Nano-Electronics Research Lab

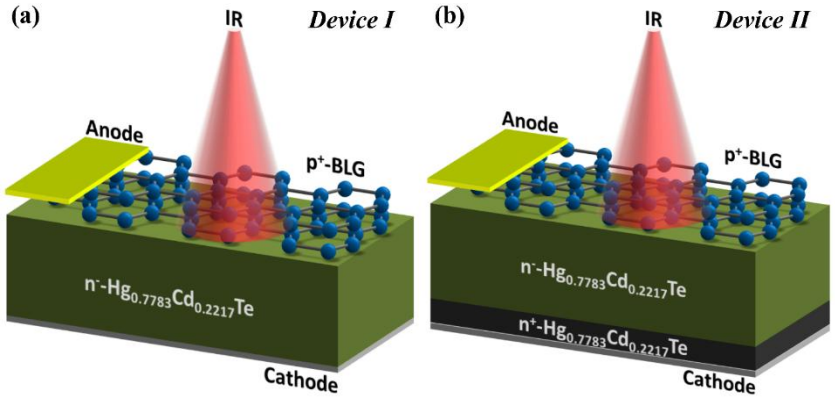
Name	Thesis Title	Status
Ankur Garg	Mathematical Modelling and Simulation of Graphene based Ballistic Rectifier	Completed
Madhulika	Design and analysis of HEMT for high frequency and high power applications	Ongoing
Shonak Bansal	Design and Simulation of Graphene Based Photodetector	Ongoing
Manjit Kaur	Design and Simulation of Carbon based Interconnects	Ongoing
Bipan Chand Kaushal	Design and Simulation of 2D Heterostructure Based Nano Diode	Ongoing
Kuldeep Sharma	Design and simulation of RF MEMS shunt switch for high frequency applications	Ongoing
Prince Jain	Design and simulation of Graphene based Metamaterials for THz applications	Ongoing
Krishna Prakash	Design and Simulation of Graphene based Thermoelectric Rectifiers	Ongoing
Lincoln Hadda	Design and Development of Frequency Reconfigurable Antenna for UWB Application	Ongoing
Priyanka Kambhoj	-	Ongoing

M. tech. Students

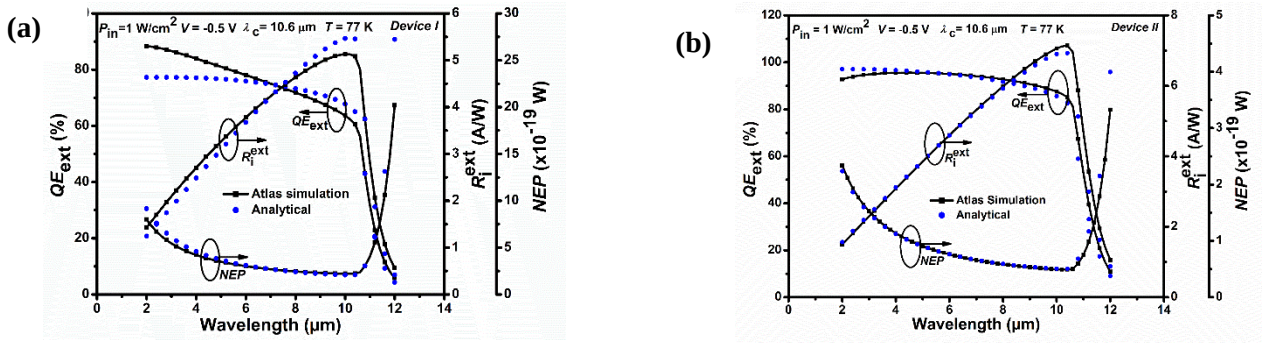
S No.	Year	Name	Thesis Title	Status
1	2019-20	Shivansh Awasthi	-	Ongoing
2	2019-20	Ayushi Khatri	-	Ongoing
3	2018-19	Sahil Garg	Parametric Optimization of Self-switching diode	Completed
4	2018-19	Parul Raj	Noise characterization of GaN HEMT	Completed
5	2017-18	Janmejay Kumar	Circularly polarized antenna for X-band application	Completed
6	2017-18	Arvind K.S	Ultra-thin multi-band metamaterial absorbers	Completed
7	2016-17	Ravi Inder Singh	Silicon-Oxide-Nitride-Oxide-Silicon (SONOS) Nano memory	Completed
8	2016-17	Archana	Comparison of H.T. and U-shaped antenna based on alternative X-band waveguide	Completed
9	2016-17	Kay Preet	PIN silicon nano wire based solar cell	Completed
10	2015-16	Surendra Pal	Quantum dot solar cell	Completed
11	2015-16	Manjeet Singh	Heterojunction based phototransistor	Completed
12	2014-15	Sachin Kr Mittal	Design of log periodic antenna working in ISM band	Completed
13	2014-15	Yogesh Chand Gupta	Mathematical modeling and simulation of InGaAs based Ballistic Rectifier	Completed
14	2014-15	Aashish Kumar	III-V based Nanowire FET	Completed

Graphene based IR Photodetectors

The photodetectors based on semiconductor materials such as Si, Ge and InGaAs has limited detecting spectral regime. The graphene/semiconductor heterojunction based photodetectors are expected to demonstrate a low dark current, low power dissipation, small parasitics, higher breakdown voltage, and high response speed for a wide spectral range from ultraviolet (UV) to infrared (IR) than that of conventional homostructures. The graphene on mercury cadmium telluride (MCT: $Hg_xCd_{1-x}Te$) demonstrates high electrical conductance and optical transmittance of 80% in the IR spectral region at 77 and 300 K suggesting potential applications in next-generation high-performance IR photodetectors for optoelectronics devices [1,2].



(a) p^+-BLG/n^--$Hg_{0.7783}Cd_{0.2217}Te$ (*Device I*); and (b) p^+-BLG/n^--$Hg_{0.7783}Cd_{0.2217}Te$/n^+-$Hg_{0.7783}Cd_{0.2217}Te$ (*Device II*) based photodetectors [3].



