

Budhaditya Chatterjee

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Professional Experience

- **2023-present:** Assistant Professor - Department of Physics, Asansol Girls' College, Kazi Nazrul University
- **2021-present:** Associate Professor - University Institute of Sciences, Department of Physics, Chandigarh University
- **2015-2021:** DST-Inspire Faculty - Indian Institute of Technology Kanpur
- **2014-2015:** Postdoctoral Researcher - Department of Physics and Astronomy, Seoul National University
- **2013-2014:** Research Associate - Indian Association for the Cultivation of Sciences, Kolkata
- **2011-2012:** Postdoctoral Researcher - Center for Optical Quantum Technologies, University of Hamburg

Education

- **2007-2011:** Ph.D - University of Heidelberg, Germany
Thesis: Tunneling dynamics of ultracold few-boson systems in double-well traps
Advisor: Prof. Dr. Lorenz S. Cederbaum
Prof. Dr. Peter Schmelcher
Distinction: Magna cum laude
- **2006-2007:** Junior Research Fellow - Indian Institute of Technology, Kharagpur, India
- **2004-2006:** Master of Science (M.Sc.)- Indian Institute of Technology, Kharagpur, India.
- **2001-2004:** Bachelor of Science (B.Sc.) - Presidency College, University of Calcutta, India.

Awards and Achievements

- **2015:** Inspire Faculty Fellowship, Department of Science and Technology (DST), Government of India
- **2014:** BK Postdoctoral Fellowship, BK21 PLUS Frontier Physics Research Division, Seoul National University.
- **2011:** Landesexzellenzinitiative Hamburg financed by the Science and Research Foundation Hamburg and supported by Joachim Herz Stiftung.
- **2007:** International Max Planck Research School for Quantum Dynamics (I.M.P.R.S-Q.D.) Fellowship.
- **2006:** Council for Scientific and Industrial Research, India, CSIR-NET Junior Research Fellowship.

Current Research Interest

- Bose-Einstein condensation
- Theory of ultracold atom and quantum gases.
- Development of numerical methods for quantum systems
- Applied Machine learning in physics

Technical Expertise

- **Numerical Method:** Experienced in **Multi-Configuration Time Dependent Hartree Method for Boson (MCTDHB)** - a highly efficient ab-initio quantum many-body method.
- **Computing:** C, Fortran, Python, Matlab, Mathematica, Bash scripting.
- **Machine learning:** Regression, Classification, Clustering, Time-Series, Neural Network

Research Grant

- **Research Grant:** DST Inspire Faculty Grant
Funding Agency: Department of Science and Technology, Government of India
Project Name: Quantum mechanisms of strongly interacting ultracold dipolar bosons
Period: 2015-2021
Amount: Rs.3500000 + salary

Teaching Experience

Institution: IIT Kanpur

- Experimental physics Laboratory - Tutorial
- Nature and properties of materials - Tutorial
- Physics 1 - Classical mechanics - Tutorial
- Physics 2 - Electromagnetism - Tutorial

Institution: Chandigarh University

- Physics for Engineers - Theory and Lab (B.Tech)
- Statistical Mechanics (B.Sc)
- Statistical Mechanics (M.Sc)
- Electromagnetic theory (B.Sc)
- Thermal physics Lab (B.Sc)
- Mathematical Physics I (B.Sc)
- Mathematical Physics I - Lab (B.Sc)
- Mathematical Physics II - Lab (B.Sc)
- Renewable Energy and Energy Harvesting (B.Sc)
- Mathematical Physics III (B.Sc)
- Mathematical Physics (M.Sc)

Student supervision

Completed

- **Student Name:** Anurag Sharma
Period: 2015-16
Thesis Degree: M.Sc
Thesis Title: Quantum phases of binary dipolar bosonic mixture in optical lattices
Co-supervisor: Prof. T.K. Ghosh
- **Student Name:** Rohit Panda
Period: 2022-23
Thesis Degree: M.Sc
Thesis Title: Quantum states of ultracold bosons in optical lattices interacting via long-range interactions.

Publications

Journal Publications

- **Exploring vortex formation in rotating Bose-Einstein condensates beyond mean-field regime,**
Budhaditya Chatterjee
arXiv:2204.01978 [cond-mat.quant-gas] (2022).
- **Detecting One-Dimensional Dipolar Bosonic Crystal Orders via Full Distribution Functions,**
B. Chatterjee, C. Lévêque, Jörg Schmiedmayer, and A. U. J. Lode,
Phys. Rev. Lett. **125**, 093602 (2020)
URL: <https://doi.org/10.1103/PhysRevLett.125.093602>
- **Sorting Fermionization from Crystallization in Many-Boson Wavefunctions,**
S. Bera, B. Chakrabarti, A. Gammal, M. C. Tsatsos, M. L. Lekala, *B. Chatterjee, C. Lévêque and A. U. J. Lode,*
Sci Rep **9**, 17873 (2019)
URL: <https://doi.org/10.1038/s41598-019-53179-1>
- **Probing relaxation dynamics of few strongly correlated bosons in 1D triple well optical lattice,**
S. Bera, R. Roy, A. Gammal, B. Chakrabarti and *B. Chatterjee,*
J. Phys. B: At. Mol. Opt. Phys. **52**, 215303 (2019).
URL: <https://doi.org/10.1088/1361-6455/ab2999>
- **Correlations of strongly interacting one-dimensional ultracold dipolar few-boson system in optical lattices,**
B. Chatterjee, M. C. Tsatsos and A. U. J. Lode,
New J. Phys. **21**, 033030 (2019).
URL: <https://doi.org/10.1088/1367-2630/aafa93>
- **Dynamics of interacting bosons in a double-well potential,**
S. Dutta, P. K. Mishra, *B. Chatterjee* and S. Basu,
EPL **124**, 30002 (2018).
URL: <https://doi.org/10.1209/0295-5075/124/30002>
- **Order parameter and detection for a finite ensemble of crystallized one-dimensional dipolar bosons in optical lattices,**
B. Chatterjee and A. U. J. Lode,
Phys. Rev. A **98**, 053624 (2018).
URL: <https://doi.org/10.1103/PhysRevA.98.053624>
- **Phases, many-body entropy measures and coherence of interacting bosons in optical lattices,**
R. Roy, A. Gammal, M. C. Tsatsos, *B. Chatterjee, B. Chakrabarti, and A. U. J. Lode,*
Phys. Rev. A **97**, 043625 (2018).
URL: <https://doi.org/10.1103/PhysRevA.97.043625>

