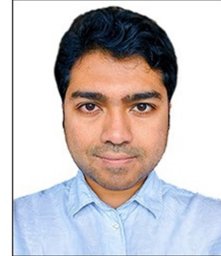


Curriculum Vitae
Subhomoy Haldar

Assistant Professor, Department of Physics, Indian Institute of Technology Kanpur, India
e-mail: shaldar@iitk.ac.in, Contact: +91 512 259 2593
<https://sites.google.com/view/subhomoyhaldar/home>

PERSONAL DETAILS

Name: Dr. Subhomoy Haldar
Address: Department of Physics, IIT Kanpur,
Uttar Pradesh, India - 208016
Date of Birth: December 17th, 1990
Nationality: Indian



RESEARCH INTEREST

- Semiconductor physics, single electron devices, and semiconductor-superconductor hybrid devices,
- Light-matter interactions and quantum sensing using quantum wells, wires & dots,
- Microwave (radiofrequency) single photon-detection in circuit-quantum electrodynamics framework,
- Physics and applications of excitonic quasi-particles under a high magnetic field,
- Electronic transport and optical spectroscopy at ultra-low temperatures and high-magnetic fields.

RESEARCH

- 2024 - Present **Assistant Professor**
Department of Physics, Indian Institute of Technology (IIT) Kanpur.
Activity: "Semiconductor QD-based spin qubit devices their control and readout."
- 2023 - 2024 **Researcher: Wallenberg Centre for Quantum Technology (WACQT).**
Lund University, Sweden and Aalto University, Finland.
Project: "Calorimetric detection of 0.1 - 1 meV energy quanta with superconductor-semiconductor hybrids."
Principal Investigators: Prof. Ville F. Maisi & Prof. Jukka Pekola.
- 2020 - 2023 **Postdoctoral Fellow: Wallenberg Centre for Quantum Technology (WACQT).**
Lund University, Sweden.
Project: "Development of microwave photodetector using superconductor-semiconductor hybrids."
Principal Investigator: Prof. Ville F. Maisi.
- 2014 - 2020 **Doctor of Philosophy (Ph.D.) in Physical Science.**
Homi Bhabha National Institute, Raja Ramanna Centre for Advanced Technology, India.
Thesis title: "Magneto-optical transport studies on ultra-low disordered semiconductor quantum wells grown by MOVPE."
Supervisor: Prof. Vijay Kumar Dixit.
- 2013 - 2014 **Master of Science (M.Sc.) Project.**
Indian Institute of Technology (IIT) Hyderabad, India.
Thesis title: "Corner Undercutting in Wet Bulk Micromachining."
Supervisor: Prof. Prem Pal.

EDUCATION

- 2014 - 2020 **Doctor of Philosophy (Ph.D.), Physical Sciences**
Homi Bhabha National Institute, Raja Ramanna Centre for Advanced Technology, India.
Grade: "Excellent" in all five yearly evaluations by doctoral committee.
- 2012 - 2014 **Master of Science (M.Sc.), Physics**
Indian Institute of Technology (IIT) Hyderabad, India.
- 2009 - 2012 **Bachelor of Science (B.Sc.), Physics Honours**
University of Kalyani,
Krishnagar Government College, West Bengal, India.
- 2007 - 2009 **Higher Secondary Education (12th),**
West Bengal Council of Higher Secondary Education (WBCHSE),
Krishnagar Don Bosco High School, West Bengal, India
- 2005 - 2007 **Secondary Education (10th)**
West Bengal Board of Secondary Education (WBBSE),
Krishnagar Don Bosco High School, West Bengal, India