QE_{ext}, R_i^{ext}, and *NEP* as a function of wavelength for (a) *Device I*; and (b) *Device II* under –0.5 V bias at 77 K under 1 W/cm^2 IR illumination intensity [3].

REFERENCES

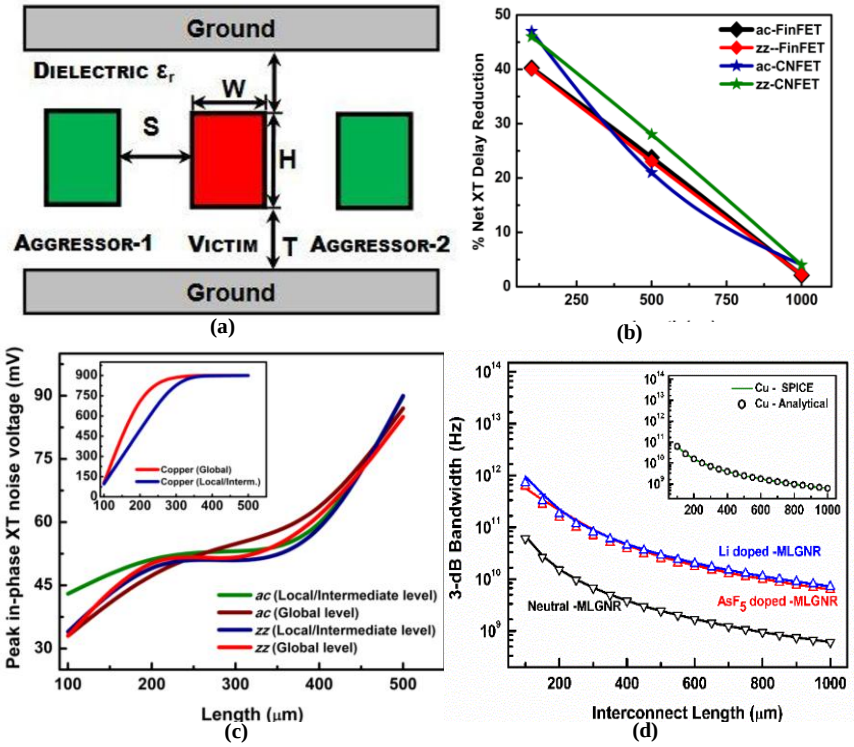
[1] W. Xu, Y. Gong, L. Liu, H. Qin and Y. Shi, "Can graphene make better HgCdTe infared detectors?" *Nanoscale Research Letters*, vol. 6, pp. 250, 2011.

[2] S. Bansal *et. al.*, "Bilayer graphene/HgCdTe based very long infrared photodetector with superior external quantum efficiency, responsivity, and detectivity," *RSC Advances*, vol. 18, no. 69, pp. 39579-39592, 2018.

[3] S. Bansal *et. al.*, "Enhanced optoelectronic properties of bilayer graphene/HgCdTe-based single- and dual-junction photodetectors in long infrared regime," *IEEE Transactions on Nanotechnology*, vol. 18, pp. 781-789, 2019.

Design and Simulation of Carbon Based Interconnects

Interconnects are the primary medium of signal propagation in all existing and emerging IC technologies. The main necessity for interconnect is to meet the high-bandwidth, low-power signaling needs without introducing performance bottlenecks as scaling continues. Therefore, solutions for future high-speed global VLSI interconnects such as Carbon nanotube (CNT), graphene Nano-ribbon (GNR), and silicon nanowire are possible replacement of conventional Copper based interconnects. Various performance metrics of interconnect are computed such as optimize delay, power, power-delay product (PDP), Energy Delay Product (EPD).



(a) Interconnect structure used for crosstalk computation [1] (b) Net percentage crosstalk delay reductions compared to Cu interconnects (c) Peak in-phase XT noise voltage for ac- and zz-MLGNR interconnects. (d) The 3-dB bandwidth results of Lithium doped MLGNR [3].

REFERENCES:

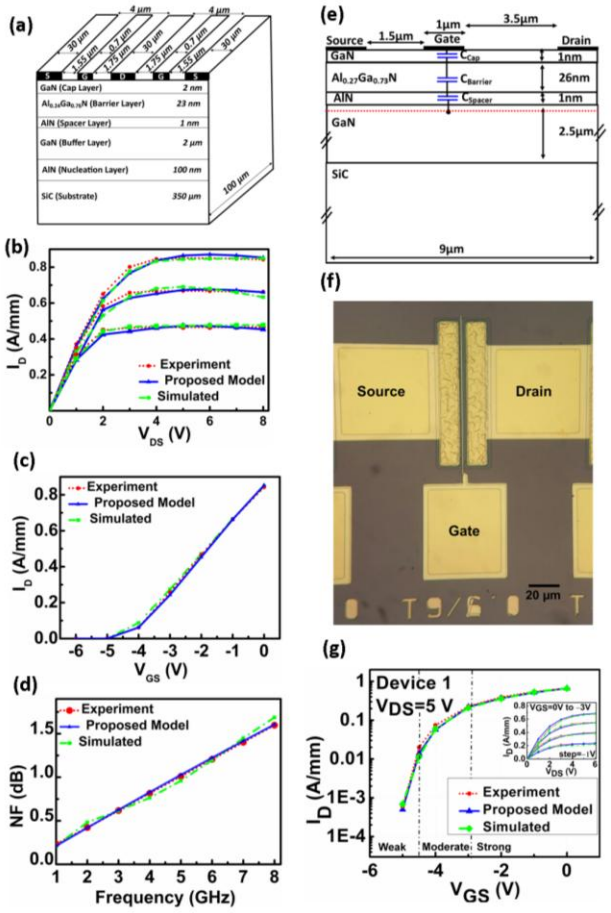
[1] Deng J. and Wong,H.-S. P., ―A Compact SPICE Model for Carbon-Nanotube Field-Effect Transistors Including Nonidealities and Its Application—Part II: Full Device Model and Circuit Performance Benchmarking, *IEEE Transactions on Electron Devices*, vol. 54, no. 12, pp. 3195-3205, 2007.

