

RESUME

Dr. Amit Kumar Pal

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1 Employment

Indian Institute of Technology Palakkad (IITPKD)

Assistant Professor

Palakkad, India
Sep. 2019 - Present

- Department of Physics, IITPKD

University of Warsaw (UW)

Post-doctoral Fellow

Warsaw, Poland
Mar. 2019 - Jul. 2019

- Quantum Metrology Group, Faculty of Physics, UW

Swansea University (SU)

Post-doctoral Fellow

Swansea, United Kingdom
Oct. 2016 - Mar. 2019

- Quantum Computation and Simulation (QCS) Group, Physics Department, SU

Harish-Chandra Research Institute (HRI)

Post-doctoral Fellow

Allahabad, India
Mar. 2014 - Oct. 2016

- Quantum Information and Computation (QIC) Group, Physics Division, HRI

2 Education

Doctor of Philosophy

University of Calcutta

Jan. 2009 - Mar. 2014
Kolkata, India

- from the Department of Physics, Bose Institute, Kolkata, India
- Advisor: Prof. Indrani Bose
- Thesis title: Ground and Thermal State Properties of Model Spin Systems

Master of Science

University of Calcutta

Aug. 2006 - Aug. 2008
Kolkata, India

- from University College of Science and Technology, Kolkata, India
- Master's degree in Physics with **First Class**, Marks obtained: 72.9%

- ~ Specialization in Condensed Matter Physics
- ~ Elective paper on Selected Topics of Statistical Mechanics
- ~ Master's project on statistical physics of random walk in one dimension

Bachelor of Science Aug. 2003 - Aug. 2006
 University of Calcutta Kolkata, India
 – from St. Xavier's College, Kolkata, India
 – Hons. in Physics with **First Class**, Marks obtained: 71.125%

Higher Secondary Examination (12th Standard) May, 2001 - Jul. 2003
 West Bengal Council for Higher Secondary Education Kolkata, India
 – from Hooghly Collegiate School, Chinsurah, India
 – passed with **First Division**, Marks obtained: 91.2%
 ~ Science subjects: Physics, Chemistry, Mathematics, Statistics (Additional)

Secondary Examination (10th Standard) May, 2001
 West Bengal Board Secondary Education Kolkata, India
 – from Hooghly Collegiate School, Chinsurah, India
 – passed with **First Division**, Marks obtained: 86.75%
 ~ Science subjects: Physical Science, Life Science, Mathematics, Mechanics (Additional)

3 Achievements

INSPIRE Faculty Award 2016
 From Ministry of Science & Technology, Department of Science & Technology, Govt. of India
 ~ Lett. No. - DST/INSPIRE/04/2016/000239

'Third place' for presentation in 31st Young Physicist Colloquium 2013
 Awarded by Indian Physical Society

Junior Research Fellowship 2009
 Awarded by University Grants Commission (UGC) Fellowship Scheme
 ~ Selected in the area of Physical Sciences

National Level Graduate Aptitude Test for Engineers (GATE) 2008
 Qualified with 93.27 percentile score

Dr. Ranjan Roy Memorial Gold Medal 2006
 Awarded by St. Xavier's College, Kolkata, India
 ~ for securing highest marks in Physics (Hons.) in B. Sc. Part I and II examinations

Ashish Palit Memorial Prize 2006
 Awarded by St. Xavier's College, Kolkata, India
 ~ for securing highest marks in Physics (Hons.) in B. Sc. Part II examinations

Certificate of Merit 2006
 Awarded by St. Xavier's College, Kolkata, India
 ~ for coming First in the B. Sc. Part II examinations

Certificate of Merit 2003
 Awarded by the Education Department, Govt. of West Bengal, India
 ~ for high rank in the Higher Secondary examination (Class 12)

4 Skills

Symbolic & Numerical Computations

- Computer assisted solutions of mathematical problems using MATHEMATICA.
- Numerical computations using FORTRAN, C programs and PYTHON scripts.

5 Interests

Quantum information, quantum computation, and their interface with **many-body physics**, **quantum thermodynamics**, and **open quantum systems**.