AWARDS AND ACHIEVEMENTS

- Publication as **Editor's Suggestion** in Physical Review Letters (**PRL**) by American Phys. Soc. 2023
- **Outstanding Doctoral Student Award** by Homi Bhabha National Institute, Mumbai, India. 2021
- **Best Ph.D. Thesis Award** by Indian Lasers Association in National Lasers Symposium-29, India. 2021
- **Young Scientist Award** by Madhya Pradesh Council of Science and Technology, Bhopal, India. 2019
- **Best Poster Award** in Condensed Matter Physics under Extreme Conditions, DAE-BRNS Symposium, Mumbai, India. 2016
- **Best Paper Award** in Int. Conf. on Advanced Trends in Eng and Tech, Jaipur, India. 2014
- **Graduate Aptitude Test Engineering (GATE)** Qualified 2014
- **Joint Entrance Screening Test (JEST)** Qualified 2014
- **IIT Hyderabad Merit Cum Means Scholarship** for Master of Science, India. 2012
- **Joint Admission Test for M.Sc. (JAM)** Qualified 2012
- **West Bengal Merit Cum Means Scholarship** for Bachelor of Science, India. 2009
- **Amul Vidya Shree** award for outstanding academic performance in 10th Exam. 2007
- Competed **State Level Water Harvesting Project** in 13th National Children Science Congress. 2005

RESEARCH AND DEVELOPMENT

I developed a simple and low-cost maskless-photolithography system using a projector and a microscope within Rs 2 lakhs during Ph.D.

JOURNAL PUBLICATIONS

1. **S. Haldar**, M. Munk, H. Havir, W. Khan, S. Lehmann, C. Thelander, K.A. Dick, P. Samuelson, P.P. Potts, and V.F. Maisi, "Coherence of an Electronic Two-Level System under Continuous Charge Sensing by a Quantum Dot Detector" **Physical Review Letters** 134, 023601 (2025).
2. **S. Haldar**, D. Barker, H. Havir, A. Ranni, S. Lehmann, K.A. Dick, and V.F. Maisi, "Continuous microwave photon counting by semiconductor-superconductor hybrids" **Physical Review Letters** 133, 217001 (2024).