[2] M. Kaur, N. Gupta, and A. K. Singh, Crosstalk Analysis of Coupled MLGNR Interconnects With Different Types of Repeater Insertion, Microprocessors and Microsystems, 67, 18-27, June, 2019.

[3] M. Kaur, N. Gupta, and A. K. Singh, Impact of Geometrical Parameters on Performance of MWCNT Based Chip Interconnects, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8261888).

High electron mobility transistors (HEMTs)

The GaN based high electron mobility transistors (HEMTs) have been frequently used for high power, high speed and low noise applications [1, 2]. Despite all these advantages, the mainstream adoption of GaN HEMTs may take longer, given their expensive and time intensive fabrication process [3]. Therefore, improved physics-based model incorporating the effect of scaling of semiconductor layers to nanoscale on the factors such as permittivity and melting temperature is developed. The accuracy of the model is validated by comparing the obtained results with the measured DC and noise characteristics of single finger and multi fingers AlGaN/GaN HEMT.



(a) Fabricated Multi finger AlGaN/GaN HEMT grown on SiC. (b) Output (c) Transfer (d) Minimum noise figure characteristics of GaN HEMT (e) Fabricated AlGaN/GaN HEMT grown on SiC. (f) The TEM image (HRHAADF mode) of HEMT active region (g) The measured (dotted lines) subthreshold characteristics.

REFERENCES

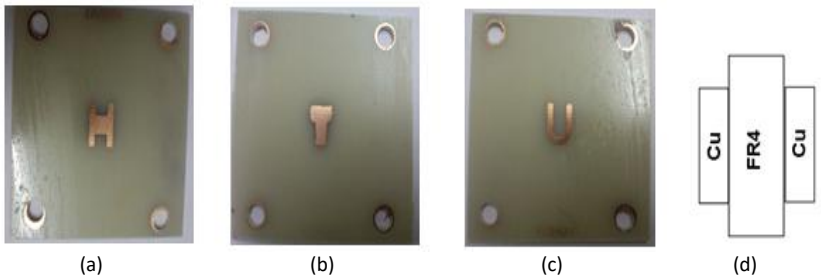
[1] G. Meneghesso, G. Verzellesi, F. Danesin, F. Rampazzo, F. Zanon, A. Tazzoli, M. Meneghini, E. Zanoni, Reliability of GaN high electron-mobility transistors: state of the art and perspectives, IEEE Trans. Device Mater. Reliab. 8 (2) (2008) 332–343. https://doi.org/10.1109/TDMR.2008.923743.

[2] V. Kumar, W. Lu, R. Schwindt, A. Kuliev, G. Simin, J. Yang, M.A. Khan, I. Adesida, AlGaN/GaN HEMTs on SiC with f/sub T/of over 120 GHz, IEEE Electron. Device Lett. 23 (8) (2002) 455–457. https://doi.org/10.1109/LED.2002.801303.

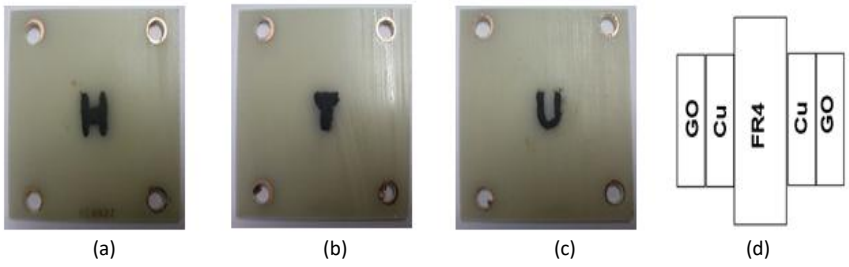
[3] Y.-F. Wu, D. Kapolnek, J.P. Ibbetson, P. Parikh, B.P. Keller, U.K. Mishra, Very-high power density AlGaN/GaN HEMTs, IEEE Trans. Electron Devices 48 (3) (2001) 586–590. https://doi.org/10.1109/16.906455.

Metamaterial

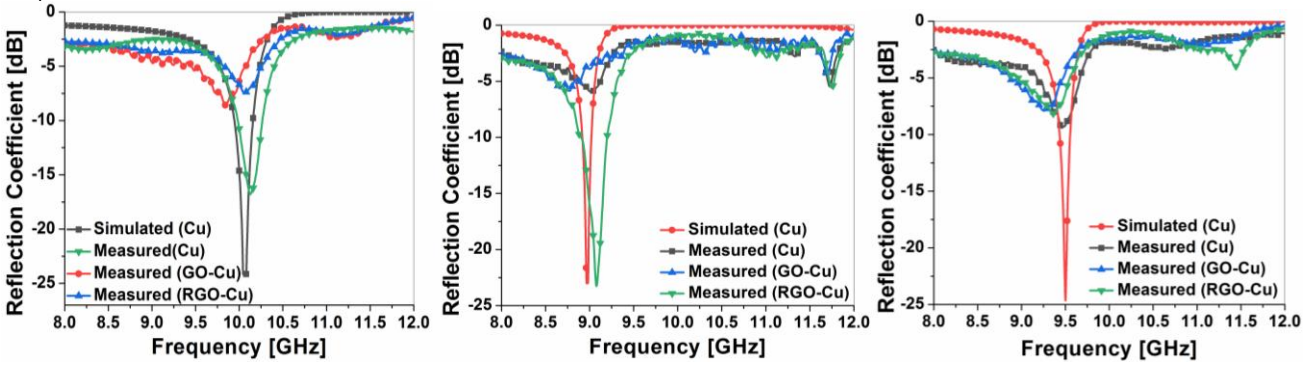
Metamaterials (MTMs) have unique electromagnetic (EM) properties which cannot be found in nature such as negative permeability (μ) and negative permittivity (ε) [1]. Metamaterials have been explored at different frequencies ranging from microwaves to optical for a wide variety of applications such as super-lenses, sensors, antenna structures, absorbers and cloaking devices [2].



