



# Arghya Chatterjee

*Curriculum Vitae*

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## CURRENT POSITION:

**Postdoctoral Fellow** 2019-  
*Key Laboratory of Quark & Lepton Physics (MOE) and Institute of Particle Physics (IOPP),  
Central China Normal University, China*  
*Research on study of QCD Critical Point search and onset of Phase transition in the STAR  
Collaboration at Brookhaven National Laboratory (BNL), New York.*

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## EDUCATION:

- **PhD (High Energy Nuclear Physics)** 2013-2019  
*University:* Variable Energy Cyclotron Centre, Homi Bhabha National Institute, Kolkata  
*Thesis title:* “ [Study of conserved quantities and their correlations in the RHIC Beam Energy Scan Program.](#)”  
*Thesis topics:* Study the properties of quark-gluon-plasma to hadronic phase transition through off-diagonal cumulant analysis of net-particle multiplicity distribution in the STAR experiment at BNL, New York.  
*Thesis advisor:* [Prof. Tapan Kumar Nayak](#)
- **Master of Science (Physics) (1st class)** 2011-2013  
*University:* National Institute of Technology, Durgapur  
*Subject:* [Academic Courses](#)  
*Specialization course:* Optoelectronics  
*Final semester project:* Short review in black hole astronomy  
*Project advisor:* [Dr. Soumen Basu](#)
- **Bachelor of Science (1st class)** 2008-2011  
*University:* The University of Burdwan, Katwa College

**Subject:** Physics (Honours) [Academic Courses](#)

Chemistry(general): [Academic Courses](#)

Mathematics: [Academic Courses](#)

- **Higher Secondary (+2)** (1st class) 2006-2008  
*Katwa Bharati Bhavan High School*  
**Board:** West Bengal Council of Higher Secondary Education
- **Secondary (10th)** (1st class) 2006  
*Katwa Janakilal Siksha Sadan High School*  
**Board:** West Bengal Board of Secondary Education

## RESEARCH AREAS:

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- Experimental Nuclear and High Energy Physics.
- Search and studies of Quark Gluon Plasma (QGP), probing the Critical Point

## CURRENT FIELD OF RESEARCH:

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Presently I am working in the field of Quark Gluon Plasma (QGP) phase of nuclear matter, as it relates to fundamental questions in high energy nuclear physics as well as makes a connection to the Early Universe and involves many branches of physics. My focus is on study of particle number fluctuations and correlations among different observables in the system created in Relativistic Heavy Ion collisions as it can help to map the QCD phase diagram. I am analysing the data from the STAR experiment at RHIC to have a precision measurement of the freeze-out parameters and to obtain signals for the search of QCD critical point.

## RESEARCH EXPERIENCE:

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### Postdoctoral Fellow

2019-

*I am currently a postdoctoral fellow working with Prof. Xiaofeng Luo in the College of Physical Science and Technology at Central China Normal University, China. My research focuses on Study of QCD phase diagram in the Beam Energy Scan program at Relativistic Heavy Ion Collider (RHIC) for studying the properties and freeze-out parameters of QGP to hadrons phase transitions in heavy-ion collisions experiments.*

### Graduate Student

2014-2019

*I pursued my PhD work under the guidance of Prof. Tapan Kumar Nayak in the STAR experiment at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL), USA. The aim of this experiment is to address fundamental questions related to the origin of the Universe and the formation of matter. During the course of my PhD, I have been primarily involved in:*

- Study of correlation between identified particles in Heavy Ion Collision using data taken by the Time Projection Chamber (TPC) and forward Time Of Flight (TOF) in the STAR experiment at BNL.
- Using the event generator, like Ultra-relativistic Quantum Molecular Dynamics (UrQMD) and A Multi-Phase Transport (AMPT), and Hadron Resonance Gas (HRG) to simulate and mimic the heavy ion collision experiment
- Regularly presented the data analysis result in STAR collaboration physics working group.

## PUBLICATIONS:

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### Journal Papers:

58 papers in total in referred journals.