3. **S. Haldar**, H. Havir, W. Khan, S. Lehmann, C. Thelander, K.A. Dick, and V.F. Maisi, "Energetics of Microwaves Probed by Double Quantum Dot Absorption" **Physical Review Letters** 130, 087003 (2023). [[Editor's Suggestion](#)]
4. **S. Haldar**, D. Zenelaj, P.P. Potts, H. Havir, S. Lehmann, K.A. Dick, P. Samuelsson, and V.F. Maisi, "Microwave power harvesting using resonator-coupled double quantum dot photodiode" **Physical Review B (Lett.)** 109, L081403 (2024).
5. S. Andersson, H. Havir, A. Ranni, **S. Haldar**, and V.F. Maisi, "High-Impedance Microwave Resonators with Two-Photon Nonlinear Effects" **Nature Communications** 16, 552 (2025).
6. A. Ranni, **S. Haldar**, H. Havir, S. Lehmann, P. Scarlino, A. Baumgartner, C. Schönenberger, C. Thelander, K.A. Dick, P. P. Potts, V.F. Maisi, "Dephasing in a crystal-phase defined double quantum dot charge qubit strongly coupled to a high-impedance resonator" **Physical Review Research** 6, 043134 (2024).
7. H. Havir, **S. Haldar**, W. Khan, S. Lehmann, K.A. Dick, C. Thelander, P. Samuelsson, and V.F. Maisi, "Quantum Dot Source-Drain Transport Response at Microwave Frequencies" **Physical Review B** 108, 205417 (2023).
8. A. Ranni, H. Havir, **S. Haldar**, and V.F. Maisi, "High impedance Josephson junction resonators in the transmission line geometry" **Applied Physics Letters** 123, 114002 (2023).
9. **S. Haldar**, V.K. Dixit, G. Vashisht, S.K. Khamari, S. Porwal, T.K. Sharma, and S.M. Oak, "Effect of carrier confinement on effective mass of excitons and estimation of ultralow disorder in $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$ quantum wells by magneto-photoluminescence" **Scientific Reports** 7, 4905 (2017).
10. **S. Haldar**, V.K. Dixit, G. Vashisht, S. Porwal, and T.K. Sharma, "The effect of magnetic field on free and bound exciton luminescence in $\text{GaAs}/\text{AlGaAs}$ multiple quantum well structure: A quantitative study on the estimation of ultra-low disorder" **Journal of Physics D: Applied Physics** 50, 335107 (2017).
11. **S. Haldar**, G. Vashisht, S. Porwal T.K. Sharma, and V.K. Dixit, "Simultaneous magneto-electro-optical measurements in modulation-doped quantum well: an investigation on magneto-photoluminescence intensity oscillations" **Journal of Applied Physics** 125, 205701 (2019).
12. **S. Haldar**, V.K. Dixit, G. Vashisht, S. Porwal, and T.K. Sharma, "Radiative recombination efficiency and effective mass of thermally activated magneto-excitons probed by quasi-simultaneous magneto-photoluminescence and magneto-surface photovoltage spectroscopy" **Journal of Applied Physics** 124, 055704 (2018).
13. **S. Haldar**, A. Banerjee, G. Vashisht, S. Porwal, T.K. Sharma, and V.K. Dixit, "A parallel magnetic field driven confinement versus separation of charges in GaAs quantum well investigated by magneto-photovoltage and magneto-photoluminescence spectroscopy" **Journal of Luminescence** 206, 342 (2019).
14. **S. Haldar**, S. Kumar, R. Roychowdhury, and V.K. Dixit "Photovoltaic Response and Charge Redistribution Processes in $\text{GaAs}/\text{AlGaAs}$ Multiple-Quantum Wells Structure" **Physica Status Solidi B** 257, 2000331 (2020).
15. **S. Haldar**, A. Banerjee, K. Kumar, R. Kumar, G. Vashisht, T.K. Sharma, and V.K. Dixit, "Anisotropic magnetic properties of excitons in GaAs multiple quantum wells" **Superlattices and Microstructures (Continued as Micro and Nanostructures)** 137, 106332 (2020).
16. G Vashisht, S Porwal, **S. Haldar**, and V.K. Dixit "Influence of interface states on built-in electric field and diamagnetic-Landau energy shifts in asymmetric modulation-doped $\text{InGaAs}/\text{GaAs}$ QWs" **Journal of Physics D: Applied Physics** 55, 385101 (2022).
17. G. Vashisht, V.K. Dixit, **S. Haldar**, and T.K. Sharma, "Effect of disorders on the optical properties of excitons in InAsP/InP quantum wells investigated by magneto-photoluminescence spectroscopy" **Journal of Optical Society of America - B** 35, 2405 (2018).
18. P. Pal, **S. Haldar**, S.S. Singh, A. Ashok, X. Yan, and K. Sato, "A detailed investigation and explanation of the appearance of different undercut profiles in KOH and TMAH" **Journal of Micromechanics and Microengineering** 24, 095026 (2014). ([from M.Sc. project](#)).

19. P. Pal, A. Ashok, **S. Haldar**, Y. Xing, and K. Sato, "Anisotropic etching in low-concentration KOH: Effects of surfactant concentration" **Micro & Nano Letters** 10, 224 (2015). ([from M.Sc. project](#)).

UNDER REVIEW/PREPARATION

1. **S. Haldar**, H. Havir, W. Khan, D. Zenelaj, P.P. Potts, S. Lehmann, C. Thelander, K.A. Dick, P. Samuelson, and V.F. Maisi, "High-efficiency microwave photodetection by cavity coupled double dots with single cavity-photon sensitivity" **arXiv:2306.15797** (Under review in Phys. Rev. Appl.).
2. **S. Haldar**, D. Subero, A. Burke, C. Thelander, M. Kumar, Karimi, L. Samuelson, J. Pekola, and V. F. Maisi, "Heat Flow in a Semiconductor Nanowire and Local Thermometry" (Under Preparation).