Prototypes with copper on FR4 for (a) H-shaped (b) T-shaped and (c) U-shaped resonators (d) Schematic cross sectional view of the composites.



Prototypes with GO-Cu on both sides of FR4 for (a) H-shaped (b) T-shaped and (c) U-shaped resonators (d) Schematic cross sectional view of the composites.



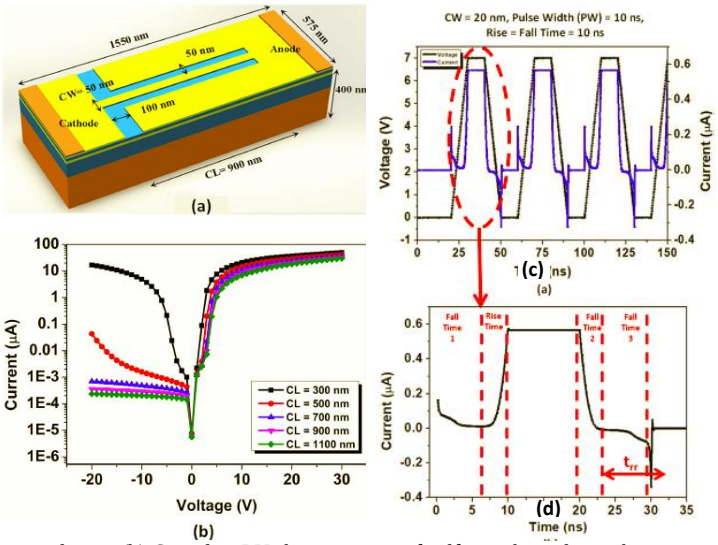
Simulated and measured reflection coefficient of (a) H-shaped, (b) T-shaped, and (c) U-shaped resonator.

REFERENCES

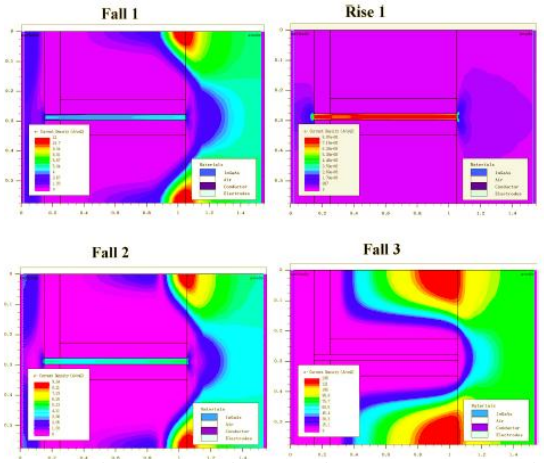
1. V. G. Veselago, “The electrodynamics of substances with simultaneouslynegative values of ε and μ,” Sov. Phys. Uspekhi, vol. 10, no. 4, pp. 509–514, 1968.
2. R. A. Shelby, D. R. Smith, and S. Schultz, “Experimental verification of a negative index of refraction,” Science (80-.)., vol. 292, no. 5514, pp. 77–79, 2001.
3. D. R. Smith, W. J. Padilla, D. C. Vier, S. C. Nemat-Nasser, and S. Schultz, “Composite medium with simultaneously negative permeability and permittivity,” Phys. Rev. Lett., vol. 84, no. 18, pp. 4184–4187, 2000.

Self-Switching Diode

SSD was first conceptualized and realized by Song *et al*. in 2003 utilizing two L-shaped trenches in InGaAs heterostructures. The device working resembles to a diode, however, does not require any doping junctions and/or Schottky barrier to produce non-linear *I-V* characteristics [1]. The planar architecture of the device, i.e., the electrical contacts are on the same plane as of device, reduces the parasitic effects enabling high frequency operation for variety of applications including communication and imaging (security/medical) [2, 3].



Self-switching diode (SSD) used for simulation. (b) Semi-log *I-V* characteristics of self-switching device by varying channel lengths. (c) The output response of SSD while applying a continuous voltage pulse (square) of 7 V. (d) The zoomed portion of a signal pulse demonstrates charging and discharging. [4]



Electron current density of SSD at fall time 1, rise time, fall time 2 and fall time 3 for input voltage pulse of 7 V. [4]

REFERENCES

[1] S. R. Kasjoo et al., "Zero bias microwave detectors based on array of nanorectifiers coupled with dipole antenna," *Solid State J.*, vol. 118, pp. 36–40, 2016.

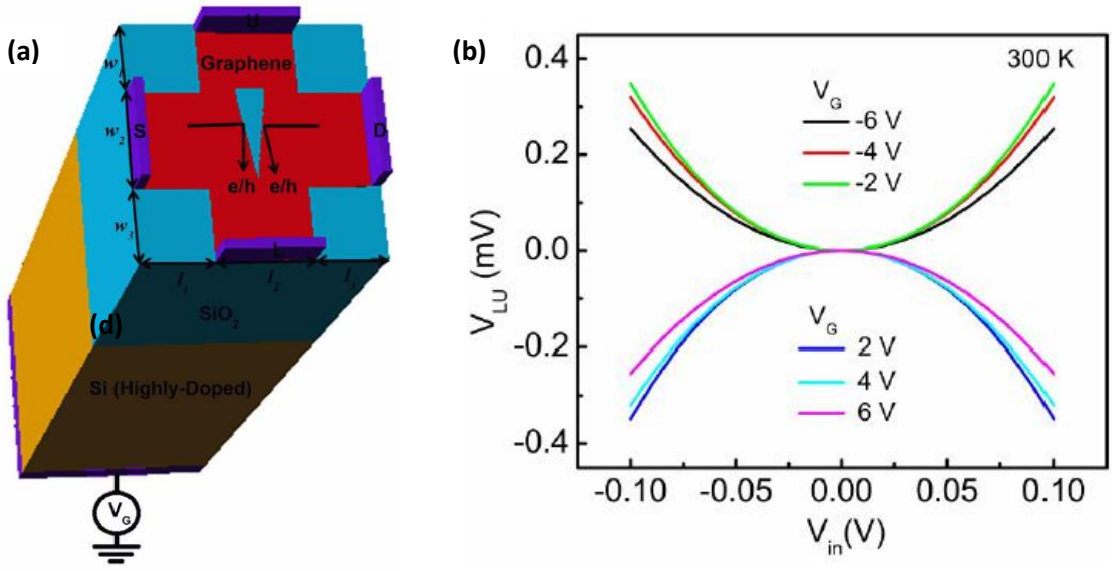
[2] G. Farhi, D. Morris, S. A. Charlebois, and J-P Raskin, "The impact of etched trenches geometry and dielectric material on the electrical behaviour of silicon-on-insulator self-switching diodes," *Nanotechnology*, vol. 22, Art. no. 435203, 2011.