#### List of publications as first/principal author

1. “Diagonal and off-diagonal susceptibilities of conserved quantities in relativistic heavy-ion collisions”, *Arghya Chatterjee, Sandeep Chatterjee, Tapan K. Nayak, Nihar Ranjan Sahoo*, [J. Phys. G: Nucl. Part. Phys. \*\*43\*\*, 125103 \(2016\)](#)
2. “Isothermal compressibility of hadronic matter formed in relativistic nuclear collisions”, *Maitreyee Mukherjee, Sumit Basu, Arghya Chatterjee, Sandeep Chatterjee, Souvik Priyam Adhya, Sanchari Thakur, Tapan K. Nayak*, [Physics Letters B. \*\*784\*\*, 1-5 \(2018\)](#)
3. “Collision energy dependence of second-order off-diagonal and diagonal cumulants of net-charge, net-proton and net-kaon multiplicity distributions in Au+Au collisions”, *J. Adam, A. Chatterjee, et al. (STAR Collaboration)*, [Phys. Rev. C \*\*100\*\*, 014902 \(2019\)](#)
4. “Effect of centrality selection on higher-order cumulants of net-proton multiplicity distributions in relativistic heavy-ion collisions”, *Arghya Chatterjee, Yu Zhang, Jingdong Zeng, Nihar R. Sahoo, Xiaofeng Luo*, [Phys. Rev. C \*\*101\*\*, 034902 \(2020\)](#)

#### List of publications as co-author

5. “Charge-dependent pair correlations relative to a third particle in p+Au and d+Au collisions at RHIC”, [Phys. Lett. B \*\*798\*\* \(2019\) 134975](#)
6. “Longitudinal double-spin asymmetry for inclusive jet and dijet production in pp collisions at  $\sqrt{s} = 510$  GeV”, [Phys. Rev. D \*\*100\*\* \(2019\) 52005](#)
7. “Measurement of inclusive J/psi suppression in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV through the dimuon channel at STAR”, [Phys. Lett. B \*\*797\*\* \(2019\) 134917](#)
8. “Polarization of Lambda (anti-Lambda) hyperons along the beam direction in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. Lett. \*\*123\*\* \(2019\) 132301](#)

9. “Measurements of the transverse-momentum-dependent cross sections of  $J/\psi$  production at mid-rapidity in proton+proton collisions at  $\sqrt{s} = 510$  and  $500$  GeV with the STAR detector”, [Phys. Rev. D \*\*100\*\* \(2019\) 52009](#)
10. “First observation of the directed flow of D0 and D0bar in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. Lett. \*\*123\*\* \(2019\) 162301](#)
11. “Observation of excess J/psi yield at very low transverse momenta in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV and U+U collisions at  $\sqrt{s_{NN}} = 193$  GeV”, [Phys. Rev. Lett. \*\*123\*\* \(2019\) 132302](#)
12. “Beam energy dependence of (anti-)deuteron production in Au+Au collisions at RHIC”, [Phys. Rev. C \*\*99\*\* \(2019\) 64905](#)
13. “Azimuthal harmonics in small and large collision systems at RHIC top energies”, [Phys. Rev. Lett. \*\*122\*\* \(2019\) 172301](#)
14. “Collision Energy Dependence of pT Correlations in Au+Au Collisions at RHIC”, [Phys. Rev. C \*\*99\*\* \(2019\) 44918](#)
15. “Centrality and transverse momentum dependence of D0-meson production at mid-rapidity in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*99\*\* \(2019\) 34908](#)
16. “Measurement of the longitudinal spin asymmetries for weak boson production in proton-proton collisions at  $\sqrt{s} = 510$  GeV”, [Phys. Rev. D \*\*99\*\* \(2019\) 51102](#)
17. “Transverse spin transfer to Lambda and anti-Lambda hyperons in polarized proton-proton collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. D \*\*98\*\* \(2018\) 91103](#)
18. “Improved measurement of the longitudinal spin transfer to Lambda and Anti-Lambda hyperons in polarized proton-proton collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. D \*\*98\*\* \(2018\) 112009](#)
19. “The Proton-Omega correlation function in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Lett. B \*\*790\*\* \(2019\) 490](#)
20. “Low pT e+e- Pair Production in Au+Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV and U+U Collisions at  $\sqrt{s_{NN}} = 193$  GeV at STAR”, [Phys. Rev. Lett. \*\*121\*\* \(2018\) 132301](#)
21. “Longitudinal Double-Spin Asymmetries for Dijet Production at Intermediate Pseudorapidity in Polarized pp Collisions at  $\sqrt{s} = 200$  GeV”, [Phys. Rev. D \*\*98\*\* \(2018\) 32011](#)
22. “Longitudinal double-spin asymmetries for pi0s in the forward direction for 510 GeV polarized pp collisions”, [Phys. Rev. D \*\*98\*\* \(2018\) 32013](#)
23. “J/psi production cross section and its dependence on charged-particle multiplicity in p+p collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Lett. B \*\*786\*\* \(2018\) 87](#)
24. “Global polarization of Lambda hyperons in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*98\*\* \(2018\) 14910](#)
25. “MWPC prototyping and performance test for the STAR inner TPC upgrade”, [Nucl. Instrum. Meth. A \*\*896\*\* \(2018\) 90](#)