LIST OF CONFERENCE PUBLICATIONS

Presented in Conferences

1. **S. Haldar**, D. Barker, H. Havir, A. Ranni, S. Lehmann, K.A. Dick, and V.F. Maisi "Continuous microwave photon counter using superconducting cavity-coupled semiconductor quantum dots", International conference on Physics of Semiconductors (ICPS), Ottawa, Canada, July 27 - Aug. 3 (2024). [**Oral Presentation**]
2. **S. Haldar** "Indigenous and inexpensive maskless-photolithography system for semiconductor devices development", 34th Madhya Pradesh Young Scientist Congress - 2019, Bhopal, India, Feb 28 - Mar.1 (2019). [**Oral Presentation**]
3. **S. Haldar**, G. Vashisht, S. Porwal, T.K. Sharma, and V.K. Dixit "Interdependence of magneto photoluminescence and quantum Hall effect in modulation-doped GaAs/AlGaAs quantum well", UK Semiconductors 2019, University of Sheffield, United Kingdom, July 10-11 (2019). [**Oral Presentation**]
4. **S. Haldar**, G. Vashisht, U.K. Ghosh, A. K. Jaiswal, S. Porwal, A. Khakha, T.K. Sharma, and V.K. Dixit "Development of simple cost-effective maskless photolithography system", 63rd DAE - Solid State Physics Symposium, GJUST, Haryana, India, Dec 18-22 (2018). [**Oral + Poster Presentation**]
AIP Conference Proceedings **2115**, 030219 (2019).
5. **S. Haldar**, G. Vashisht, S. Porwal, T.K. Sharma and V.K. Dixit "Effect of magnetic field on the radiative recombination efficiency of excitons and trions in GaAs/AlGaAs quantum well", 27th National Lasers Symposium, Raja Ramanna Centre for Advanced Technology, Indore, India, Dec. 3-6 (2018).
6. **S. Haldar**, G. Vashisht, S. Porwal, T.K. Sharma, and V.K. Dixit "Effect of barrier layer on the effective mass of excitons in GaAs/Al_xGa_{1-x}As QWs investigated via Magneto-PL spectroscopy", 19th International workshop on the physics of semiconductor devices (IWPSD), IIT Delhi, Delhi, Dec.14-17 (2017). [**Oral + Poster Presentation**]
7. **S. Haldar**, G. Vashisht, S. Parwal, S.K. Khamari, and V.K. Dixit, T.K. Sharma and S.M. Oak "Role of disorder and multi-valley scattering on the dynamics and effective mass of excitons in Al_xGa_{1-x}As/GaAs quantum wells investigated by magneto-photoluminescence" Condensed Matter Physics Under Extreme Condition-Symposium, Bhabha Atomic Research Centre, Mumbai, India, Apr 13-16 (2016). [**Oral + Poster Presentation**]
8. **S. Haldar**, A. Ashok, and P. Pal "An experimental investigation on the appearance of different planes at convex corner In TMAH and KOH solutions" International Conference on Advanced Trends in Engineering and Technology, Arya Institute of Engineering & Technology, Jaipur, India, Apr. 18-19 (2014). [**Oral Presentation**]
Proceeding of ICATET-2014, ISBN: 978-81-925882-2-3 (2014)
9. G. Vashisht, **S. Haldar**, S. Porwal, T. K. Sharma and V. K. Dixit, "Impact of disorder on the charge carrier transport and recombination properties in asymmetrically doped InGaAs/GaAs QWs probed by magneto-PL and PC measurements", 21st International Workshop on Physics of Semiconductor Devices (IWPSD), IIT Delhi, Dec.14-17 (2021).

