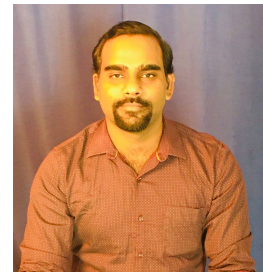


Dr. Bharat Kumar

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About Me

Dr. Bharat Kumar is a nuclear astrophysicist and faculty member in the Department of Physics and Astronomy at the National Institute of Technology, Rourkela, India. Currently, he is leading a research project titled "Physics of Neutron Stars: Constraints from Finite Nuclei to Gravitational Waves" (CRG/2021/000101), which is generously supported by a three-year core research grant from the SERB for the period 2022-2025. Dr. Kumar's research interests revolve around the theoretical exploration of various facets of neutron stars and dark matter, situated at the intersection of nuclear physics and astrophysics. His work establishes critical connections between multi-messenger astronomical observations and nuclear experiments.

Employment History

- 2020 – Present 📖 **Assistant Professor**, NIT, Rourkela, Odisha, India.
- 2019 – 2020 📖 **Postdoctoral**, University of Tsukuba, Japan.
- 2018 – 2019 📖 **Postdoctoral** LIGO-India, IUCAA, Pune, India.

Education

- 2014 – 2018 📖 **Ph.D.** Institute of Physics, Bhubaneswar, India.
Thesis title: *Implications of nuclear interaction for nuclear structure and astrophysics within the relativistic mean-field model.* [<https://arxiv.org/abs/1812.03306>]
Supervisor: Prof. S. K. Patra
- 2013 – 2014 📖 **Post M.Sc.**, Institute of Physics, Bhubaneswar, India.
Thesis title: *Shape co-existence and parity doublet in Zr isotopes.*
Supervisor: Prof. S. K. Patra
- 2010 – 2012 📖 **M.Sc.**, Aligarh Muslim University, Aligarh, India.
- 2007 – 2010 📖 **B.Sc.(Hons)**, Aligarh Muslim University, Aligarh, India.

Skills

- Languages 📖 English, Hindi
- Coding 📖 Fortran, Mathematica, Python, \LaTeX , ...
- Misc. 📖 Academic research, teaching, \LaTeX typesetting and publishing.

List of Sponsored Projects

1. Physics of Neutron Stars: Constraints from Finite Nuclei to Gravitational Waves
PI: Dr Bharat Kumar (NIT, Rourkela)

Co-PI: Prof B K Agrawal (SINP, Kolkata)

Sponsoring agency: SERB

Tenure of the Assignment: 2022-2025

Total Amount: 21,12,828 Rs.

Research Interests

- **Nuclear Physics**

Ground state properties of finite nuclei; Nuclear energy density functionals; Relativistic mean-field and Skyrme Hartree-Fock models; Parity doublets; Nucleon density clustering; Multifragmentation fission; Density dependence of the nuclear symmetry energy; Neutron distributions and neutron skins, Equation of state of dense nuclear matter

- **Nuclear Astrophysics**

Static and rotating neutron star structure (mass, radius, moment of inertia, quadrupole deformation, tidal deformability, Radial and Non-Radial Oscillations); Compositions in neutron stars, gravitational waves, WIMP Dark Matter

Academic Visits and Schools/Symposium/Conferences Attended

1. DST-SERC School on Nuclear Structure at High Angular Momentum and Isospin Oct. 5-25, 2014 at HBCSE, TIFR-Mumbai, India.
2. Winter School on Nuclear Astrophysics Jan. 19-31, 2015 VECC, Kolkata.
3. DAE Symposium on Nuclear Physics Dept. of Physics, BHU, India, Dec. 8-12, (2014).
4. Nuclear Physics Meet-June 26-30, (2015) Institute of Physics, Bhubaneswar, India.
5. Recent development of density functional theory-July 17-19, (2015) Institute of Physics, Bhubaneswar, India.
6. 40th Academic Year Activities of Institute of Physics IOP Internal Symposium, Bhubaneswar, India, August 27, (2015).
7. International workshop on "Recent Trends in Nuclear Structure and its Implication in Astrophysics" 4th-8th Jan., 2016, Blue Lily Puri.
8. CNT Lectures on selected topics in nuclear theory- 16-25 Feb. 2016 Variable Energy Cyclotron Centre, Kolkata.
9. Probing the frontiers of particle physics with neutrinos and LHC Institute of Physics, Bhubaneswar, odisha from 17th-21st Oct. 2016.
10. CNT Lectures on Special Topics in Nuclear Astrophysics- 1-11 March 2017, Variable Energy Cyclotron Centre, Kolkata.
11. Summer school on gravitational-wave astronomy- 17-28 July 2017, International centre for theoretical sciences, Tata Institute of fundamental research, Bangalore.
12. Summer school on gravitational-wave astronomy- 13-24 August 2018, International centre for theoretical sciences, Tata Institute of fundamental research, Bangalore.
13. 30th meeting of the Indian Association for General Relativity and Gravitation(IAGRG), 3-5 January 2019, BITS-Pilani, Hyderabad Campus.