Quantum Information Theory

- Detection, quantification, and characterization of quantum correlations in bipartite and multipartite scenarios
- Quantum correlations as resource in quantum communication – Multipartite scenarios

Interface of Quantum Information Theory in Quantum Many-Body Physics

- Application of quantum information theoretic tools and techniques to characterize novel phases and phenomena observed in quantum many-body systems
- Use of quantum many-body systems for implementing quantum protocols

Quantum Computing

- Quantum error correction, fault-tolerant quantum computation, topological quantum computing

Open Quantum Systems

- Markovian and non-Markovian dynamics of open quantum systems from the perspective of quantum information theory, decoherence and dynamics of quantum correlations

Quantum Thermodynamics

- Quantum aspects of thermalization, and role of quantum correlations in quantum thermodynamics, quantum heat engines

Statistical Physics of Complex Systems

- Application of the principles of statistical physics to study and understand interdisciplinary systems as diverse as ecosystems, financial markets, population biology and complex diseases

6 Reviewer Experience

Reviewed research articles for Physical Review A, Journal of Physics A, European Physical Journal B, International Journal of Quantum Information, Pramana

7 Publications

22 research articles including **19 published papers** in refereed journals such as Phys. Rev. A, New J. Phys., Europhys. Lett., J. Phys. B: At. Mol. Opt. Phys., J. Phys.: Condens. Matter, Phys. Lett. A, Eur. Phys. J. B, Eur. Phys. J. E, Int. J. Mod. Phys. B, and Phys. Biol., along with **1 published book chapter** and **2 pre-prints** .

1. “Necessarily transient quantum refrigerator”, S. Das, A. Misra, **A. K. Pal**, A. Sen(De), and U. Sen, Europhys. Lett. **125**, 20007 (2019)
DOI: [10.1209/0295-5075/125/20007](https://doi.org/10.1209/0295-5075/125/20007) [[arXiv: 1606.06985](#)]
2. “Estimating localizable entanglement from witnesses”, D. Amaro, M. Müller, and **A. K. Pal**, New J. Phys. **20**, 063017 (2018)
DOI: [10.1088/1367-2630/aac485](https://doi.org/10.1088/1367-2630/aac485) [[arXiv: 1803.02753](#)]
3. “Scale-invariant freezing of entanglement”, T. Chanda, T. Das, D. Sadhukhan, **A. K. Pal**, A. Sen(De), and U. Sen, Phys. Rev. A **97**, 062324 (2018)
DOI: [10.1103/PhysRevA.97.062324](https://doi.org/10.1103/PhysRevA.97.062324) [[arXiv: 1610.00730](#)]
4. “Emergence of entanglement with temperature and time in factorization-surface states”, T. Chanda, T. Das, D. Sadhukhan, **A. K. Pal**, A. Sen(De), and U. Sen, Phys. Rev. A **97**, 012316 (2018)
DOI: [10.1103/PhysRevA.97.012316](https://doi.org/10.1103/PhysRevA.97.012316) [[arXiv: 1705.09812](#)]
5. “Canonical distillation of entanglement”, T. Das, A. Kumar, **A. K. Pal**, N. Shukla, A. Sen(De), and U. Sen, Phys. Lett. A **381**, 3529 (2017)
DOI: [10.1016/j.physleta.2017.08.065](https://doi.org/10.1016/j.physleta.2017.08.065) [[arXiv: 1411.7936](#)]
6. “Multipartite entanglement accumulation in quantum states: Localizable generalized geometric measure”, D. Sadhukhan, S. Singha Roy, **A. K. Pal**, D. Rakshit, A. Sen(De), and U. Sen, Phys. Rev. A **95**, 022301 (2017)
DOI: [10.1103/PhysRevA.95.022301](https://doi.org/10.1103/PhysRevA.95.022301) [[arXiv: 1511.03998](#)]
7. “Static and dynamical quantum correlations in phases of an alternating-field XY model”, T. Chanda, T. Das, D. Sadhukhan, **A. K. Pal**, A. Sen(De), and U. Sen, Phys. Rev. A **94**, 042310 (2016)
DOI: [10.1103/PhysRevA.94.042310](https://doi.org/10.1103/PhysRevA.94.042310) [[arXiv: 1605.07576](#)]
8. “Conclusive identification of quantum channels via monogamy of quantum correlations”, A. Kumar, S. Singha Roy, **A. K. Pal**, R. Prabhu, A. Sen(De), and U. Sen, Phys. Lett. A **380**, 3588 (2016)
DOI: [10.1016/j.physleta.2016.08.039](https://doi.org/10.1016/j.physleta.2016.08.039) [[arXiv: 1603.02801](#)]
9. “Statistics of leading digits leads to unification of quantum correlations”, T. Chanda, T. Das, D. Sadhukhan, **A. K. Pal**, A. Sen(De), and U. Sen, Europhys. Lett. **114**, 30004 (2016)
DOI: [10.1209/0295-5075/114/30004](https://doi.org/10.1209/0295-5075/114/30004) [[arXiv: 1509.09295](#)]
(Selected as featured article (Editor’s choice) in Europhysics Letters, & included in the **Europhysics Letters Highlights of 2016** as one of the best papers published in the journal in 2016)
10. “Reducing computational complexity of quantum correlations”, T. Chanda, T. Das, D. Sadhukhan, **A. K. Pal**, A. Sen(De), and U. Sen, Phys. Rev. A **92**, 062301 (2015)
DOI: [10.1103/PhysRevA.92.062301](https://doi.org/10.1103/PhysRevA.92.062301) [[arXiv: 1504.04727](#)]