10. G. Vashisht, **S. Haldar***, S. Porwal, R. Kumar, V.K. Dixit “*Electric and Magnetic Field Effects on the Exciton Localization in a Modulation Doped InGaAs/GaAs Quantum Well*” 64th DAE-Solid state Physics Symposium, Indian Institute of Technology Jodhpur, India (2019) [***Presenting Author**]
AIP Conference Proceedings **2265**, 030483 (2020).
11. G. Vashisht, V. K. Dixit, **S. Haldar** and T. K. Sharma, “*Effect of magnetic field on the photoluminescence efficiency of free/bound excitons in InAsP/InP QWs*”, 30th Annual General Meeting of MRSI and 1st Indian Materials Conclave IISc Bangalore, Feb.12-15 (2019).
12. H. Darji, G. Vashisht, R. Roychowdhury, **S. Haldar**, S.K. Khamari, V.K. Dixit, and T.K. Sharma “*Role of Surface and Interface States on the Performance of GaAs Based Photodetectors*” Prof. Dinesh Varshney Memorial National Conference on Physics and Chemistry of Materials, Indore, India (2018).
AIP Conference Proceedings **2100**, 020059 (2019).
13. E. R. Aarathy, G. Vashisht, **S. Haldar**, R. Roychowdhury, T.K. Sharma, and V.K. Dixit “*Development of Symmetric and Asymmetric Waveguide Laser Diode Arrays*” 27th National Lasers Symposium, Raja Ramanna Centre for Advanced Technology, Indore, India (2018).
14. G. Vashisht, **S. Haldar**, S. Porwal, R. Kumar, T. K. Sharma and V. K. Dixit, “*InAsP/InP multiple quantum well based IR detectors with enhanced spectral photoresponse*”, 19th International Workshop on Physics of Semiconductor Devices (IWPSD), IIT Delhi, Dec.11-15 (2017).

Presented in Meetings/Contributory talks

1. **S. Haldar** “Detection of a single microwave photon using semiconductor-superconductor hybrids: experimental and fundamental challenges” *University of Copenhagen, Niels Bohr Institute, Denmark, Oct. 10th (2024)* [**Invited Talk**]
2. **S. Haldar**, D. Subero, A. Burke, C. Thelander, M. Kumar, Karimi, L. Samuelson, J. Pekola, and V. F. Maisi, "Heat Flow in a Semiconductor Nanowire and Local Thermometry. *NanoLund Annual Meeting-2024*, Lund University, Sweden, Oct 8th (2024). [Poster]
3. **S. Haldar** “Detection of a single microwave photon using cavity-coupled semiconductor quantum dots” *UGC-DAE-CSR, Indore, March 4th, 2024*
Raja Ramanna Centre for Advanced Technology (RRCAT), Indore, India, March 5th, 2024
Saha Institute of Nuclear Physics (SINP), Kolkata, India, March 7th, 2024
Indian Institute of Technology (IIT) Bombay, Mumbai, India, March 12th, 2024
Indian Institute of Science Technology and Research (IISER) Pune, India, March 13th, 2024
Tata Institute of Fundamental Research (TIFR) Mumbai, India, March 15th, 2024
Indian Institute of Technology (IIT) Hyderabad, India, March 18th, 2024
Indian Institute of Science (IISc), Bangalore, India March 19th 2024. [**Contributory Oral Presentations**]
4. **S. Haldar** D. Barker, H. Havir, A. Ranni, S. Lehmann, K.A. Dick, and V.F. Maisi “One photon at a time: Detection of individual microwave photons using cavity-coupled quantum dots” *NanoLund Annual Meeting-2023*, Lund University, Sweden (2023). [**Invited Talk**]
5. **S. Haldar**, D. Barker, H. Havir, A. Ranni, S. Lehmann, K.A. Dick, and V.F. Maisi “Towards continuous and efficient microwave photon-counter using semiconductor-superconductor hybrids” *Department of Physics, Aalto University, Finland, June 31st (2022)*. [**Invited Talk**]
6. **S. Haldar**, D. Barker, H. Havir, A. Ranni, S. Lehmann, K.A. Dick, and V.F. Maisi, “Towards continuous and efficient microwave photon-counter using semiconductor-superconductor hybrids” *Wallenberg Centre for Quantum Technology Annual Meeting*, Chalmers University, Sweden, Nov 10th (2022). [**Invited Talk**]
7. **S. Haldar**, D. Zenelaj, P.P. Potts, H. Havir, P. Samuelsson, and V.F. Maisi “Microwave power harvesting using cavity coupled double quantum dots”, *Nano Lund Annual meeting 2022*, Lund University, Sweden, Oct 11th (2022).
8. **S. Haldar**, G Vashisht, S. Porwal, T.K. Sharma and V.K. Dixit “Interdependence of magneto-photoluminescence and quantum Hall effect in modulation-doped GaAs/AlGaAs quantum well”, *Contributory talk, Department of Physics, Lancaster University, United Kingdom, July (2019)*. [**Contributory Oral Presentation**]