14. Conference on Multi-messenger Astronomy in the Era of LIGO-India, 15-18 January 2019, Khandala, India.
15. India-UK Entrepreneurial Workshop, 18-19 January 2019, IUCAA, Pune.
16. The 15th International Symposium on Origin of Matter and Evolution of Galaxies, 2-5 July 2019, Yukawa Institute for Theoretical Physics, Kyoto University, Japan.
17. The 18th CNS International Summer School, 21-27 August 2019, Hongo campus, University of Tokyo, Japan.
18. Academic visit to Department of Physics Education, Daegu University, South Korea, 22-25 September 2019.
19. Quarks and Compact Stars 2019, 26-28 September 2019, Haeundae, Busan, South Korea.

Presentations

Contributed Talks:

1. Analysis of parity doublet in medium mass nuclei,
DAE Symposium on Nuclear Physics, Dept. of Physics, BHU, India, Dec. 8-12, (2014).
2. Shape co-existence and Parity doublet in Zr isotopes,
Nuclear Physics Meet-2015, Institute of Physics, Bhubaneswar, India, June 26-30,(2015).
3. Examining the stability of thermally fissile Th and U isotopes,
40th Academic Year Activities of Institute of Physics
IOP Internal Symposium, Bhubaneswar, India, August 27, (2015).
4. Tidal effects in equal-mass binary neutron stars
61st DAE-BRNS Symposium on Nuclear Physics,
December 05-09, 2016, Saha Institute of Nuclear Physics, 1/AF Bidhannagar, Kolkata -700064, India.
5. Tidal deformability of neutron stars within relativistic mean field equations of state
CNT Lectures on Special Topics in Nuclear Astrophysics- 1-11 March 2017, Variable Energy Cyclotron Centre, Kolkata.
6. New effective interactions IOPB-I and G₃; the 18th CNS Summer School 2019, University of Tokyo, Japan.

Invited Talks:

1. New relativistic effective interaction for finite nuclei, infinite nuclear matter and neutron stars,
ICTS-TIFR, Bangalore.
2. New relativistic effective interaction for finite nuclei infinite nuclear matter and neutron stars,
Tsukuba-CCS workshop on “microscopic theories of nuclear structure and dynamics”, University of Tsukuba, Japan.
3. Implications of nuclear interaction for nuclear structure and astrophysics within the relativistic mean-field model, Tsukuba-Center for Computational Sciences, University of Tsukuba, Japan.
4. Neutron star astrophysics from gravitational waves and nuclear theory, Sado2019, the 5th workshop on many-body correlations in microscopic nuclear model, September 5-6, 2019 at Senkaku-sou, Niigata, Japan.
5. Relativistic models (G₃ and IOPB-I) of the neutron-star matter equation of states, September 24, 2019 at Kyungpook National University, Daegu, South Korea.
6. Constraints on the moment of inertia of neutron-star/pulsars from GW170817, February 27, 2020 at Physical Research Laboratory, Ahmadabad, India.

Awards/Achievements/Memberships

2011-2012	■ PG Merit Scholarship at AMU, Aligarh, UP, India.
2013	■ BARC (OCES & DGFS)
	■ Joint Entrance Screening Test
2013-2014	■ Junior Research Fellowship (JRF), Department of Atomic Energy (DAE), India.
2014-2018	■ Senior Research Fellowship (SRF), Department of Atomic Energy (DAE), India.
2021	■ Member of Odisha Physical Society, India.
2022-2025	■ Associate of IUCAA Pune, India.

Reviewer of the journals

Since 2018	■ Phys. Lett. B, Mod. Phys. Lett. A
Since 2019	■ Astrophysical Journal, Astrophysics Journal Letter
Since 2020	■ Physics of the Dark Universe
Since 2021	■ Nuclear Physics A

Courses taught

PH-1002	■ Physics-II (Theory)
PH-2007	■ Electrostatics and Magnetostatics (Theory)
PH-1070	■ Physics Laboratory (Laboratory)
PH-6121	■ Quantum Field Theory
PH-4006	■ Quantum Mechanics-II

