Jeet Shah
Doctoral Candidate

University of Maryland
College Park, Maryland
Condensed Matter Physics

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in Linkedin

EDUCATION

2021 – **University of Maryland**, *Doctor of Philosophy (Physics)*, GPA 4.0/4.0
Advisors: Prof. Alexey Gorshkov and Prof. Victor Galitski
Selected courses: Quantum Error Correction (Audit), Machine Learning for Physicists, Topological Quantum Phases of Matter.

2016 – 2020 **Indian Institute of Science, Bangalore**, *Bachelor of Science in Physics (Research)*, GPA 9.7/10.0
Thesis Advisor: Prof. Subroto Mukerjee
Selected courses: Quantum Statistical Field Theory, Advanced Mathematical Methods, Condensed Matter Physics 1 & 2.

RESEARCH & TEACHING EXPERIENCE

2021 – **University of Maryland, Department of Physics**, *Research Assistant*
Affiliations:
▶ Joint Quantum Institute (JQI)
▶ Joint Center for Quantum Information and Computer Science (QuICS)

2021 **University of Maryland, Department of Physics**, *Teaching Assistant*
TA for General Physics: Electrodynamics, Light, Relativity and Modern Physics course.

2020 **Indian Institute of Science, Bangalore**, *Project Assistant*
Supervisor: Prof. Subroto Mukerjee

2019 **Technical University of Munich**, *Summer Researcher*, DAAD-WISE scholar
Supervisor: Prof. Sergej Moroz. Resulted in publication [2].

2017 - 2020 **Indian Institute of Science, Bangalore**, *Undergraduate researcher*, KVPY fellow
▶ (2019-2020) Supervisor: Prof. Subroto Mukerjee. Resulted in publication [1].
▶ (2018) Supervisor: Prof. Subroto Mukerjee. Numerical calculation of electromagnetic fields from the topological magneto-electric effect in Python.
▶ (2018) Supervisor: Prof. Manish Jain. Monte Carlo simulation of Ising model with long-range interactions in Python.
▶ (2017) Supervisor: Prof. H. R. Krishnamurthy. Ran a few quantum algorithms on IBM's cloud quantum computers.

RESEARCH PROJECTS

[6] Instability of the mixed cluster-state to strong-weak spontaneous symmetry breaking (SSB) (Manuscript in preparation).
Authors: **Jeet Shah,** Christopher Fechisin, Cheng-Ju Lin, Brayden Ware, Joseph T. Iosue, James D. Watson, Yu-Xin Wang, Yan-Qi Wang, Alexey V. Gorshkov.
Proposed a parent Lindbladian whose steady state is the mixed cluster-state which is in a mixed-state SPT. Studied the effects of perturbations to the parent Lindbladian using DMRG (ITensors library in Julia).

[5] Quantum monomer-dimer model on the Penrose tiling (Manuscript in preparation).
Authors: **Jeet Shah,** Gautam Nambiar, Alexey V. Gorshkov, and Victor Galitski.
Proposed a Rokhsar-Kivelson potential term that makes the quantum monomer-dimer model exactly solvable. Calculated the correlators at the exactly solvable point using Monte Carlo (in Julia).

[4]   Renormalization Group (RG) scheme for field theories on loops (Manuscript in preparation).
      Authors: **Jeet Shah***, Gautam Nambiar*, Alexey V. Gorshkov, and Victor Galitski.
      Outlined a procedure that computes the outcome of coarse-graining and rescaling of a theory in
      which the degrees of freedom live on extended loops as opposed to points. Applied our procedure
      on the $U(1)$ gauge theory in $3+1$ dimensions and recovered the confinement-deconfinement
      transition.
      *Equal contribution

[3]   Quantum spin ice in three-dimensional Rydberg atom arrays (10.48550/arXiv.2301.04657).
      Authors: **Jeet Shah**, Gautam Nambiar, Alexey V. Gorshkov, and Victor Galitski.
      Proposed realization of a $U(1)$ quantum spin liquid in 3D Rydberg atom arrays. Also proposed
      various correlators that can distinguish the quantum spin liquid from ordered phases. Provided
      protocols to measure these correlators.

[2]   Gauging the Kitaev Chain (SciPost Phys. **10**, 148 (2021), 10.48550/arXiv.2010.00607).
      Authors: Umberto Borla, Ruben Verresen, **Jeet Shah**, and Sergej Moroz.
      Gauged the fermion parity of the Kitaev chain and studied the resulting model using DMRG
      (TenPy library in Python). Showed that the Higgs phase exhibits fermionic Symmetry Protected
      Topological (SPT) order distinct from the Kitaev chain.

[1]   Renormalization Group study of systems with quadratic band touching (Phys. Rev. B **103**,
      195118, 10.48550/arXiv.2011.00249).
      Authors: **Jeet Shah**, and Subroto Mukerjee.
      Studied perturbative effects of interactions in two two-dimensional systems with a quadratic band
      touchings were studied using the renormalization group (RG) at one-loop level. Showed that the
      system has an instability towards exciton condensatation for repulsive interactions.

POSTERS

Quantum spin ice in three-dimensional Rydberg atom arrays, based on [3]
▶ 2024 – Ultra Quantum Matter Annual Meeting at Flatiron institute, New York
▶ 2023 – Conference on Fractionalization and Emergent Gauge Fields in Quantum Matter at
   ICTP, Italy
▶ 2023 – APS March meeting
▶ 2023 – Robust Quantum Simulation (RQS) Institute Workshop at University of Maryland

TALKS

Quantum spin ice in three-dimensional Rydberg atom arrays, based on [3]
▶ 2024 – Robust Quantum Simulation (RQS) Journal Club
▶ 2023 – APS March meeting
▶ 2022 – Friday Quantum Seminar at Joint Quantum Institute (JQI), UMD

HONOURS AND OTHER ACTIVITIES

2023 –	Member of the Graduate Student Colloquium Committee Every semester the committee invites and hosts a speaker for a colloquium at UMD.
2019	DAAD-WISE scholarship. Awarded by the German Government.
2016 – 2020	KVPY scholarship. Awarded by the Indian Government.
2016	All India Rank of 146 in the Advanced Joint Entrance Examination (JEE) in India.

SKILLS

Programming	Julia, Python, C, C++, Mathematica, LaTeX, Git