26. “Beam energy dependence of rapidity-even dipolar flow in Au+Au collisions”, [Phys. Lett. B \*\*784\*\* \(2018\) 26](#)
27. “Correlation Measurements Between Flow Harmonics in Au+Au Collisions at RHIC”, [Phys. Lett. B \*\*783\*\* \(2018\) 459](#)
28. “Azimuthal anisotropy in Cu+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*98\*\* \(2018\) 14915](#)
29. “Transverse spin-dependent azimuthal correlations of charged pion pairs measured in  $p^\uparrow + p$  collisions at  $\sqrt{s} = 500$  GeV”, [Phys. Lett. B \*\*780\*\* \(2018\) 332](#)
30. “Measurement of hyper triton lifetime in Au+Au collisions at the Relativistic Heavy-Ion Collider”, [Phys. Rev. C \*\*97\*\* \(2018\) 54909](#)
31. “The STAR MAPS-based PiXeL detector”, [Nucl. Instrum. Meth. A \*\*907\*\* \(2018\) 60](#)
32. “Collision Energy Dependence of Moments of Net-Kaon Multiplicity Distributions at RHIC”, [Phys. Lett. B \*\*785\*\* \(2018\) 551](#)
33. “Beam-Energy Dependence of Directed Flow of Lambda, Anti-Lambda, K plus, K minus, K0 short and phi in Au+Au Collisions”, [Phys. Rev. Lett. \*\*120\*\* \(2018\) 62301](#)
34. “Azimuthal transverse single-spin asymmetries of inclusive jets and charged pions within jets from polarized-proton collisions at  $\sqrt{s_{NN}} = 500$  GeV”, [Phys. Rev. D \*\*97\*\* \(2018\) 32004](#)
35. “Beam Energy Dependence of Jet-Quenching Effects in Au+Au Collisions at  $\sqrt{s_{NN}} = 7.7, 11.5, 14.5, 19.6, 27, 39,$  and  $62.4$  GeV”, [Phys. Rev. Lett. \*\*121\*\* \(2018\) 32301](#)
36. “The evolution of the STAR Trigger System”, [Nucl. Instrum. Meth. A \*\*902\*\* \(2018\) 228](#)
37. “Coherent diffractive photoproduction of rho0 mesons on gold nuclei at 200 GeV/nucleon-pair at the Relativistic Heavy Ion Collider”, [Phys. Rev. C \*\*96\*\* \(2017\) 54904](#)
38. “Measurements of jet quenching with semi-inclusive hadron+jet distributions in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*96\*\* \(2017\) 24905](#)
39. “Harmonic decomposition of three-particle azimuthal correlations at RHIC”, [Phys. Rev. C \*\*98\*\* \(2018\) 34918](#)
40. “Bulk Properties of the Medium Produced in Relativistic Heavy-Ion Collisions from the Beam Energy Scan Program”, [Phys. Rev. C \*\*96\*\* \(2017\) 44904](#)
41. “Constraining the initial conditions and temperature dependent transport with three-particle correlations in Au+Au collisions”, [Phys. Lett. B \*\*790\*\* \(2019\) 81](#)
42. “Measurement of D0 azimuthal anisotropy at mid-rapidity in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. Lett. \*\*118\*\* \(2017\) 212301](#)
43. “Global Lambda hyperon polarization in nuclear collisions: evidence for the most vortical fluid”, [Nature \*\*548\*\* \(2017\) 62](#)
44. “Design and implementation of wire tension measurement system for MWPCs used in the STAR iTPC upgrade”, [Nucl. Instrum. Meth. A \*\*859\*\* \(2017\) 90](#)

45. “Measurement of the cross section and longitudinal double-spin asymmetry for di-jet production in polarized pp collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. D \*\*95\*\* \(2017\) 71103](#)
46. “Di-Jet Imbalance Measurements at  $\sqrt{s_{NN}} = 200$  GeV at STAR”, [Phys. Rev. Lett. \*\*119\*\* \(2017\) 62301](#)
47. “Upsilon production in U+U collisions at  $\sqrt{s_{NN}} = 193$  GeV with the STAR experiment”, [Phys. Rev. C \*\*94\*\* \(2016\) 64904](#)
48. “Charge-dependent directed flow in Cu+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. Lett. \*\*118\*\* \(2017\) 12301](#)
49. “Energy dependence of J/psi production in Au+Au collisions at  $\sqrt{s_{NN}} = 39, 62.4$  and  $200$  GeV”, [Phys. Lett. B \*\*771\*\* \(2017\) 13](#)
50. “Direct virtual photon production in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Lett. B \*\*770\*\* \(2017\) 451](#)
51. “Jet-like Correlations with Direct-Photon and Neutral-Pion Triggers at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Lett. B \*\*760\*\* \(2016\) 689](#)
52. “Near-side azimuthal and pseudorapidity correlations using neutral strange baryons and mesons in d+Au, Cu+Cu and Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*94\*\* \(2016\) 14910](#)
53. “J/psi production at low transverse momentum in p+p and d+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”, [Phys. Rev. C \*\*93\*\* \(2016\) 64904](#)
54. “Measurement of elliptic flow of light nuclei at  $\sqrt{s_{NN}} = 200, 62.4, 39, 27, 19.6, 11.5$ , and  $7.7$  GeV at RHIC”, [Phys. Rev. C \*\*94\*\* \(2016\) 34908](#)