PhD Students

Pinku Routray (PhD)	■ Nuclear Astrophysics-Ongoing 2021-Continue
Sayatan Ghosh (PhD)	■ Nuclear Astrophysics-Ongoing 2022-Continue
Probit Kalita (PhD)	■ Nuclear Astrophysics-Ongoing 2022-Continue
Sunitarani Pani (Ex-PhD)	■ Nuclear Astrophysics-Ongoing 2022-Continue

UG/PG Students

Sailesh Ranjan Mohanty (UG)	■ Impacts of Anisotropy on Neutron Star Properties: Insights from Non-adiabatic Gravitational Collapse Publications: <ul style="list-style-type: none">• https://arxiv.org/abs/2304.02439• https://doi.org/10.48550/arXiv.2211.12808• https://arxiv.org/abs/2305.15724
Khokan Singha (PG)	■ Exploring the impact of Delta-Baryons on the Properties of Neutron Stars
Shahebaj Hasan Shaikh (PG)	■ Finite temperature dependent equation of state for nucleonic core of neutron stars

(continued)

Mrityunjoy Singha (PG)	Dark compact objects
Athul K P (PG)	Impact of the equation of state on f - and p - mode oscillations of neutron stars
	Publications:
	<ul style="list-style-type: none">• Phys. Rev. D 106 (2022) 063005• Galaxies 11 (2023) 60; [Invited Article]
	Current Position: PhD in FSU
Souhardya Sen (PG)	Radial oscillations in neutron stars from unified equation of states
	Publications:
	<ul style="list-style-type: none">• Galaxies 11 (2023) 60; [Invited Article]• Phys. Rev. D 107 (2023) 103039
Vikram Singh Khati (PG)	Presence of dark matter in the core of Neutron star
Pritam Kumar Bishee (UG)	Treatment of quark matter in the inner core of Neutron star
Soumya Prakash Behera (UG)	Nuclear constraints on gravitational waves from deformed pulsars
Manisha (PG)	Computation of two-fluid dark matter (SIRE-project)
Arijit Maiti (PG)	Studying the Structure of Neutron Stars Through Numerical Analysis of TOV Equations (SIRE-project)

Administrative Experience

Departmental Activities

2020-Continue	Department Academic Committee UG & PG
2022-Continue	PIC-Time Table and Seminar Incharge
2021-2022	PIC-Placement

Institute Activities

2023	XX Convocation Dress Distribution Committee Member
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Research Publications

II. Preprinted Papers

1. Exploring the Macroscopic Properties and Nonradial Oscillations of Proto-Neutron Stars: Effects of Temperature, Entropy, and Lepton Fraction, Sayantan Ghosh, Shahebaj Shaikh, Probit J Kalita, Pinku Routaray, **Bharat Kumar**, and B.K. Agrawal Submitted to Nuclear Physics A [<https://arxiv.org/abs/2307.06892>]
2. Dark Matter Admixed Neutron Star in the light of HESS J1731-347 and PSR J0952-0607, Pinku Routaray, H C Das, Jeet Amrit Pattnaik, and **Bharat Kumar** Submitted to Physics of Dark Universe [<https://arxiv.org/abs/2307.12748>]
3. Probing the impact of Delta-Baryons on Nuclear Matter and Non-Radial Oscillations in Neutron Stars, Probit Jyoti Kalita, Pinku Routaray, Sayantan Ghosh, and **Bharat Kumar**, Bijay K. Agrawal

Submitted to JCAP [<https://arxiv.org/abs/2308.09008>]

4. Exploring Radial Oscillations in Slow Stable and Hybrid Neutron Stars, Sayantan Ghosh, Sayantan Ghosh, Tianqi Zhao, and **Bharat Kumar**, Submitted to PRD [<https://arxiv.org/abs/2401.08347>]
5. Unstable Anisotropic Neutron Stars: Probing the Limits of Gravitational Collapse, S. R. Mohanty, Sayantan Ghosh, and **Bharat Kumar**, Submitted to PRD [<https://arxiv.org/abs/2304.02439>]
6. Correlation between the curvature and various properties of the neutron star, S K Biswal, H C Das, Ankit Kumar, **Bharat Kumar**, and S K Patra,, [<https://arxiv.org/abs/2012.13673>]
7. Structure effects on fission yields, **Bharat Kumar**, M. T. Senthil Kannan, M. Balasubramaniam, B. K. Agrawal, S. K. Patra, [<https://arxiv.org/abs/1701.00731>]

Chapters in book

1. Recent parametrization in relativistic mean-field formalism, K C Naik, R. N. Panda, **Bharat Kumar** and S. K. Patra, Nuclear structure physics, CRC press (2020) ISBN:9780367256104