- **Condensate fragmentation as a sensitive measure of the quantum many-body behavior of bosons with long-range interactions,**
U. R. Fischer, A. U. J. Lode and *B. Chatterjee*
Phys. Rev. A **91**, 063621 (2015).
URL: <https://doi.org/10.1103/PhysRevA.91.063621>
- **Ultracold dipolar few-boson ensembles in a triple well trap,**
B. Chatterjee, I. Brouzos, L. Cao and P. Schmelcher
J. Phys. B: At. Mol. Opt. Phys. **46**, 085304 (2013).
URL: <https://doi.org/10.1088/0953-4075/46/8/085304>
- **The impact of spatial correlation on the tunneling dynamics of few-boson mixtures in a combined triple well and harmonic trap,**
L. Cao, I. Brouzos, *B. Chatterjee*, and P. Schmelcher
New J. Phys. **14**, 093011 (2012).
URL: <https://doi.org/10.1088/1367-2630/14/9/093011>
- **Few-boson tunneling dynamics of strongly correlated binary mixtures in a double well,**
B. Chatterjee, I. Brouzos, L. Cao and P. Schmelcher
Phys. Rev. A **85**, 013611 (2012).
URL: <https://doi.org/10.1103/PhysRevA.85.013611>
- **Few-boson tunneling in a double well with spatially modulated interaction**
B. Chatterjee, I. Brouzos, S. Zoellner and P. Schmelcher
Phys. Rev. A **82**, 043619 (2010).
URL: <https://doi.org/10.1103/PhysRevA.82.043619>
- **Pairing in disordered s-wave superconductors and the effect of their coupling,**
B. Chatterjee and A. Taraphder
Solid State Communication, vol. 148. page 582 (2008).
URL: <https://doi.org/10.1016/j.ssc.2008.09.037>

Conference paper

- **Tunneling Dynamics of interacting bosons in a quantum seesaw potential,**
S. Dutta, *B. Chatterjee*, P. K. Mishra, A. U. J. Lode, M. C. Tsatsos and S. Basu,
J. Phys.: Conf. Ser. **1290**, 012030 (2019)
URL: <https://doi.org/10.1088/1742-6596/1290/1/012030>

Book Chapter

- **Quantum simulators, phase transitions, resonant tunneling, and variances: A many-body perspective**
A.U.J. Lode, O.E Alon, J. Arnold, A. Bhowmik, M. Büttner, L.S. Cederbaum, *B. Chatterjee*, R. Chitra, S. Dutta, C. Georges, A. Hemmerich, H. Keßler, J. Klinder, C. Lévêque, R. Lin, P. Mognini, F. Schäfer, J. Schmiedmayer and M. Žonda
High Performance Computing in Science and Engineering'21
Pages: 35-59
Springer, Cham (2021)
URL: https://doi.org/10.1007/978-3-030-66792-4_5
- **Crystallization, Fermionization, and Cavity-Induced Phase Transitions of Bose-Einstein Condensates**
A.U.J. Lode, O.E Alon, L.S. Cederbaum, B. Chakrabarti, *B. Chatterjee*, R. Chitra, A. Gammal, S.K. Haldar, M.L. Lekala, C. Lévêque, R. Lin, P. Mognini, L. Papariello, M.C. Tsatsos
High Performance Computing in Science and Engineering'19
Pages: 77-87
Springer, Cham (2023)
URL: https://doi.org/10.1007/978-3-031-17937-2_3
- **Exploring Many-Body Physics with Bose-Einstein Condensates,**
O. E. Alon, V. S. Bagnato, R. Beinke, S. Basu, L. S. Cederbaum, B. Chakrabarti, *B. Chatterjee*, R. Chitra, F. S. Diorico, S. Dutta, L. Exl, A. Gammal, S. K. Haldar, S. Klaiman, C. Lévêque, R. Lin, N. J. Mauser, P. Mognini, L. Papariello, R. Roy, K. Sakmann, A. I. Streltsov, G. D. Telles, M. C. Tsatsos, R. Wu, A. U. J. Lode,
High Performance Computing in Science and Engineering'18
Pages: 89-110

Springer, Cham (2019)

URL: https://doi.org/10.1007/978-3-030-13325-2_6