Kaustav Mukherjee

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Education

Degree	**Doctor of Philosopy (Ph.D.) in Physics**
Fellowship	Prime Minister's Research Fellow
Period	August 2019 — July 2023
Title	Quantum network tomography using Rydberg gases
Advisor	Dr. Sebastian Wüster
University	Indian Institute of Science Education and Research Bhopal, India

Degree	**Master of Science (M.S.) in Physics**
Period	August 2016 - May 2019
Title	Quantum Dynamic simulations using Rydberg gases
Advisor	Dr. Sebastian Wüster
CGPA	9.75
University	Indian Institute of Science Education and Research Bhopal, India

Degree	**Bachelor of Science Hons. (B.Sc[H]) in Physics**	
Period	August 2013 - May 2016	
Score	87.9%	
University	University of Delhi	New Delhi, India

Degree	**High School - Senior Secondary Board (CBSE)**	
Year	June 2013	
Score	91.4%	
School	The Air Force School	New Delhi, India

List of Publications

Title	**Two-Dimensional Spectroscopy in Rydberg gases**
Authors	K. Mukherjee, H. P. Goswami, S. Whitlock, S. Wüster and A. Eisfeld
Journal	New Journal of Physics **22**, 073040 (2020)

Title	**Trapping and binding by dephasing**
Authors	K. Mukherjee, S. Poddar and S. Wüster
Journal	Phys. Rev. A (Letters) **105**, L041102 (2022)

Title	**Excitons guided by polaritons**
Authors	K. Mukherjee and S. Wüster
Journal	arXiv/2304.14951

Title	**Symmetry of surfaces for linear fractional group**
Authors	K. Mukherjee and L. Kundu
Journal	arxiv/2205.05724

Title	**Quantum network coherence tomography using Machine Learning**
Authors	K. Mukherjee, S. Whitlock and S. Wüster
Journal	(To be submitted)

Research Projects

Title	**Quantum network coherence tomography using Machine learning**
	The project explores to what extent the characteristic features of an open quantum system can be extracted by a Neural network based on the excitation transport properties.

Title	**Trapping and binding by dephasing**
	The objective of the project is to demonstrate a Particle-in-a-box scenario replacing the potential well by a spatially selective decoherence channel resulting in trapping or binding of atoms by dephasing alone.

Title	**Two-Dimensional Spectroscopy in Rydberg gases**
	The project proposes a testing platform to simulate 2D spectroscopy on Rydberg atoms with two objectives: Firstly, to benchmark the complex 2D technique on simpler models and secondly, to introduce it to the ultra-cold regime.

Title	**Excitons guided by polaritons**
	The project targets at the design of an experimentally realisitic system displaying high-fidelity quantum transport of excitons solely guided by measurement induced decoherence of polaritons.

Title	**Interference pathways distinguishing Classical and Quantum distribution**
	The project aims explores a platform to distinguish classical and quantum mechanical distributions of atomic positions using the interference in the excitation transport pathways in the system.

Awards and Scholarships

- Prime Minister's Research Fellowship (PMRF) for pursuing Ph.D.
- Department of Science & Technology (DST) Fellowship for pursuing M.S.
- Air Force Welfare Association (AFWWA) Scholarship for pursuing B.Sc.
- Secured perfect 10 SPI in three consecutive semesters of M.S.
- Qualified CSIR-NET JRF 2018 with All India Rank 116.
- Qualified GATE 2018 with All India Rank 1170.
- Qualified JEST 2016 and '17 with All India Rank 209 and 182, respectively.
- Qualified IIT-JAM 2016 with All India Rank 256.
- 1st Position award in college in B.Sc. (Hons.) Physics.
- 1st Position award in inter-school Heptathlon competition on physics experiment (2012).
- 3rd Position award in National Level Examination of Abacus and Mental Arithimetic (2009).

Conferences and Schools

Sep 2021	**Conference**	
Name	QUANTUMatter 2022	
Organizer	Phantoms Foundation	Barcelona, Spain
Presented	Poster on "Trapping and Binding by dephasing"	
Sep 2021	**Conference**	
Name	Virtual DPG Spring Conference - Atomic, Molecular, Plasma Physics and Quantum Optics Section (SAMOP) 2021	
Organizer	Deutsche Physikalische Gesellschaft (DPG)	Germany
Presented	Poster on "Two-Dimensional Spectroscopy in Rydberg gases"	
May 2021	**Summer School**	
Name	Trapped Atoms, Molecules and Ions (TAMIONs)	
Organizer	International Centre for Theoretical Sciences (ICTS)	Bengaluru, India
Nov 2020	**Symposium**	
Name	Quantum simulations of molecular energy transport	
Organizer	Jointly by University of. Strasbourg, France & IISER Bhopal, India under CEFIPRA	
Presented	Talk on "Quantum dynamic simulations using Neural Networks and Two-dimensional Spectroscopy in Rydberg gases"	

Dec 2019	**Conference**	
Name	International Conference on Atomic, Molecular, Optical and Nano Physics with Applications (CAMNP 2019)	
Organizer	Delhi Technological University (DTU)	New Delhi, India
Presented	Poster on "Two-Dimensional Spectroscopy in Rydberg gases"	
Oct 2018	**Workshop**	
Name	Dynamics of Ultracold systems with embedded Highly-excited Rydberg atoms (DUSSEHRA 2018)	
Organizer	IISER Bhopal under Max Planck-IISER partner group	Bhopal, India
Presented	Poster on "Quantum state tomography"	
June 2017	**Summer School**	
Name	Buoyancy Driven flows	
Organizer	International Centre for Theoretical Sciences (ICTS)	Bengaluru, India
June 2017	**Winter School**	
Name	Solar Astrophysics	
Organizer	Indian Institute of Astrophysics (IIA)	Kodaikanal, India

Technical Strengths

Programming Languages	C++, MPI, Python, XMDS, Fortran 90
Software & Tools	MATLAB, Mathematica, LaTex, Office, Inkscape, Machine Learning (Tensorflow - Python)
Languages	Bengali (native), English (fluent), Hindi (fluent)

Teaching Experience

Summer 2018	Volunteer teacher for class 8th and 9th on eVidyaloka.
Autumn 2019	Tutor for the course on "Waves and Optics"
Spring 2020	Tutor for the course on "Numerical methods and programming"
Autumn 2020	Tutor for the course on "Quantum Mechanics - I"
Spring 2021	Tutor for the course on "Physics through Computational Thinking"
Spring 2022	Tutor for the course on "Computational Applications" at School of Planning and Architecture, Bhopal.
Autumn 2022	Tutor for the NPTEL course on "Advanced Quantum Mechanics with Applications" for Prof. Saurabh Basu at IIT Guwahati
2019-2022	Co-supervised three M.S. students at IISER Bhopal

Referees

Referee 1	**Dr. Sebastian Wüster**
Address	Department of Physics, Indian Institute of Science Education and Research (IISER) Bhopal Bhopal Bypass Road, Bhauri Bhopal - 462066, M.P. India
E-mail	sebastian@iiserb.ac.in
Phone	+91-755-669-1213

Referee 2	**Prof. Shannon Whitlock**
Address	8 allée Gaspard Monge BP 70028 F-67083 Strasbourg Cedex, France
E-mail	whitlock@unistra.fr
Phone	+33 (0)3 68 85 51 64

Referee 3	**Prof. Subhash Chaturvedi**
Address	Department of Physics, Indian Institute of Science Education and Research (IISER) Bhopal Bhopal Bypass Road, Bhauri Bhopal - 462066, M.P. India
E-mail	subhash@iiserb.ac.in
Phone	+91 755 269 1201