Abhirup Mukherjee | Doctoral Researcher

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Research Experience

Indian Institute of Science Education and Research Kolkata, India | Prof. Siddhartha Lal — Doctoral Research
Study of Mott transitions and non-Fermi liquids through Kondo breakdown — *2021 - ongoing*

Indian Institute of Science Education and Research Kolkata, India | Prof. Siddhartha Lal — M.Sc. Thesis
Unitary renormalisation group study of an extended Anderson impurity model — *2020 - 2021*

Ramakrishna Mission Vidyamandira, India | Prof. Pushpajit Halder — B.Sc. Final Year Project
The EPR paradox: Entangled states — *2018*

Publications and Preprints

Mott Criticality as the Confinement Transition of a Pseudogap-Mott Metal — July 2025
Abhirup Mukherjee, S R. Hassan, A Mukherjee, N S. Vidhyadhiraja, A Taraphder, S Lal — **arXiv:2507.17201**

Revealing the magnetic dimensional crossover in the Heisenberg ferromagnet $CrSiTe_3$ through picosecond strain pulses — April 2025
A Kumar N M, S Mukherjee, **Abhirup Mukherjee**, A Punjal, S Purwar, T Setti, S Prabhu S., S Lal, N Kamaraju — **Phys. Rev. B 111, L140414**

Holographic entanglement renormalisation for fermionic quantum matter — June 2024
Abhirup Mukherjee, S Patra, S Lal — **J. Phys. A: Math. Theor. 57 275401**

Kondo frustration via charge fluctuations: a route to Mott localisation — November 2023
Abhirup Mukherjee, N S Vidhyadhiraja, A Taraphder, S Lal — **New J. Phys. 25 113011**

Frustration shapes multi-channel Kondo physics: a star graph perspective — May 2023
S Patra, **Abhirup Mukherjee**, A Mukherjee, N S Vidhyadhiraja, A Taraphder, S Lal — **J. Phys.: Condens. Matter 35 315601**

Unveiling the Kondo cloud: Unitary renormalization-group study of the Kondo model — February 2022
A Mukherjee, **Abhirup Mukherjee**, N S. Vidhyadhiraja, A Taraphder, S Lal — **Phys. Rev. B 105, 085119**

Ongoing Projects

Punctured-Chern invariant at IQHE plateau-to-plateau transitions: A unitary RG study
Abhirup Mukherjee, S Pujari, S Lal

Some universal features of Kondo breakdown: Insights into Mott criticality
D Debata, **Abhirup Mukherjee**, S Lal

Kondo breakdown as a measurement-driven entanglement transition
D Debata, **Abhirup Mukherjee**, S Lal

Quantum criticality in a three-orbital impurity model
D Debata*, A Kumar*, **Abhirup Mukherjee**, S Lal

Education

Indian Institute of Science Education and Research (*IISER*) Kolkata, India — **M.Sc. + Ph.D. in Physics**
CGPA: 9.61 — *2018 - ongoing*

Ramakrishna Mission Vidyamandira (Autonomous), University of Calcutta, India — **B.Sc. in Physics (Hons.)**
CGPA: 9.22 — *2015 - 2018*

Technical Skills

- Field theory-based techniques (unitary renormalisation group method) and *low-energy Hamiltonian* methods
- Computation of two-point and multi-point *correlation functions and entanglement measures* in fermionic systems
- Numerical computation of dynamical correlations (spectral function, self-energy, etc) using exact diagonalisation
- Julia and python for numerical computation

Talks and Poster Presentations

- Poster: 7th Annual Conference on Quantum Condensed Matter — December 2024, IIT Guwahati
- Poster: Young Investigators Meet on Quantum Condensed Matter Theory — December 2023, IISER Bhopal
- Poster: Conference on Emergent phenomena in Quantum MATerials — October 2022, IIT Roorkee
- Talk on *Insights On The Pseudogap In 2D From An Impurity Model* at DPS Day, Department of Physical Sciences — June 2025, IISER Kolkata
- Talk on *Kondo Effect and Its Breakdown: Interplay of Fluctuations in Zero Dimensions* at PP65: Physics Trends at IISER Kolkata — June 2023, IISER Kolkata

Teaching Experience

Teaching Assistantship at IISER Kolkata

- Condensed Matter Physics II (2022). Instructor: Prof. Siddhartha Lal
- Quantum Mechanics. (2023) Instructor: Prof. Siddhartha Lal
- Computational Physics (2024). Instructor: Prof. Rangeet Bhattacharyya

Awards and Honours

- Qualified *CSIR-UGC NET* with All India Rank (AIR) 59 (Dec 2018)
- Gold medallist, National Graduate Physics Examination (*NGPE*) - 2018
- Qualified *JAM* (AIR 10) and *JEST* (AIR 21) — national-level entrance exams for M.Sc/Ph.D. in India
- Silver medallist, *B.Sc. (Hons.)*, Ramakrishna Mission Vidyamandira, University of Calcutta, (2015-2018)

References

Prof. Siddhartha Lal (*Ph.D. advisor*)
Department of Physical Sciences, IISER Kolkata, India
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Prof. A Taraphder
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