[3] I. Mehdi, J. V Siles, C. Lee, and E. Schlecht, "THz diode technology: Status, prospects, and applications," *Proc. IEEE*, vol. 105, no. 6, pp. 990–1007, Jun. 2017.

[4] S. Garg et al., "Extraction of trench capacitance and reverse recovery time of InGaAs self-switching diode", *IEEE Transactions on Nanotechnology*, vol.18, pp. 925-931, 2019.

Ballistic Rectifier

The DC, AC and thermoelectric results achieved for 2D and/or 3D simulations of ballistic devices. The observed electrical result is non-linear in ballistic and quasi ballistic regime. Based on its non-linear electrical properties, a number of operations such as frequency multiplier, adders, and latches etc. [1-3] with high speed (upto THz) can be performed. The fabrication of ballistic rectifiers with and without antidot, and three terminals ballistic rectifier also carried out.



(a) 3D device structure of graphene FTBR with highly-doped Si/SiO2 substrate. (b) The FTBR is biased using Push-Push input configurations.

REFERENCES:

[1] A. Garg, K. Prakash, N. Jain, N. Gupta, S. Kumar and A. K. Singh, "III-V Heterostructure Based Three Terminal Thermal Rectifier," in *2017 Progress In Electromagnetics Research Symposium-Spring (PIERS), St Petersburg, Russia*, 2017, pp. 3681–3683.

[2] A. K. Singh, G. Auton, E. Hill, and A. Song, "Graphene based ballistic rectifiers," Carbon , vol. 84, pp. 124–129, 2015.

[3] A. Garg, N. Jain, and A. K. Singh, "Modeling and Simulation of Graphene based Three Terminal Junction Rectifier," *J Comput Electron*, vol. 17, pp. 562–570, 2018.

[4] A. Garg, N. Jain, S. Kumar and A. K. Singh, Analysis of nonlinear characteristics of graphene based four-terminal ballistic rectifier using drift-diffusion model, Nanoscale Advances,1-9, 2019,

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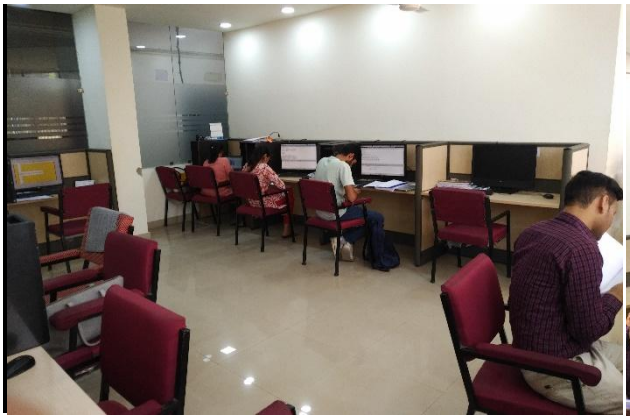

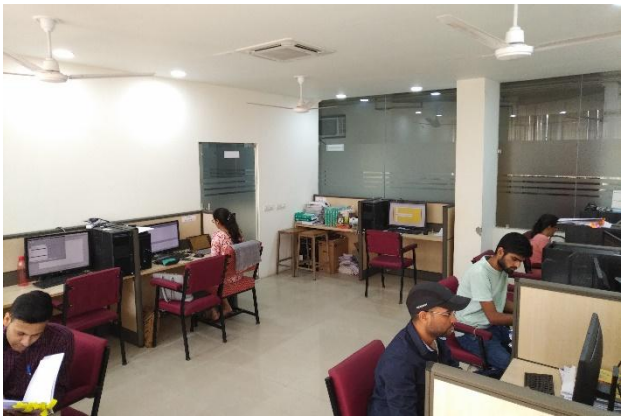

Major Equipments

Equipment Name	Brief Specification	Applications	Picture
Workstation with Intel Xeon dual processor	40 core liquid cooled system with NVDIA quadro 4 GB graphics.	Used for running high performance simulation softwares like Silvaco, HFSS.	

Digital Storage Oscilloscope	4 channel + signal generator with DSP capability such as FFT, Impulse response etc. Max operating frequency of 200 MHz with 20 Giga-samples/second sampling rate.	For Analysis of signals and performing mathematical operations on the input signal to check harmonics in the signal.	
Source Measure Unit	2 channel precision measure unit with minimum current of 100 fA. Can be controlled using Keysight workbench software.	Used to measure I-V or DC characteristics of electronic devices.	
20 GHz Vector Network Analyser	100 MHz to 20 GHz Frequency Range with Resolution of 1 Hz	Used for Measuring Scattering Parameters of two port networks.	
Probe station System	Two-point and Four point probe measurement capable. Consist of vacuum chuck with diameter of 4 inches. Comprises of Microscope to place contacts on the electrodes of device with great accuracy.	Used for Performing Electrical characterization on mm-µm scale devices.	
Dual range DC power supply	Comprises of two modes: 0-15 V output with max current of 7 A or 0-30 V with max current of 4 A.	Used for providing constant DC voltage to testing devices and equipment's.	
6.5 digit DMM (Bench type)	6.5 Significant digit resolution	Measuring Voltage and Current with high precision	

