Sumukh Vaidya

Purdue University, Indiana, USA

	Education
Jan'21-	Purdue University, Indiana, USAGPA: 3.95/4.0.
Current	PhD Candidate in the Department of Physics and Astronomy.
	<i>Advisor:</i> Prof Tongcang Li, Department of Physics and Elmore Family School of Electrical and Computer Engineering, Purdue University
Jul'15-Aug'20	Indian Institute of Technology Bombay, India CPI: 8.32/10.0.
	Dual Degree (Bachelors + Masters in Technology) in Engineering Physics. Specialisation: Nanoscience.
	Publications
2023	Nanotube spin defects for omnidirectional magnetic field sensing, Arxiv Preprint.
	X. Gao, S. Vaidya , S. Dikshit, P Ju, K. Shen, Y. Jin, S. Zhang, and T. Li Link: https://arxiv.org/abs/2310.02709
2023	Quantum sensing and imaging with spin defects in hexagonal boron nitride, Advances
	in Physics: X.
	S. Vaidya, X. Gao, S. Dikshit, I. Aharonovich, and T. Li.
	Link: https://www.tandfonline.com/doi/full/10.1080/23746149.2023.2206049
2023	Quantum sensing of paramagnetic spins in liquids with spin qubits in hexagonal boron
	X Gao S Vaidva P lu S Dikshit K Shen Y P Chen and T Li
	Link: https://pubs.acs.org/doi/10.1021/acsphotonics.3c00621
2022	Nuclear spin polarization and control in hexagonal boron nitride, Nature Materials.
	X. Gao, S. Vaidya, K. Li, P. Ju, B. Jiang, Z. Xu, A.E.L. Allcca, K. Shen, T. Taniguchi, K. Watanabe,
	S.A. Bhave, Y.P. Chen, Y. Ping, T. Li
	Link: https://www.nature.com/articles/s41563-022-01329-8
2022	Light Induced Quasi-Fermi Level Splitting in Molecular Semiconductor Alloys, Materials Advances.
	N. Jain , R. Saxena , S. Vaidya , W. Huang , A. Welford , C.R. McNeill and D. Kabra
	Link: https://pubs.rsc.org/en/content/articlehtml/2022/ma/d2ma00131d
2021	Novel optoelectronic technique for direct tracking of ultrafast triplet excitons in polymeric semiconductor, <i>Applied Physics Reviews</i> .
	G. Banappanavar, S. Vaidya , U. Bothra, L.R. Hegde, K.P. Sharma, R.H. Friend, D. Kabra Link: https://doi.org/10.1063/5.0054583
	Technical skills
Software	C++, Python, $Matlab$, Mathematica, $PTEX$, LabView, SolidWorks, Arduino,
Research:	Optical Measurements, Optical System Design, Low Temperature Optical measurements, Ion Implantation, Data Acquisition System Design, 2-D heterostructure assembly
Trained User:	Glove Box, Spin Coater, Plasma Asher, Screen Printer, Wet Bench based techniques

West Lafayette Indiana, USA-47906 © (+1) 765-479-9514

⊠ vaidya10@purdue.edu

Research Projects

Aug'21- Quantum Sensing with 2-D materials, PhD Research.

- Present Prof. Tongcang Li, Department of Physics and Astronomy and Elmore Family School of Electrical and Computer Engineering, Purdue University
 - Built a setup to optically measure the electron spin resonance (ESR) of samples using the Optically Detected Magnetic Resonance (ODMR) Technique
 - $\circ~$ System programming in Labview and data analysis in MATLAB and Python
 - Setup the and interfaced RF electronics with PC to run the experiments and collect data
 - Gained expertise on the assembly and measurements of 2-D heterostructures involving materials like graphene and hexagonal Boron Nitride (hBN)
 - Helped to build a low temperature vacuum system to take optical measurements at liquid Helium temperatures and investigate quantum materials
 - Built a high-vacuum ion-implanter setup to create spin defects in 2-D materials for quantum sensing

May'19- Fourier Plane Imaging Microscopy of Thin Films and Fabrication of Large-Area

Jul'20 Carbon-Based Perovskite Solar Cells, Dual Degree (Masters) Thesis.

Prof. Dinesh Kabra, Department of Physics, IIT Bombay

- Fabricated Large-Area, carbon-based Perovskite Solar Cells via screen printing methods. Obtained chemical handling training and Usage Authorisation on wet bench and glove box apparatus
- Automated data acquisition for Time Delayed Collection Field Experiments using National Instruments VISA automation and control tools
- Built a setup to perform fourier plane imaging microscopy on samples of organic and perovskite thin films, to determine the emitter orientation in the films, enabling engineering of better devices
- Simulated fourier plane emission profiles of thin film emitters under laser excitation and successfully determined the emitter orientations in the films
- Simulated in MATLAB the outcoupling efficiency and delayed emission profiles of LEDs based on molecular semiconductors to improve emission characteristics of devices via interfacial engineering

Jul'18-Apr'19 **A study of recombination dynamics in Bulk Hetero-Junction Organic Solar Cells**, *Bachelors Thesis.*

Prof. Dinesh Kabra, Department of Physics, IIT Bombay

- Studied charge dynamics in blended bulk heterojunction solar cells via photocurrent measurements
- Simulated the emission in F8BT based organic LEDs via Dyadic Greens function based modelling
- Set up the Steady State Photocarrier Grating experiment to determine diffusion lengths and density of states in photoconductive materials. Investigated organic semiconductors and perovskite films under photoexcitation.

