Mr. Prashant Thakur orcid link-

CONTACT INFORMATION

Research Scholar
Department of Physics, BITS Pilani, K. K. Birla Goa Campus
Room No- PhD Hall
State: Goa, PIN:403726, Country: India.

mobile: +91 8580404641
e-mail: p20190072@goa.bits-pilani.ac.in

PERMANENT ADDRESS

Singh's House, Near boys hostel
Vivekanand Vihar
City: Solan ; State: Himachal Pradesh,
PIN: 173212; Country: India

Home: + 91 8580404641
e-mail: prashantthakur1921@gmail.com

EDUCATION

- **Ph.D.** (2020-2025) **(Defense Completed on 11/02/2025)**
  -**Birla Institute of Technology & Science** – Pilani, K.K. Birla Goa Campus, India
  -**Thesis Title:** *Feasibility of Dark Matter in Neutron Stars: A Quantitative Analysis*
  -Supervisor: **Prof. Tarun Kumar Jha**
  -Advisor: **Dr. Tuhin Malik**
  -Examiner: **Prof. Ritam Mallick (IISER Bhopal)**
  -Thesis Reviewed by: **Prof. Ritam Mallick (IISER Bhopal), Prof. Dr. Odilon Lourenço (Instituto Tecnológico de Aeronáutica, São José dos Campos, SP, Brazil)**

- **Masters of Science (M.Sc) Physics:**
  -**Shoolini University, Solan, India**,
  -**Year of Completion :** 2018
  -**Degree Grade Point Average :** 7.77/10.00

- **Bachelor of Science (B.Sc) Physics:**
  -**Centre of Excellence, Sanjauli Degree College**, Shimla, Himachal Pradesh
  -**Year of Completion :**2015
  -**Pass Subjects :** Physics(Hons.) Mathematics, Chemistry, English, Hindi

- **Higher Secondary Exam:**
  -**Chapslee School**, Shimla, Himachal Pradesh
  -**Year of Completion:** 2011

- **Secondary Exam:**
  -**Chapslee School**, Shimla, Himachal Pradesh
  -**Year of Completion :** 2009

RESEARCH INTERESTS

My research focuses on neutron stars and their equations of state, particularly their properties, interactions with dark matter, and how these interactions can constrain from astrophysical observations. I aim to understand the internal structure, dynamics, and role of exotic particles in neutron stars. During my PhD, I have had the opportunity to gain expertise in various advanced methodologies and tools that are pivotal for state-of-the-art research in high energy nuclear physics and astrophysics. Specifically, I have developed a strong proficiency in Bayesian Inference, which has been instrumental in my data analysis and modeling efforts. My work with Machine Learning has enabled me to leverage complex algorithms and models to uncover patterns and insights from large datasets. Furthermore, my experience with Big Data Analysis has equipped me with the skills to handle and interpret vast amounts of data efficiently. Additionally, I have become adept at using Mathematica for symbolic computations and analytical derivations, which has greatly enhanced my problem-solving capabilities. My proficiency with the RNS (Rotating Neutron Star) code has allowed me to perform detailed simulations and analyses of neutron star properties, contributing significantly to my research on dense matter physics and dark matter interactions. Currently, and in the foreseeable future, my research aims to explore the internal structure of neutron stars (NS) and investigate the presence of dark matter within them through a phenomenological methodology, in which I am well-versed.

RESEARCH VISIT

- Departamento de Física, University of Coimbra, Coimbra, Portugal, from 1st May 2023 - 30th July 2023.
  .
- Inter-University Centre for Astronomy and Astrophysics, India, from 13th September 2024 - 30th September 2024.

JOURNALS

* In Communication

1. Feasibility of Dark Matter Admixed Neutron Star Based on Recent Observational Constraints

Authors: *Prashant Thakur, Tuhin Malik, Arpan Das, B.K. Sharma, T.K. Jha, Constança Providência*

arXiv: arXiv:2408.03780v1

In Communication to: Astronomy & Astrophysics

2. Non-Radial Oscillation Modes in Hybrid Stars with Hyperons and Delta Baryons: Full General Relativity Formalism vs. Cowling Approximation

Authors: *Ishfaq Ahmad Rather, Kau D. Marquez, Prashant Thakur, Odilon Lourenço*

e-Print: e-Print: 2412.12002 [astro-ph.HE]

In Communication to: Physical Review D

Date: Dec 16, 2024

4. Supernova Remnants with Mirror Dark Matter and Hyperons

Authors: *Adamu Issifu (Espirito Santo U.), Prashant Thakur (Birla Inst. Tech. Sci.), Franciele M. da Silva (Londrina U.), Kau D. Marquez (Espirito Santo U.), Débora P. Menezes (Londrina U.) et al.*

e-Print: e-Print: 2412.17946 [hep-ph]

In Communication to: Physical Review D

Date: Dec 23, 2024

3. Impact of σ-cut Potential on Antikaon Condensation in Neutron Stars within the Relativistic Mean Field Model

Authors: *Prashant Thakur, B. K. Sharma, Lakshana Sudarsan, Krishna Kunnampully, T. K. Jha*

In Communication to: Physical Review C

* Published

1. Hyperon Bulk Viscosity and r-Modes of Neutron Stars

Authors: *O P Jyothilakshmi, P E Sravan Krishnan, Prashant Thakur, V Sreekanth, T.K. Jha*

DOI: 10.1093/mnras/stac2360

Journal: Monthly Notices of the Royal Astronomical Society, 516 (2022) 3, 3381-3388

2. Exploring Robust Correlations Between Fermionic Dark Matter Model Parameters and Neutron Star Properties: A Two-Fluid Perspective

Authors: *Prashant Thakur, Tuhin Malik, Arpan Das, T.K. Jha, Constança Providência*

