Graduate Student,
Indian Institute of Science Education and Research Bhopal,
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Bhaskar De

Curriculum Vitæ

Personal Information

Date of birth: July 22, 1997
Nationality: Indian
Work area: Two - Dimensional Coherent Spectroscopy
Languages: English, Bengali, Hindi

Research Interests

- Ultrafast and multidimensional coherent spectroscopy
- Ultrafast laser pulse shaping
- Machine learning for spectral analysis

Education

2020 – Present **Indian Institute of Science Education and Research (IISER) Bhopal**, India.
Ph.D. in Physics.
Thesis Advisor: Dr. Rohan Singh
Topic: Computational and Experimental Advancements in Optical Two-Dimensional Coherent Spectroscopy
Expected: March, 2026

2018 – 2020 **Indian Institute of Technology (IIT) Madras**, India.
M.Sc. in Physics.
GPA 8.47/10.0

2015 – 2018 **Ramakrishna Mission Residential College (Autonomous)**, affiliated to University of Calcutta, India.
B.Sc. (Hons.) in Physics.
Graduated with First Class Honours

Publications

- **Bhaskar De**, Pradeep Kumar, Krishna. K. Maurya, Rishabh Tripathi, and Rohan Singh, **"Quantitative Lineshape Analysis for Arbitrary Inhomogeneity in Two-Dimensional Coherent Spectroscopy"**, *Optics Letters*, **50**, 4502-4505 (2025).
- Pradeep Kumar[†], **Bhaskar De**[†], Rishabh Tripathi, and Rohan Singh, **"Exciton-exciton interactions: A quantitative comparison between complementary phenomenological models."** *Physical Review B*, **109**, 155423 (2024). ([†] Equal contribution)
- Rishabh Tripathi, Krishna. K. Maurya, Pradeep Kumar, **Bhaskar De**, and Rohan Singh, **"Coherent nonlinear optical response for high-intensity excitation."** *The Journal of Chemical Physics*, **162**, 114111 (2025).

Research Experience

- Designed and assembled collinear multidimensional coherent spectroscopy setup, including precise beam alignment, temporal compression, spectrum shaping, and four-wave mixing signal detection
- Gained extensive experience with femtosecond laser amplifiers and optical parametric amplifiers (OPA)
- Developed laser-scanning bright-field reflection microscopy to carry out spatially resolved 2DCS experiments
- Used ultrafast pulse characterization methods (intensity autocorrelation, FROG) to improve time-resolved experiments and achieve sub-60 fs resolution; applied spatial light modulators and grating-based compressors for pulse shaping.
- Applied computational and machine-learning approaches to simulate lineshape simulations, analysis, and modeling exciton–exciton interactions.
- Mentored five Master's students on projects involving ultrafast optics, experimental alignment, and simulations.

Experimental Skills

2DCS Setup	Passive phase-stabilized collinear 2D coherent spectroscopy with a 50 kHz pulsed laser; four-wave mixing detection.
Pulse Shaping	SLM-based spectral/temporal pulse shaping; grating-based dispersion control; vortex beam generation.
Pulse Characterization	Intensity autocorrelation; SHG-FROG.
Microscopy & Imaging	Laser-scanning bright-field reflection microscopy; transmission microscopy.
Cryogenics & Optical Techniques	Low-temperature photoluminescence and absorption spectroscopy (down to 4.2 K).

Technical Skills

Programming Languages	Python, Fortran, MATLAB, Mathematica
Software	LabVIEW, Inkscape, Blender
Computational Techniques	Parallel Computing, Machine Learning, Deep Learning, Neural Networks

Academic Achievements

2025 **APS-DLS Travel Award**, APS-Division of Laser Science

Awarded by the Division of Laser Science of the American Physical Society to support participation in CLEO 2025.

2025 **ANRF International Travel Grant**, Anusandhan National Research Foundation, India

Awarded by the Anusandhan National Research Foundation to support international conference travel to CLEO 2025.

2021 – Present **Prime Minister's Research Fellowship (PMRF)**, IISER Bhopal

Awarded by the Ministry of Education, Government of India, for outstanding research potential in science and engineering. The fellowship provides significant financial support and a research grant for conducting doctoral research.

2022 **PMRF Annual Review Commendation**, IIT Madras

Graded "Recommended with Commendation" during the 2022 PMRF annual review, leading to an invitation to present a highlighted poster at the 2023 PMRF Annual Symposium, IIT Madras.

2020 – 2021 **Junior Research Fellowship (JRF)**, IISER Bhopal

Funded by the Council of Scientific and Industrial Research (CSIR), Government of India. Conducted research in the field of spectroscopy, focusing on two-dimesnional coherent spectroscopy.

2018 – 2020 **Competitive Exam Qualifications**

Qualified **GATE**, **JEST**, **CSIR-NET JRF**, and **IIT JAM** – All-India competitive exams for postgraduate and doctoral studies in Physics.

2015 – 2020 **INSPIRE Scholarship**, Government of India

Awarded for ranking in the top 1% of the West Bengal Council of Higher Secondary Education (WBCHSE) Higher Secondary Examination in 2015. This scholarship supports students pursuing higher education in science and engineering.

Conference Presentations

May 2025 **Poster**: "Two-Dimensional Coherent Spectroscopy with Arbitrary Inhomogeneous Broadening: Simulations and Analysis." Presented at **CLEO 2025**, Long Beach, CA, United States.

March 2025 **Talk**: "Simulating Two-Dimensional Coherent Spectroscopy with Arbitrary Inhomogeneity Beyond Gaussian Distributions." Presented at **APS Global Physics Summit 2025**, Anaheim, CA, United States.

August 2024 **Poster**: "Two-Dimensional Coherent Spectroscopy Simulations with Arbitrary Inhomogeneous Distribution." Presented at **CLEO Pacific Rim 2024**, Incheon, South Korea.

February 2023 **Highlighted Poster**: "Investigation for the Method of Including Random Inhomogeneity in Simulated 2D Spectra." Presented at the **PMRF Annual Symposium 2023**, IIT Madras, Chennai, India.

November 2022 **Poster**: "Comparative Study of Complementary Many-Body Interaction Models for Two-Dimensional Excitons." Presented at the DAE-BRNS 9th Theme Meeting on Ultrafast Sciences (**UFS 2022**), IISER Thiruvananthapuram, Thiruvananthapuram, India.

Teaching Assistantship

IISER Bhopal Waves and Optics, General Physics Laboratory-I, Experimental Techniques, Physics Laboratory II, Basic Electronics

National Programme on Technology Enhanced Learning (NPTEL)
- NOC22-PH42, Numerical Methods and Simulation Techniques for Scientists and Engineers - 8 Weeks Course
- NOC23-PH02, Physics through Computational Thinking - 8 Weeks Course
- NOC23-PH33, Introduction to Laser - 12 Weeks Course
- NOC24-PH13, Physics through Computational Thinking - 8 Weeks Course

RKMRC Narendrapur
- "MATLAB BASICS" at RKMRC, Narendrapur, Kolkata
- "Python Program and Applications" at RKMRC, Narendrapur, Kolkata