11. “Freezing of quantum correlations under local decoherence”, T. Chanda, **A. K. Pal**, A. Biswas, A. Sen(De), and U. Sen, Phys. Rev. A, **91**, 062119 (2015)
DOI: [10.1103/PhysRevA.91.062119](https://doi.org/10.1103/PhysRevA.91.062119) [[arXiv: 1409.2096](#)]
12. “Quantum discord, decoherence and quantum phase transition”, I. Bose and **A. K. Pal**, Int. J. Mod. Phys. B **27**, 1345042 (2013)
DOI: [10.1142/S0217979213450422](https://doi.org/10.1142/S0217979213450422) [[arXiv: 1205.1300](#)]
13. “Noise-induced regime shifts: A quantitative characterization”, S. Ghosh, **A. K. Pal**, and I. Bose, Eur. Phys. J. E **36**: 123 (2013)
DOI: [10.1140/epje/i2013-13123-y](https://doi.org/10.1140/epje/i2013-13123-y) [[arXiv: 1212.5385](#)]
14. “Early signatures of regime shifts in gene expression dynamics”, M. Pal, **A. K. Pal**, S. Ghosh, and I. Bose, Phys. Biol. **10**, 036010 (2013)
DOI: [10.1088/1478-3975/10/3/036010](https://doi.org/10.1088/1478-3975/10/3/036010) [[arXiv: 1212.5383](#)]
15. “Markovian evolution of classical and quantum correlations in transverse-field XY model”, **A. K. Pal** and I. Bose, Eur. Phys. J. B **85**: 277 (2012)
DOI: [10.1140/epjb/e2012-30108-1](https://doi.org/10.1140/epjb/e2012-30108-1) [[arXiv: 1112.2050](#)]
16. “Transverse Ising Model: Markovian evolution of classical and quantum correlations under decoherence”, **A. K. Pal** and I. Bose, Eur. Phys. J. B **85**: 36 (2012)
DOI: [10.1140/epjb/e2011-20858-5](https://doi.org/10.1140/epjb/e2011-20858-5) [[arXiv: 1107.3939](#)]
17. “Quantum discord in the ground and thermal states of spin clusters”, **A. K. Pal** and I. Bose, J. Phys. B: At. Mol. Opt. Phys. **44**, 045101 (2011)
DOI: [10.1088/0953-4075/44/4/045101](https://doi.org/10.1088/0953-4075/44/4/045101) [[arXiv: 1012.0650](#)]
18. “Motion of bound domain walls in a spin ladder”, I. Bose and **A. K. Pal**, Eur. Phys. J. B **77**, 139-146 (2010)
DOI: [10.1140/epjb/e2010-00240-1](https://doi.org/10.1140/epjb/e2010-00240-1) [[arXiv: 1006.3666](#)]
19. “Entanglement in a molecular three-qubit system”, **A. K. Pal** and I. Bose, J. Phys.: Condens. Matter **22**, 016004 (2010)
DOI: [10.1088/0953-8984/22/1/016004](https://doi.org/10.1088/0953-8984/22/1/016004) [[arXiv: 0909.2918](#)]

Books / Book Chapters

20. “Monogamy of quantum correlations - a review” by H. S. Dhar, **A. K. Pal**, D. Rakshit, A. Sen(De), and U. Sen in [Lectures on general quantum correlations and their applications](#), edited by Felipe Fanchini, Diogo Soares-Pinto, and Gerardo Adesso (Springer (2017))
DOI: [10.1007/978-3-319-53412-1](https://doi.org/10.1007/978-3-319-53412-1) [[arXiv: 1610.01069](#)]

Pre-prints

21. “Scalable characterization of localizable entanglement in noisy topological quantum codes”, D. Amaro, M. Müller, and **A. K. Pal**, pre-print available at [[arXiv: 1907.13161](#)]
22. “Uniform decoherence effect on localizable entanglement in random multi-qubit pure states”, R. Banerjee, **A. K. Pal**, and A. Sen(De), pre-print available at [[arXiv: 1907.10847](#)]