			
Programmable arbitrary function generator 30 MHz	Max output frequency 30 MHz, Single Output Channel with Sampling rate 125 MSa/s	Used for providing various types of test waveforms to check the performance/characteristics of circuits and devices.	
Horn Antenna (S/X Band)	Emits EM waves in the range 2-4 GHz/8-10 GHz	Used for wirelessly transmitting microwaves.	
Waveguide to Coaxial Adaptor (S/X Band)	frequency range 2-4 GHz/8-10 GHz	Provides interface for connecting microwave components like waveguide with electrical equipment.	
Handheld Multimeter 4.5 Digits	4.5 digit precision Rechargeable batteries.	Measuring Voltage and Current precisely with portability.	
Soldering Station workstation	Siron 852 with SMD components reworking capability.	Used for soldering SMD, Body Mount components and	

		connectors to devices, antennas, etc.	

List of Projects

S. No	Name of Project	Period	Agency	Amount (in lacs)
1	Vander Waals Hetero-structure based self-switching diode	2019-2021	Science and Engineering Research Board (SERB), Department of Sciences and Technology (DST)	50.58
2	Composition-microstructure-property correlation studies of eco-friendly (lead free) magnetoelectric multiferroic composites	2019-2021	Science and Engineering Research Board (SERB), Department of Sciences and Technology (DST)	62.11
	Development of Electronic Device fabrication and Characterization facility	2017-2022	FIST- Department of Science and technology	217
3	Structure-microstructure-property correlation study in chemically modified lead free BZT-BCT solid solution	2017-2020	Directorate of Extramural Research & Intellectual property rights (ER & IPR), Defence research and development organization (DRDO)	48.355
4	Graphene based Ballistic Rectifiers	2016-2019	Science and Engineering Research Board (SERB), Department of Sciences and Technology (DST)	65.70
5	Simulation and Modelling of GaN HEMTs for MMIC Applications	2016-2018	Directorate of Extramural Research & Intellectual property rights (ER & IPR), Defence research and development organization (DRDO)	31.84
6	Design and Development of nonlinear nanoelectronic devices	2015-2020	Ministry of Electronics and Information Technology (MietY), Government of India	32.87
7	Design and Development of photonic devices	2015-2020	Ministry of Electronics and Information Technology (MietY), Government of India	32.87
8	Development of Bio-amplifier for the analysis of EEG signal and performing motor imaging experiments for BCI	2015-2017	Punjab Engineering College (Deemed to be University), Chandigarh	3.42

LIST OF PUBLICATIONS

2019

N. Sharma, A. Mall, R. Gupta, A. Garg, **A. K. Singh,** S. Kumar, Temperature Dependent Structural and Electrical Analysis of Cr-doped Multiferroic GaFeO3 Ceramics, Materials Research Express, 2019
A. Garg, N. Jain, S. Kumar and **A. K. Singh,** Analysis of nonlinear characteristics of graphene based four-terminal ballistic rectifier using drift-diffusion model, Nanoscale Advances,1-9, 2019,
S. Garg, B. Kaushal, S. Kumar, S. R Kasjoo, S. Mahapatra and **A. K. Singh,** Extraction of trench capacitance and reverse recovery time of InGaAs self-switching diode, IEEE Transactions on Nanotechnology, 18, 925 – 931, 2019
S. Bansal, A. Das, P. Jain, K. Prakash, K. Sharma, N. Kumar, N. Sardana, N. Gupta, S. Kumar and **A. K. Singh,** Enhanced Opto-electronic Properties of Bilayer Graphene/ HgCdTe Based Single- and Dual-Junction Photodetectors in Long Infrared Regime, IEEE Transactions on Nanotechnology, 18, 781 – 789, 2019
K. Sharma, A. Karmakar, M. Sharma, A. Chauhan, S. Bansal, M. Hooda, S. Kumar, N. Gupta and **A. K. Singh,** Reconfigurable Dual Notch Band Antenna on Si-Substrate integrated with RF MEMS SP4T Switch for GPS, 3G, 4G, Bluetooth, UWB and Close Range Radar Applications, AEÜ - International Journal of Electronics and Communications, 118, 152873, 2019
Madhulika, N. Jain, S. Kumar, **A. K. Singh,** Influence of barrier and spacer layer on structural and electrical, properties of AlGaN/GaN HEMT, International Journal of Information Technology, 1-6, 2019
N. Kumar, N. Bastola, M. Kumar, S. Dhiman, **A. K. Singh**, S. Kumar, Effect of Nd3+ substitution on structural, ferroelectric, magnetic and electrical properties of BiFeO3-PbTiO3 binary system, SN Applied Sciences (SNAS) Springer,1, 874, 2019
M. Kaur, N. Gupta, and **A. K. Singh,** Crosstalk Analysis of Coupled MLGNR Interconnects With Different Types of Repeater Insertion, Microprocessors and Microsystems, 67, 18-27, June, 2019
Madhulika, A. Malik, N. Jain, M. Mishra, S. Kumar, D. S. Rawal and **A. K. Singh,** Nanoscale structural parameters based analytical model for GaN HEMTs, Superlattice and Microst., 130 267-276, June, 2019
M. Kumar, R. Rai, N. Kumar, G. Sharma, **A. K. Singh**, S. Kumar, Crystal structure correlation of ferroelectric and dielectric properties of Nb doped PZT95/5, Journal of Materials Science: Materials in Electronics, 30, 5014-5020, March, 2019
R. Mukhiya, P. Agarwal, S. Badjatya, M. Garg, P. Gaikwad, S. Sinha, **A. K. Singh**, R. Gopal, Design, modelling and system level simulations of DRIE-based MEMS differential capacitive accelerometer, Microsystem Technologies, 1-12, Jan, 2019
D. K. Singh, V. D. Mishra, H. S. Gusain, N. Gupta, **A. K. Singh,** Geo-spatial Modeling for Automated Demarcation of Snow Avalanche Hazard Areas Using Landsat-8 Satellite Images and In Situ Data, Journal of the Indian Society of Remote Sensing, 47, 513-526, March, 2019