Research Internships

Dec'17 Noise reduction for Central Drift Chamber.

Prof. Hiroyuki Noumi, RCNP, Osaka University, Japan

- Implemented noise reduction measures in signal acquisition for cosmic ray tracking in drift chamber
- Used c++ & Root scripts to visualise data & see channel response for detection of incoming particles
- Characterised chamber response as function of gas flow rate & voltage to find best detection conditions
- Calculated efficiency of the different detection channel layers in the Drift Chamber
- Worked on c++ and Root scripts for tracking of individual particles to find real time trajectories

May'17 Characterisation of PMTs as Muon Beam Counter.

- Prof. Tsutomu Mibe, g-2/EDM Collaboration, KEK, Tsukuba, Japan
- Received a letter of recommendation for applying to JPARC Asia Summer Student Program
- Studied properties, output characteristics, effect of magnetic fields on Photomultiplier Tubes (PMTs)
- Built a testing circuit testing PMTs as Muon Counters
- Wrote report detailing the experiment and findings regarding the effect of magnetic fields on PMTs

Academic Achievements

- 2015 All India Rank of 1053 in JEE Advanced. Out of 150,000 candidates appeared
- 2015 All India Rank of 1296 in JEE Mains.

Out of 1.35 million candidates appeared

- 2014 **91.8% in 12th Board Examination**. *Central Board of Secondary Education*, New Delhi, India
- 2014 Selected for Level II of Indian National Chemistry Olympiad (InChO). Among Top 1% of students appeared
- 2014 **99.3875 Percentile in Problem Solving Assessment Examination** . Conducted by Central Board of Secondary Education, New Delhi

Leadership Roles

- May'21- Webmaster, Purdue Physics Graduate Student Association (PGSA).
- Apr'22 Maintaining the website of the Purdue Physics Graduate Student Association (PGSA)

Mar'19- Head, Department Academic Mentorship Program(DAMP).

- Jun'20 Spearheaded a 3-tiered team of 16 Coordinators and 215 Mentors overseeing 12 UG departments
 - Instituted DAMP in Departments of Mathematics and Environmental Sc. to cater to 40 sophomores
 - Implemented the revamped Academic Rehab Policy to setup a support ecosystem for 130+ students
 Boosted the team's capabilities by organising targeted training by Tata Institute of Social Sciences
 - Organised Technical Education Quality Improvement Program (TEQIP) workshops for 200+ faculty
 - Handpicked 12 mentors from 22 applicants as the acting DAMPC of 3 newly inducted departments

Mar'18- Institute Student Mentorship Program.

Mar'19 • Helping and guiding 10 undergraduate freshmen to adjust to life at IITB and guiding them towards various opportunities at IIT Bombay. Among 80 selected students from 300+ applicants

Mar'17- Department Academic Mentorship Program (DAMP) Mentor.

 Helping 6 sophomore students resolve their academic problems and guide them towards the various opportunities in the Department of Physics at IITB. Among 8 selected students from 20+ applicants

Teaching Assistantships.

 \circ Introduction to Quantum Mechanics \circ Electronics Laboratory: Op-Amps \circ PHYS172- Modern Mechanics Lab and Recitation

Relevant Courses

- Physics oQuantum Mechanics oContinuum Mechanics oNon Linear Dynamics oWaves and Oscillations oClassical Mechanics oSpecial Relativity oThermal Physics oPhotonics oIntro to Nanoscience and Nanotechnology oIntro to Condensed Matter Physics oStatistical Physics oElectromagnetic Theory oIntroduction to Nuclear and Particle Physics oAtomic and Molecular Physics oAnalytical Techniques oSemiconductor Physics o of Nanoelectronic Devices oSolid State Devices oPhysics of Quantum Devices oPhysics of Nanostructures and Nanoscale devices oThin Films Physics and Technology oNanomaterials, Nanostructures and Nanofabrication
- Mathematics oData Analysis and Interpretation oNumerical Methods oComplex Analysis oDifferential Equations oLinear Algebra oCalculus oGroup Theory Methods
 - Other oSolar Photovoltaics- Fundamental Technologies & Applications oComputer Programming & Utilisation oDigital Systems oElectronic Devices oOrganic-Inorganic Chemistry oPhysical Chemistry oBiology oEconomics oCapitalism:Theories, Histories & Varieties

References

Prof. Tongcang Li.

Department of Physics and Astronomy and Elmore Family School of Electrical and Computer Engineering, Purdue University

Prof. Dinesh Kabra.

Department of Physics, Indian Institute of Technology Bombay

Prof. Pradeep Sarin.

Department of Physics, Indian Institute of Technology Bombay