#### Conference Papers:

55. “Off-diagonal cumulants of net-charge, net-proton and net-kaon multiplicity distributions in Au+Au collisions at  $\sqrt{s_{NN}} = 7.7-200$  GeV”, [Arghya Chatterjee, PoS CORFU 2018, \*\*164\*\* \(2019\)](#)
56. “Estimation of the isothermal compressibility from event-by-event multiplicity fluctuation studies”, [Maitreyee Mukherjee, Sumit Basu, Arghya Chatterjee, Sandeep Chatterjee, Sanchari Thakur, Souvik Priyam Adhya, Tapan K. Nayak, EPJ Web of Conferences \*\*171\*\*, 14010 \(2018\)](#)
57. “Susceptibilities of conserved quantities in relativistic heavy-ion collisions at RHIC”, [Arghya Chatterjee, Sandeep Chatterjee, Nihar Ranjan Sahoo, Tapan K. Nayak, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. \*\*61\*\*, 738 \(2016\)](#)
58. “Study of Event-by-Event correlations of charge, baryon number and strangeness in heavy-ion collisions”, [Arghya Chatterjee, Sandeep Chatterjee, Nihar Ranjan Sahoo, Tapan K. Nayak, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. \*\*60\*\*, 782 \(2015\)](#)

## TALKS AND POSTERS AT CONFERENCES

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6 oral/plenary presentations and 3 posters.

### International conferences:

1. “Off-diagonal cumulants of net-particle multiplicity distributions in Au+Au collisions and effect of centrality selection on net-proton cumulant analysis” at *Workshop on the QCD Phase Structure at High Baryon Density Region*, Wuhan, China, November 2019 (Oral Talk)
2. “The STAR measurements on off-diagonal cumulants of net-particle multiplicity distributions in Au+Au collisions at  $\sqrt{s_{NN}} = 7.7\text{-}200$  GeV” at *Quark Matter 2019*, Wuhan, China, November 2019 (Poster)
3. “Second-order Off-diagonal cumulants of net-proton, net-kaon and net-charge multiplicity distributions at RHIC ” at *QPT 2019*, Enshi, China, August 2019 (Oral Talk)
4. “Off-diagonal cumulants of net-charge, net-proton and net-kaon multiplicity distributions in Au+Au collisions at  $\sqrt{s_{NN}} = 7.7\text{-}200$  GeV” at *CPOD 2018*, Corfu, Greece, September 2018 (**Plenary Talk**)
5. “Study of off-diagonal cumulants of net-charge, net-proton and net-kaon multiplicity distributions in Au+Au collisions at STAR” *RHIC & AGS Users meeting 2018*, BNL, USA, June 2018 (**Invited Talk**)
6. “Off-diagonal Cumulants of Net-charge, Net-proton, and Net-kaon Multiplicity Distributions in Au+Au collisions at STAR” at *Quark Matter 2018*, Venezia, Italy, May 2018 (Poster)

### National conferences:

7. “Susceptibilities of conserved quantities in relativistic heavy-ion collisions at RHIC” at *61st DAE-BRNS Symposium on Nuclear Physics*, SINP, Kolkata, 5-9 December 2016 (Oral Talk)
8. “Study of cross correlations susceptibilities of conserved charge fluctuation at RHIC energies” at *CNT QGP Meet 2015*, VECC, Kolkata, 16-20 November 2015 (Oral Talk)
9. “Study of Event-by-Event correlations of charge, baryon number and strangeness in heavy-ion collisions” at *60th DAE-BRNS Symp. on Nucl. Phys.*, SSIHL, Bangalore, 7-11 December 2015 (Poster)

## TECHNICAL SKILLS:

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- Programming Languages: Python, C++, html
- Detector experience
- Simulation packages: GEANT, event generators for HIC (UrQMD, HIJING, AMPT, JAM)
- Software: ROOT, Mathematica
- Operating Systems: Unix/Linux, Windows, Macintosh

## **ACADEMIC ACTIVITIES:**

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- JEST (Joint Entrance Screening Test) 2013