

# Nilanjandev Bhaumik

Department of Physics  
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## Current affiliation

PhD student, Department of Physics, Indian Institute of Science, Bangalore  
Thesis supervisor : Dr. Rajeev Kumar Jain  
Expected date of completion : December 2022

## Education

- 2016 Master of Science (M.Sc) in Physics, *Indian Institute of Technology Guwahati*, India.
- 2014 Bachelor of Science (B.Sc) in Physics, *Presidency University*, Kolkata, India.

## Research interests

Inflationary cosmology, Primordial black holes (PBH) from inflation, Second order stochastic gravitational wave (GW) background, Possible imprints of early matter domination through GW detection, Ultra light PBHs and their observational imprints, Large scale CMB anomalies, Scalar-tensor theories, Cosmological data analysis

## Publications/Preprints

- 2018 1. Interior volume of  $(1+D)$  dimensional Schwarzschild black hole, **N. Bhaumik**, B. R. Majhi, *Int. J. Mod. Phys. A* **33**, 1850011 (2018) [[arXiv:1607.03704 \[gr-qc\]](#)].
- 2020 2. Primordial black holes dark matter from inflection point models of inflation and the effects of reheating, **N. Bhaumik**, R. K. Jain, *JCAP* **01**, 037 (2020), [[arXiv:1907.04125 \[astro-ph.CO\]](#)].
- 2021 3. Small scale induced gravitational waves from primordial black holes, a stringent lower mass bound, and the imprints of an early matter to radiation transition, **N. Bhaumik**, R. K. Jain, *Phys. Rev. D* **104**, 023531 (2021), [[arXiv:2009.10424 \[astro-ph.CO\]](#)].
- 2022 4. Doubly peaked induced stochastic gravitational wave background: Testing baryogenesis from primordial black holes, **N. Bhaumik**, A Ghoshal and M. Lewicki, [[arXiv:2205.06260 \[astro-ph.CO\]](#)].

## Ongoing projects

- (to appear) 1. Understanding large scale CMB anomalies with the generalized non-minimal derivative coupling during inflation, Y. Tiwari, **N. Bhaumik**, R. K. Jain.
- 2. Signatures of neutrino mass model in primordial black holes and scalar-induced gravitational waves, **N. Bhaumik**, A. Ghoshal.
- 3. Understanding the steepest growth of the primordial scalar spectrum in ultra slow roll regime, **N. Bhaumik**, R. K. Jain.

## Presentations/Talks/Posters

- Oct 2019 (Offline) Oral presentation on "Formation of primordial black holes from inflationary models" in Young Astronomer's Meet 2019, Kodaikanal Solar Observatory, Kodaikanal, India

- Nov 2019 (Offline) Poster presentation on "Primordial black holes as a dark matter candidate" in in-house symposium, Department of Physics, IISc Bangalore
- Dec 2019 (Offline) Oral presentation on "Primordial black holes dark matter from inflection point models of inflation and the effects of reheating" in the 9th International Conference on Gravitation and Cosmology (ICGC), IISER Mohali, India
- Nov 2020 (Online) Oral presentation on "Lowest mass limit of Primordial black holes from USR models and effects of reheating" in Less Travelled Path Of Dark Matter: Axions And Primordial Black Holes, ICTS, Bangalore, India
- Dec 2020 (Online) Oral presentation on "Lowest mass bound and reheating effects for primordial black holes from USR models of inflation" in 31st meeting of the Indian Association for General Relativity and Gravitation (IAGRG), IIT Gandhinagar, India.
- May 2021 (Online) Invited talk on "Ultra slow roll models of inflation with different reheating histories, to form primordial black holes and induced stochastic gravitational wave background" in cosmology group meeting at Indian Institute of Technology Madras, India
- Aug 2021 (Online) Oral presentation on "PBHs and induced GWs from single field inflation and the small scale imprints of reheating " in The 24th International Conference on Particle Physics and Cosmology (COSMO'21), University of Illinois, USA

## Organizing experiences

- 2020-2021 Weekly journal-club meeting, cosmology group, Indian Institute of Science, Bangalore.

## Teaching experience

- 2019-2020 Graduate course : Quantum Mechanis.  
Course instructor : Dr. Manish Jain, Indian Institute of Science, Bangalore.

## Computational skills

1. Fortran, 2. C, 3. Python, 4. Mathematica, .
5. HPC setup for CosmoMC Montepython and COBAYA in cray x40 supercomputer .

## Schools/Workshops/Conferences attended (offline/online)

- March 2018 (Offline) Introductory School on Galaxy Formation, NISER, Bhubaneswar, India
- Jan 2019 (Offline) Cosmology - The Next Decade: School and Workshop, ICTS, Bangalore, India
- Oct 2019 (Offline) (Speaker) Young Astronomers' Meet 2019, Kodaikanal Solar Observatory, Kodaikanal, India
- Dec 2019 (Offline) (Parallel session speaker) International Conference on Gravitation and Cosmology, IISER Mohali, India
- Aug-Sept 2020 (Online) Physics Of The Early Universe - An Online Precursor, ICTS, Bangalore, India
- Nov 2020 (Online)(Speaker) Less Travelled Path Of Dark Matter: Axions And Primordial Black Holes, ICTS, Bangalore, India
- Dec 2020 (Online)(Parallel session speaker) 31st meeting of the Indian Association for General Relativity and Gravitation (IAGRG), IIT Gandhinagar, India.
- March 2021 (Online) Theoretical Aspects of Astroparticle Physics, Cosmology and Gravitation - 2021 GGI school, Florence, Italy
- Aug 2021 (Online)(Parallel session speaker) 24th International Conference on Particle Physics and Cosmology (COSMO'21), University of Illinois, USA

Aug-Sept (Online) School-cum-Workshop on Data Analysis in Cosmology and Astroparticle Physics, ISI  
2021 Kolkata, India.

## Academic achievements and scholarships

- 2017 Secured All India Rank - 142 in JRF-NET 2016 (National Eligibility Test for PhD in India) in Physics.
- 2017 Secured All India Rank - 78 in JEST 2017 in Physics.
- 2014 Secured All India Rank - 221 in JAM 2014 (Joint Admission Test for M.Sc) in Physics.
- 2011–2016 INSPIRE Scholarship (B.Sc and M.Sc), Department of Science and Technology, India.

## Previous research experience

- 2015-2016 M.Sc thesis : Interior volume of  $(1 + D)$  dimensional Schwarzschild black hole.  
Supervisor : Dr. Bibhas Ranjan Majhi , Indian Institute of Technology, Guwahati.
- 2018 Computational course project : Obtaining primordial scalar and tensor power spectra for single scalar field inflationary models.  
Course Instructor : Dr. Manish Jain, Indian Institute of Science, Bangalore.

## Personal

DOB, Gender 26 April 1994, Male.  
Citizenship Indian.  
Languages English, Bengali, Hindi.