DOI: 10.1103/PhysRevD.109.043030

Journal: Physical Review D, 109 (2024) 4, 043030

3. Towards Uncovering Dark Matter Effects on Neutron Star Properties: A Machine Learning Approach

Authors: *Prashant Thakur, Tuhin Malik, T.K. Jha*

DOI: 10.3390/particles7010005

Journal: Particles, 7 (2024) 1, 80-95

4. Influence of the Symmetry Energy and σ-cut Potential on the Properties of Pure Nucleonic and Hyperon-Rich Neutron Star Matter

Authors: *Prashant Thakur, B. K. Sharma, A. Ashika, S. Srivishnu, T.K. Jha*

DOI: 10.1103/PhysRevC.109.025805

Journal: Physical Review C, 109 (2024) 2, 025805

*

Conference Proceedings

1. Neutron Stars with Fermionic Dark Matter: A Two-Fluid Approach

Authors: *Prashant Thakur, T.K. Jha*

Proceedings: DAE Symp.Nucl.Phys., 66 (2023) 776-777

2. Antikaon Condensates with Dark Vector Meson in Neutron Stars

Authors: *Prashant Thakur, T.K. Jha*

Proceedings: DAE Symp.Nucl.Phys., 66 (2023) 804-805

3. HESSJ1731-347 Supernova Remnant as Possible Dark Matter Admixtured Candidate

Authors: *Prashant Thakur, T.K. Jha, B.K. Sharma*

Proceedings: DAE Symp.Nucl.Phys., 67 (2024) 817-818

4. Neutron Stars Anisotropic Nature: A Study of Exotic States of Matter and Cosmic Observations

Authors: *Premachand Mahapatra, Prashant Thakur*

Proceedings: DAE Symp.Nucl.Phys., 67 (2024) 819-820

5. On the Possibility of a 2.6$M_\odot$ Neutron Star

Authors: *Tamanna Iqbal, R. Chandra, B.K. Sharma, Prashant Thakur, T.K. Jha*

Proceedings: DAE Symp.Nucl.Phys., 66 (2023) 772-773

Conferences & Workshops Attended

- **Gravitational-Wave Astronomy Summer School (Online)**
  Organized by ICTS-TIFR, Bengaluru, India — July 5-16, 2021
- **ICTS Summer School on Gravitational-Wave Astronomy 2022**
  Hosted offline at ICTS-TIFR, Bengaluru, India — May 30 - June 10, 2022
- **Workshop on Lunar Gravitational-Wave Detection**
  ICTS-TIFR, Bengaluru, India — April 17-20, 2023

- **DAE Symposium on Nuclear Physics 2022**
  Cotton University, Guwahati, Assam, India December 1-5, 2022
  Presented Poster

- **Dark Matter and Stars: Multi-Messenger Probes of Dark Matter and Modified Gravity**
  Centro de Congressos, CENTRA, IST, University of Lisbon, Portugal May 3-5, 2023
  Presented Poster

- **DAE Symposium on Nuclear Physics 2023**
  IIT Indore, Madhya Pradesh, India December 9-13, 2023
  Presented Poster

- **NEOSGrav2024: International Conference on Neutron Star Equation of State and Gravitational Waves**
  Kenilworth Hotel, Goa, India October 1-4, 2024
  Invited Talk

- **3rd International Conference on Neutrinos and Dark Matter**
  Cairo, Egypt Dec 11-14, 2024
  Invited talk

TEACHING

- Teaching Assistance (TA) at BITS-Pilani Goa (Mechanics Lab, Electrodynamics and Optics Lab)

PROGRAMMING LANGUAGES/SKILLS

- **Coding Skills:**
  - Python, FORTRAN 90, Linux Shell scripting
- **Software:**
  - Wolfram Mathematica, RNS, LORENE, NMMA, LaTeX
- **Gravitational Wave Analysis:**
  - BILBY
- **Neutron Star Related Codes:**
  - Equation of States (Relativistic Mean Field Theory)
  - Dark Matter Modeling (Fermionic and Bosonic)
  - Tolman-Oppenheimer-Volkoff (TOV) Equation Solver
  - Two-Fluid TOV Solver
  - Non-Radial Oscillations of Neutron Stars (f, p, and g modes) using both Cowling Approximation and Full GR Framework
  - Modified theory of Gravity f(R,T)
  - Anisotropic Neutron Stars

KNOWN LANGUAGES

- English, Hindi, Punjabi, Pahadi

PERSONAL DETAILS

- Name of Father : Mr. HarKrishan Singh (Retired Government officer).
- Name of Mother : Mrs. Sangeeta (House Wife)
- Date of Birth : 19th March, 1992
- Nationality : Indian
- Marital Status : Married
- Spouse name: Prachie Sharma

REFEREES

Prof. Tarun Kumar Jha
Associate Professor
Physics Department
Birla Institute of Technology & Science, Pilani
K K Birla Goa Campus
India
e-mail: *tkjha@goa.bits-pilani.ac.in*

Prof. Bharat Kishore Sharma
Assistant Professor
Department of Sciences
Amrita School of Physical Sciences, Amrita Vishwa Vidyapeetham, Coimbatore 641112
India
e-mail: *bk_sharma@cb.amrita.edu*

Prof. Constança Providência
Professor
CFisUC
Department of Physics, University of Coimbra,
P-3004 - 516 Coimbra, Portugal
e-mail: *cp@uc.pt*

Dr. Tuhin Malik
Researcher
CFisUC
University of Coimbra

Portugal
e-mail: *tuhin.malik@uc.pt*

Dr. Arpan Das
Assistant Professor
Physics Department
Birla Institute of Technology & Science, Pilani

Pilani Campus, India
e-mail: *arpan.das@pilani.bits-pilani.ac.in*