OTHER REPORTS

1. **S. Haldar** and V.K. Dixit “Physics and applications of semiconductor quantum wells under high magnetic field” **RRCAT News Letter**, 34 (1), 32-39 (2021).
2. V.K. Dixit, S.K. Khamari, S. Porwal, A. Chatterjee, G. Vashisht, **S. Haldar**, A. Khakha, V. Agnihotri, R. Kumar, T.K. Sharma, and KS Bindra “Investigation into the complexities in active region of quantum well laser diode arrays”, **Kiran: A Bulletin of the Indian Laser Association** 28, (2016).

SKILLS AND EXPERIENCE

- **Proficient in Nano-fabrication in cleanroom and expertise in the following systems:**
 - o Electron-beam lithography (EBL) [Raith – Voyager],
 - o Mask-aligner (MJB4) & maskless-photolithography [Self-made, Heidelberg MLA 150],
 - o Focused Ion Beam lithography [FEI Nova],
 - o Scanning electron microscopy (SEM) [Zeiss Leo, Hitachi],
 - o Oxide deposition by e-beam evaporators & Atomic Layer Deposition [ALD Picosun Sunale R-100],
 - o Thermal/e-beam evaporators [Temescal FC 2000] & lift-off/etch back method,
 - o Sputtering of superconducting thin films (Nb, Al, etc) [AJA Orion 5]
 - o Isotropic/anisotropic wet etching of semiconductors, metals and oxides [BOE, KOH, TMAH],
 - o Reactive Ion Etching [Trion T2], sample Dicer [Disco DAD 3320] and Wire Bonding.
- **Experienced in handling semiconductor nanowires and quantum dots,**
- **Experienced working with Dilution Refrigerators** $T \approx 10$ mK [Bluefors LD-series], **Dewar based Liquid Helium cryostat** $T > 1.6$ K [Janis SVT-2513-DMI] and **closed-cycle cryostat** $T > 8$ K:
 - o Radio Frequency (RF) spectroscopy and low-noise electrical transport measurements,
 - o Visible-Infrared photoluminescence, surface-photovoltage, photo-current, etc.,
 - o Classical and quantum Hall measurements.
- **Proficient in handling RF and optical components for spectroscopy under a high magnetic field:**
 - o RF reflectometry using heterodyne circuits,
 - o Photoluminescence, Surface photovoltage, Photocurrent, electro-chemical capacitance-voltage, etc.
- **Growth and structural characterization:**
 - o Metal-organic vapor phase epitaxy growth (MOVPE): basic operation,
 - o Cross-sectional transmission electron microscopy (TEM),
 - o Scanning tunneling microscopy (STM),
 - o Fourier-transform infrared spectroscopy (FTIR),
 - o High-resolution x-ray diffraction measurements (HRXRD) [data analysis].
- **Software Knowledge:** Proficient in Layout-Editor for mask preparation, Sonnet and HFSS high frequency simulator, Expert-epitaxy for HRXRD data analysis, Band-Engineering software, Adobe-Photoshop, Origin-pro, Latex, basic programming skills in MATLAB, Windows, and Microsoft office.

REVIEWER

1. **Reviewer of Journal of Applied Physics**, American Institute of Physics (AIP) publishing.
2. **Reviewer of RSC Applied Interfaces**, Royal Society of Chemistry (RSC) publishing.
3. **Reviewer of MDPI Micromachines**, MDPI publishing.
4. **Thesis Reviewer: M.Sc. thesis by Mattis Hallen**, Title: “Microwave Simulations of Superconducting Circuits using Coupled Scattering Parameter Calculation and Contour Integration”, Lund University, Sweden