adam Roberge, Joshua Letton, Mathew Kelley, Cole A. Love-Baker, MVS Chandrashekhar* and Andrew B. Greytak, 'Influence of Purification Methods on Optoelectronic Properties of PbS-QD Films' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
12. *Joshua Letton, Mathew Kelley, Fiaz Ahmed, Andrew B. Greytak and MVS Chandrashekhar*, 'Influence of PbS Quantum Dot Sensitization on Action Spectrum of Graphene/SiC Schottky Diodes' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
13. **MVS Chandrashekhar**, *Michael Straker (MS from MSU Sabbatical)*, Abdulganiyu Ajilore, William A. Phelan and Michael Spencer, 'Electrical Characterization of Single Crystal Boron Carbide Metal Semiconductor Diodes' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
14. Shahab Mollah, *Richard Floyd*, Kamal Hussain, Mikhail E. Gaevski, Iftikhar Ahmad, **MVS Chandrashekhar**, G Simin, Virginia Wheeler, Charles Eddy and Asif Khan, 'AlGaIn MOSHFETs with High-k ALD Oxides—Towards Enhancement Mode Ultra-Wide Bandgap Devices' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
15. *Richard Floyd, Fatima Asif, Mikhail E. Gaevski, G Simin, MVS Chandrashekhar* and Asif Khan, 'Study of Optical Waveguiding Using DUV AlGaIn Integrated Optical Devices' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
16. Luke A. Lyle , Serdal Okur , *Joshua Letton, Venkata S.N. Chava*, Robert F. Davis, Gary Tompa, **MVS Chandrashekhar** and Lisa Porter, 'UV Photodetectors Based on (Al,Ga,In)₂ O₃ -Alloy Films' presented at the 61st Electronic Materials Conference, Ann Arbor, MI (2019)
17. *Mohi Uddin Jewel, Md Didarul Alam, Shahab Mollah, Richard Floyd, Kamal Hussain, Mikhail Gaevski, Iftikhar Ahmad, Grigory Simin, Asif Khan and MVS Chandrashekhar*, 'Solar Blind High-

k ZrO₂Gate AlGaN MOSHFET Photodetector', presented at the 13th International Conference on Nitride Semiconductors, Seattle WA (2019)

18. *Richard Floyd*, Fatima Asif, Mikhail Gaevski, Grigory Simin, **MVS Chandrashekar** and Asif Khan, 'Optical Waveguiding in MEMOCVD-Grown AlGaN for DUV Integrated Optoelectronic Devices', presented at the 13th International Conference on Nitride Semiconductors, Seattle WA (2019)
19. Mikhail Gaevski, Shahab Mollah, Kamal Hussain, *Richard Floyd*, Md Abdullah-Al Mamun, **MVS Chandrashekar**, Iftikhar Ahmad, Grigory Simin, Virginia Wheeler, Charles R. Eddy Jr. and Asif Khan, 'Dynamic Performance of AlGaN MOSHFETs with High-k ALD Oxides', presented at the 13th International Conference on Nitride Semiconductors, Seattle WA (2019)
20. Kamal Hussain, *Richard Floyd*, *Md Abdullah-Al Mamun*, Mikhail Gaevski, **MVS Chandrashekar**, Iftikhar Ahmad, Grigory Simin, Virginia Wheeler, Charles R. Eddy Jr. and Asif Khan, 'Al_xGa_{1-x}N (x>0.4) Channel MOSHFETs with High-k ALD Gate Oxides', presented at the 13th International Conference on Nitride Semiconductors, Seattle WA (2019)