8 Selected talks

- On “Estimating entanglement in large-scale noisy topological codes”, in January, 2019, at the Department of Physics, Indian Institute of Science Education and Research, Kolkata, India
- On “Estimating entanglement in large-scale noisy topological codes”, in December, 2018, at the Satyendra-Nath Bose National Centre for Basic Sciences, Kolkata, India
- On “Estimating entanglement in large-scale noisy topological codes” at the International conference titled *Quantum Information Processing and Applications* (QIPA) held in December, 2018, at Harish-Chandra Research Institute, Allahabad, India
- On “Estimating entanglement in large-scale noisy topological codes”, in December, 2018, at the Indian Association for the Cultivation of Science, Kolkata, India
- On “Entanglement in large-scale noisy topological codes”, in November, 2018, at University of Warsaw, Warsaw, Poland
- On “Estimating localizable entanglement”, in July, 2018, at University of Siegen, Siegen, Germany
- On “Localizable entanglement in noisy cluster states”, in December, 2017, at Harish-Chandra Research Institute, Allahabad, India
- On “Entanglement under noisy environments: From quantum computation to quantum many-body physics”, in December, 2017, at Raman Research Institute, Bengaluru, India
- On “Entanglement under noisy environments: From quantum computation to quantum many-body physics”, in December, 2017, at Department of Physics, Indian Institute of Technology, Chennai, India
- On “Entanglement under noisy environments: From quantum computation to quantum many-body physics”, in December, 2017, at Department of Physics, Indian Institute of Science Education and Research, Pune, India
- On “Generation of entanglement over factorization states”, at the *Advanced School and Workshop on Quantum Science and Quantum Technologies*, held at the Abdus Salam International Center For Theoretical Physics, Trieste, Italy, in September, 2017
- On “Dynamics of entanglement in many-body systems”, at *CCPQ Workshop on Dynamics of Complex Quantum Systems*, held in Windsor, UK, in August, 2017
- On “Frozen quantum correlations: From quantum discord to entanglement”, in March, 2017, at Department of Physics, Jawaharlal Nehru University, New Delhi, India
- On “Frozen quantum correlations: From quantum discord to entanglement”, in March, 2017, at Department of Physics, Indian Institute of Technology, Kanpur, India
- On “Freezing of entanglement: Scale-invariance in many-body systems”, in *Young Quantum* (YouQu), a meeting for young researchers, held in March, 2017, at Harish-Chandra Research Institute, Allahabad, India

- On “Can one freeze quantum correlations?”, in November, 2016, at the AMQP Seminar Series, at the Department of Physics, Swansea University, Swansea, United Kingdom
- On “Necessarily transient quantum refrigerators”, in July, 2016, at the Ctrl-Q Seminar series at the Department of Physics, University of Saarland, Saarbrücken, Germany
- On “Constrained quantum correlations: A user-friendly computational scheme” at the International conference titled *Quantum Information Processing and Applications* (QIPA) held in December, 2015, at Harish-Chandra Research Institute, Allahabad, India
- On “Frozen Quantum Correlations” at *Young Quantum* (YouQu), a meeting for young researchers, held in February, 2015, at Harish-Chandra Research Institute, Allahabad, India
- On “Decoherence and Quantum Phase Transitions in Quantum Spin Models” in November, 2013, at the Physics Department, Harish-Chandra Research Institute, Allahabad, India
- On “Decoherence and Quantum Phase Transitions in Quantum Spin Models” at the 31st Young Physicist’s Colloquium, organized by Saha Institute of Nuclear Physics and Indian Physical Society, in August, 2013, held at Saha Institute of Nuclear Physics, Kolkata, India
- On “Measures of Quantum Correlations”, in July, 2010, at the Bi-monthly seminar series organized by the Statistical Physics Group, University of Calcutta, Kolkata, India

9 Selected posters

- Poster at the *3rd Seefeld Workshop on Quantum Information* held at Seefeld, Tyrol, Austria, organized by University of Innsbruck, Innsbruck, Austria, & Universitat Autònoma de Barcelona, Barcelona, Spain
- Poster at the *International Meeting on Quantum Information Processing and Applications* held at Harish Chandra Research Institute, Allahabad, India
- Poster at the *International School and Conference on Quantum Information* held at Institute of Physics, Bhubaneswar, India
- Poster at the *International School and Conference on Quantum Information Processing and Applications* held at Harish Chandra Research Institute, Allahabad, India
- Poster at the *International Conference on Statistical Physics* held at Saha Institute of Nuclear Physics, Kolkata, India

10 Other activities

Organizer of the conferences “Young Quantum 2015” (YouQu15) in 2015 and “Young Quantum 2017” (YouQu17) in 2017, and local organizer of the International meeting on “Quantum Information Processing and Applications 2015” (QIPA15) in 2015, held at Harish-Chandra Research Institute, Allahabad, India.