2018

Bansal, K. Sharma, N. Sardana, S. Kumar, N. Gupta and **A. K. Singh,** Bilayer Graphene/ HgCdTe Based Very Long Infrared Photodetector with Superior External Quantum Efficiency, Responsivity, and Detectivity, RSC Advances, 8, 39579-39592, Nov, 2018
A. K. Singh, G. Auton, E. W. Hill and A. Song, Estimation of intrinsic and extrinsic capacitances of graphene self-switching diode using conformal mapping technique, 2D Materials, 5, 035023, 2018
A. Garg, N. Jain, and **A. K. Singh,** Modeling and Simulation of Graphene based Three Terminal Junction Rectifier, Journal of Computational Electronics, 17, 562–570, 2018
J. S. Malhotra, **A. K. Singh**, R.Khosla, S. K. Sharma, G. Sharma, and S. Kumar, Investigations on

structural, optical and magnetic properties of Fe & Dy co-doped ZnO nanoparticles, Journal of Materials Science: Materials in Electronics, 29, 3850-3855, 2018
J. S. Malhotra, A. Sharma, **A. K. Singh**, S. Kumar, B. S. Rana, and S. Kumar, Investigations on photocatalytic, antimicrobial and magnetic properties of sol-gel synthesized Ga doped ZnO nanoparticles, International Journal of Nanoscience, 17, 1850014, 2018
S. Garg, B. Kaushal, **A. K. Singh**, S.Kumar, S. Mahapatra, Parametric Optimization of Self-Switching Diode, IEEE 13th Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Oregon, USA on 14-17 October, 2018 (DOI: 10.1109/NMDC.2018.8605832)
S. Bansal, P. Jain, N. Gupta, **A. K. Singh**, N. Kumar, S. Kumar, N. Sardana, A Highly Efficient Bilayer Graphene-HgCdTe Heterojunction Based p+-n Photodetector for Long Wavelength Infrared (LWIR), IEEE 13th Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Oregon, USA on 14-17 October, 2018 (DOI: 10.1109/NMDC.2018.8605848)
P. Jain, A. K. Singh, S.Bansal, S. Garg, K. Prakash, N. Gupta, and **A. K. Singh**, N. Sharma, S. Kumar, N. Sardana, Dual band graphene based metamaterial absorber for terahertz applications, IEEE 13th Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Oregon, USA on 14-17 October, 2018 (DOI: 10.1109/NMDC.2018.8605833)
N. Kumar, S. Kumar, B. Narayan, S. Bansal, **A. K. Si**ngh, Effect of Dy3+ substitution on structural, magnetic and dielectric properties of BiFeO3-PbTiO3 multiferroics, IEEE 13th Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Oregon, USA on 14-17 October, 2018 (DOI: 10.1109/NMDC.2018.8605908)
N. Sharma, S. Kumar, A. Kumar Mall, P. Jain, **A. K. Singh**, R. Gupta, A. Garg, Effect of Zn doping on structural and ferroelectric properties of GaFeO3 for futuristic spintronic applications, IEEE 13th Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Oregon, USA on 14-17 October, 2018 (DOI: 10.1109/NMDC.2018.8605861)
Madhulika, H. Pandey, M. Garg, N. Jain, S. Kumar, D. S. Rawal, M. Mishra, and **A. K. Singh,** Modelling DC, RF and Noise Behavior of AlGaN/GaN HEMT on SiC Substrate "The Physics of Semiconductor Devices", Springer, 2018(DOI: 10.1007/978-3-319-97604-4_26)

2017

S. Bansal, N. Gupta, and **A. K. Singh,** Nature inspired metaheuristic algorithms to find near OGR sequences for WDM channel allocation and their performance comparison, Open Mathematics, 15, 520-547, 2017
A. Song, G. Auton, **A. K. Singh**, J. Zhang, X. Zhang, and E. Hill, Graphene based Nano-Rectifiers, IEEE MTT-S International Microwave and RF Conference (IMaRC) 2017, 11-13 December, 2017 (DOI: 10.1109/IMaRC.2017.8449694)
P. Jain, A. Thourwal, S. Bansal, N. Gupta, S. Samanta, N. Sardana, S. Kumar, and **A. K. Singh,** T-Shaped Resonator for X-band Applications, IEEE MTT-S International Microwave and RF Conference (IMaRC) 2017, 11-13 December, 2017 (DOI: 10.1109/IMaRC.2017.8449677)
M. Kaur, N. Gupta, and **A. K. Singh,** Performance Analysis of Multilayer Graphene Nanoribbon Based Interconnects,IEEE MTT-S International Microwave and RF Conference (IMaRC) 2017, 11-13 December, 2017 (DOI: 10.1109/IMaRC.2017.8449677)
S. Bansal, K. Sharma, K. Soni, N. Gupta, K. Ghosh, and **A. K. Singh,** Hg1–xCdxTe Based p-i-n IR Photodetector for Free Space Optical Communication, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8261800)
N. Kumar, N. Bastola, P. Jain, S. Kumar, **A. K. Singh**, and R. Ranjan, Investigation on structural, ferroelectric and magnetic properties of BiFeO3-PbTiO3 multiferroic system, 38th

Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8262192)
P. Jain, A. Thourwal, N. Sardana, S. Kumar, N. Gupta, and **A. K. Singh,** I-shaped Metamaterial Antenna for X-band Applications, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8262229)
P. Jain, S. Bansal, N. Kumar, S. Kumar, N. Gupta, and **A. K. Singh,** Magneto-dielectric Properties of Composite Ferrite Based Substrate for UHF Band Microstrip Antenna, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8261886)
M. Kaur, N. Gupta, and **A. K. Singh,** Impact of Geometrical Parameters on Performance of MWCNT Based Chip Interconnects, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8261888)
A. Garg, K. Prakash, N. Jain, N. Gupta, S. Kumar, and **A. K. Singh,** III-V Heterostructure Based Three Terminal Thermal Rectifier, 38th Progress In Electromagnetics Research Symposium 2017, 20-25 May, 2017 (PIERS Proceedings archived on IEEE) (DOI: 10.1109/PIERS.2017.8262397)
Madhulika, N. Jain, S. Kumar, and **A. K. Singh,** Influence of Barrier and Spacer Layer on Structural and Electrical Properties of AlGaN/GaN HEMT, 4th International Conference on Computing for Sustainable, Global Development, 01-03 March, 2017

2016

S. R. Kasjoo, **A. K. Singh**, and A. M. Song, Zero Bias Microwave Detectors Based on Array of Nanorectifiers Coupled with a Dipole Antenna, Solid State Electronics,118, 36-40, 2016
S. Bansal, **A. K. Singh**, and N. Gupta, Optimal Golomb Ruler Sequences Generation: A Novel Parallel Hybrid Multiobjective Bat Algorithm, Springer: Journal of The Institution of Engineers (India): Series B, 98, 43–64, 2016
K. Sharma, S. Bansal, S. Roy, A. Kumar, K. Prakash, N. Gupta, J. Vyas, and **A. K. Singh** Analysis of Actuation Voltage Using High Dielectric Materials in Radio Frequency MEMS Switch, IEEE International Conference On Signal Processing And Communication, 26-28 December, 2016 (DOI: 10.1109/ICSPCom.2016.7980613)
S. Bansal, K. Sharma, N. Gupta, and **A. K. Singh,** Simulation and Optimization of Hg1–xCdxTe Based Mid-Wavelength IR Photodetector, 3RD IEEE Uttar Pradesh Section International Conference On Electrical, Computer and Electronics (IEEE UPCON-2016), 09-11 December, 2016 (DOI: 10.1109/UPCON.2016.7894691)
A. Garg, N. Jain, and **A. K. Singh,** Drift-Diffusion Modeling and Simulation of Four Terminal Ballistic Rectifier, IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology(RTEICT 2016), 20-21 May, 2016 (DOI: 10.1109/RTEICT.2016.7808187)
S. R. Kasjoo, Muhammad M. Ramli, M. Mohamad Isa, Siti S. Mat Isa, N. Khalid, N. I. Mohd Noor, N. Ahmad, **A. K. Singh,** Hysteresis in a Field-Effect Device Based on an Exfoliated Thin Film of Few-Layer Graphene, IEEE International Conference on Microelectronics, Communication & Computing (MicroCom 2016), 23-25 January, 2016 (DOI: 10.1109/MicroCom.2016.7522532)
S. Garg, A. Garg, S. Bansal, A. Chaudhary, S. R. Kasjoo, **A. K. Singh,** Effect of Filling Dielectric in etched trenches of Novel Unipolar Nanodiode, IEEE International Conference on Microelectronics, Communication & Computing (MicroCom 2016), 23-25 January, 2016 (

DOI: 10.1109/MicroCom.2016.7522531)

2015

S. R. Kasjoo, **A. K. Singh**, and A. M. Song, RF characterization of unipolar nanorectifiers at zero bias, Physica Status Solidi A, 212, 1–7, 2015

A. K. Singh, G. Auton, E. Hill, and A. M. Song, Graphene based ballistic rectifiers, Carbon, 84, 24-129, 2015

S. R. Kasjoo, **A. K. Singh**, and A. Song, Low-Frequency Noise of an AlGaAs/GaAs- Based Self-Switching Diode, 2015 IEEE Conference on Electron Devices and Solid State Circuits (EDSSC2015), 01-04 June, 2015 (DOI: 10.1109/EDSSC.2015.7285188)

S. R. Kasjoo, **A. K. Singh**, and A. Song, RF Characterization of Zero-Bias Planar Nanodiodes Coupled with a Narrowband Dipole Antenna, 2015 IEEE Conference on Electron Devices and Solid State Circuits (EDSSC2015), 01-04 June, 2015 (DOI: 10.1109/EDSSC.2015.7285186)

P. Jain, S. Bansal, **A. K. Singh**, and N. Gupta, Golomb Ruler Sequences Optimization for FWM Crosstalk Reduction: Multi-population Hybrid Flower Pollination Algorithm, Progress in Electromagnetics Research Symposium 2015, 06-09 July, 2015 (PIERS Proceedings 2015)

A. K. Singh, S. R. Kasjoo, and A. M. Song, Coplanar Waveguide Fed Coplanar Patch Antenna for Nanorectifiers at 2.45GHz, Progress in Electromagnetics Research Symposium 2015, 06-09 July, 2015 (PIERS Proceedings 2015)

2014

A. K. Singh, S. R. Kasjoo, and A. M. Song, Low-frequency noise of a ballistic rectifier, IEEE Transactions on Nanotechnology, 13, 527–531, 2014

2013

S. R. Kasjoo, **A. K. Singh**, U. Hashim, Characterization of unipolar nanorectifiers coupled with an RF antenna, 2013 IEEE Regional Symposium on Micro and Nanoelectronics (IEEERSM2013), 25-27 September, 2013 (DOI: 10.1109/RSM.2013.6706461)

2009

S. K. Singh and **A. K. Singh,** UWB Rectangular Ring Microstrip Antenna with Simple Capacitive Feed for Breast Cancer Detection, Progress In Electromagnetics Research Symposium 2009, 23-27 March, 2009 (PIERS Proceedings 2009)

S. K. Singh and **A. K. Singh,** Multiband Rectangular Ring Microstrip Antenna for UWB Wireless Applications;1643-1646, 2009, Progress In Electromagnetics Research Symposium 2009, 23-27 March, 2009 (PIERS Proceedings 2009)