Nilanjandev Bhaumik

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Current affiliation

Postdoctoral Fellow, ICTP - Asia Pacific , Beijing

Education and work experience

2024 Postdoctoral Fellow, Department of Physics, *Indian Institute of Technology*, Madras, India.

2023 Doctor of Philosophy (Ph.D.) in Early Universe Cosmology, *Indian Institute of Science*, Bengaluru, India, (Thesis supervisor: Dr. Rajeev Kumar Jain).

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 background (SGWB), Detection of SGWB, Possible imprints of early matter domination through GW detection, Ultralight PBHs and their imprints in GW background, Black hole evaporation, Baryogenesis, Large scale CMB anomalies, Scalar-tensor theories, Data analysis for CMB (Planck-2018 and BICEP-2020) and SGWB(NANOGrav-2023)

Publications and preprints

2024 8. Constraining the history of reheating with the NANOGrav 15-year data , S. Maity, **N. Bhaumik**, M. R. Haque, D. Maity, L. Sriramkumar, [arXiv:2403.16963 [astro-ph.CO]].

2023 7. Ultra-low mass PBHs in the early universe can explain the PTA signal , **N. Bhaumik**, R. K. Jain and M. Lewicki, Phys. Rev. D 108, 123532 (2023) [arXiv:2308.07912 [astro-ph.CO]].

2023 6. Distinct signatures of spinning PBH domination and evaporation: doubly peaked gravitational waves, dark relics and CMB complementarity , **N. Bhaumik**, A. Ghoshal, R. K. Jain and M. Lewicki, JHEP 05 (2023) 169, [arXiv:2212.00775 [astro-ph.CO]].

2023 5. Understanding large scale CMB anomalies with the generalized non-minimal derivative coupling during inflation , Y. Tiwari, **N. Bhaumik**, R. K. Jain, Phys. Rev. D 107 (2023), no. 10 103513 . [arXiv:2206.13320 [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, JHEP 07 (2022) **130**, [arXiv:2205.06260 [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]].

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]].

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]].

Presentations/Talks/Posters

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

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

September 2022 (In person) Contributed talk on "Stochastic gravitational waves background to probe the reheating histories in the presence of primordial black holes" 31st Texas Symposium on Relativistic Astrophysics, Prague, Czech Republic

September, 2022 (In person) (Talk) A Cosmic Window to Fundamental Physics: Primordial Non-Gaussianity (PNG) and Beyond, IFT Madrid

December, 2022 (In person) (Talk) 32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG32), IISER Kolkata

March, 2023 (In person) (Talk) Less Travelled Path to the Dark Universe (LTPDU) , ICTS Bengaluru

Dec, 2023 (In person) (Talk) 10th International Conference on Gravitation and Cosmology (ICGC) , IIT Guwahati

Academic Visits

26 September 2022 Talk on "Formation of primordial black holes from inflation and their post inflationary imprints in gravitational wave background", Jagiellonian University, Kraków, Poland

27-28 September 2022 Talk on "Different aspects of primordial black holes : inflationary models and detectable gravitational wave background", Warsaw University, Warsaw, Poland

30 September 2022 Talk on "Stochastic gravitational wave background to probe primordial black hole scenarios and compatibility with inflationary models", Catholic University of Louvain, Louvain-la-Neuve, Belgium

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.

Technical skills

Operating Systems : Linux

Programming Language: Fortran, C, Python

Symbolic computation : Mathematica

Computational Experience

High-Performance Computing :

Param Pravega, ATOS Bull Sequana XH2000 series (IISc, India)

SahasraT-Cray XC40 system (IISc, India)

Observational data analysis :

CMB: COSMOMC and COBAYA for PLANCK-2018 (Plik and Camspec12.5) and BICEP (2020)
SGWB: PTArcade for NANOGrav 15 years data release (2023)

Schools/Workshops/Conferences attended (offline/online)

Jan 2019	(In Person) Cosmology - The Next Decade: School and Workshop, ICTS, Bangalore, India
Dec 2019	(In Person) 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
June, 2022	(Online) Gravity: Current challenges in black hole physics and cosmology, YITP, Kyoto, Japan
July 2022	(In Person) Summer School on Cosmology 2022, ICTP, Trieste, Italy
September, 2022	(In person) 31st Texas Symposium on Relativistic Astrophysics, Prague, Czech Republic
September, 2022	(In person) A Cosmic Window to Fundamental Physics: Primordial Non-Gaussianity (PNG) and Beyond, IFT Madrid
December, 2022	(In person) 32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG32), IISER Kolkata
March, 2023	(In person) Less Travelled Path to the Dark Universe (LTPDU), ICTS Bengaluru

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.
2011–2016	INSPIRE SHE 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 (arXiv:1607.03704). Supervisor : Dr. Bibhas Ranjan Majhi , Indian Institute of Technology, Guwahati.

Personal

Date of birth	26 April 1994
Gender, Citizenship	Male, Indian