Papers Published in International Refereed Journals

1. The Impact of Anisotropy on Neutron Star Properties: Insights from I-f-C Universal Relations, S. R. Mohanty, Sayantan Ghosh, Pinku Routaray, H. C. Das and **Bharat Kumar**, Accepted in JCAP [<https://arxiv.org/abs/2305.15724>]
2. Investigating Dark Matter-Admixed Neutron Stars with NITR Equation of State in Light of PSR J0952-0607, Pinku Routaray, Sailesh Ranjan Mohanty, H. C. Das, Sayantan Ghosh, P. J. Kalita, V. Parmar, **Bharat Kumar**, **JCAP 10 (2023) 073**; [<https://doi.org/10.48550/arXiv.2211.12808>] Impact Factor:**7.28**
3. Probing the impact of WIMP dark matter on universal relations, GW₁₇₀₈₁₇ posterior, and radial oscillations Pinku Routaray, Abdul Quddus, Kabir Chakravarti, and **Bharat Kumar**, **MNRAS 525 (2023) 5492**; [<https://arxiv.org/pdf/2202.04364.pdf>] Impact Factor:**5.23**
4. Radial Oscillations of Dark Matter admixed Neutron Stars, Pinku Routaray, H. C. Das, Souhardya Sen, **Bharat Kumar**, Grigoris Panotopoulos, and Tianqi Zhao, **Phys. Rev. D 107 (2023) 103039**; [<https://doi.org/10.48550/arXiv.2211.12808>] Impact Factor:**5.29**
5. Radial oscillations in neutron stars from unified equation of states, Souhardya Sen, Shubham Kumar, Athul Kunjipurayil, Pinku Routaray, Sayantan Ghosh, Probit J. Kalita, Tianqi Zhao and **Bharat Kumar**, **Galaxies 11 (2023) 60**; [Invited Article] [<https://arxiv.org/pdf/2205.02076.pdf>] Impact Factor:**3.3**
6. Theoretical studies on structural properties and decay modes of ^{284–375}119 isotopes, Asloob A. Rather, M. Ikram, Ishfaq A. Rather, A. A. Usmani, **Bharat Kumar**, K. P. Santhosh, S. K. Patra, **Eur. Phys. J. Plus 138 (2023) 467**; [<https://arxiv.org/abs/1709.07311>] Impact Factor:**3.75**

7. Impact of the equation of state on f - and p - mode oscillations of neutron stars, Athul Kunjipurayil, Tianqi Zhao, **Bharat Kumar**, Bijay K. Agrawal, and Madappa Prakash, **Phys. Rev. D** **106** (2022) 063005; [<https://arxiv.org/abs/2205.02081>] Impact Factor:5.29
8. Dark Matter Effects on the Compact Star Properties, H C Das, Ankit Kumar, **Bharat Kumar**, and S K Patra, **Galaxies** **10** (2022) 14; [Invited Review Article] Impact Factor:3.17
9. Universal relations between the quasinormal modes of neutron star and tidal deformability, Hajime Sotani, and **Bharat Kumar**, **Phys. Rev. D** **104** (2021) 123002; [<https://arxiv.org/pdf/2109.08145.pdf>] Impact Factor:5.29
10. The BigApple force and it's implications to finite nuclei and astrophysical objects, H C Das, Ankit Kumar, **Bharat Kumar**, S K Biswal, and S K Patra, **IJMP E** **30** (2021) 2150088; [<https://arxiv.org/abs/2009.10690>] Impact Factor:1.174
11. Impacts of dark matter on the curvature of the neutron star, H C Das, Ankit Kumar, **Bharat Kumar**, S K Biswal, and S K Patra, **JCAP** **01** (2021) 007; [<https://arxiv.org/abs/2007.05382>] Impact Factor:5.21
12. Warm dense matter and cooling of supernovae remnants, Ankit Kumar, H C Das, S K Biswal, **Bharat Kumar**, and S K Patra, **Eur. Phys. J C** **80** (2020) 775; [<https://doi.org/10.1140/epjc/s10052-020-8353-4>] Impact Factor:4.39
13. *GW170817 constraints on the properties of a neutron star in the presence of WIMP dark matter, Abdul Quddus, Grigorios Panotopoulos, **Bharat Kumar**, Shakeb Ahmad, and S. K. Patra, **J. Phys. G** **47** (2020) 095202; [<https://doi.org/10.1088/1361-6471/ab9d36>] Impact Factor:2.41
14. Effects of dark matter on the nuclear and neutron star matter, H C Das, Ankit Kumar, **Bharat Kumar**, S K Biswal, Takashi Nakatsukasa, Ang Li, and S K Patra, **MNRAS** **495** (2020) 4893; [<https://doi.org/10.1093/mnras/staa1435>] Impact Factor:5.54
15. *Inferring Neutron Star Properties from GW170817 with Universal Relations **Bharat Kumar**, and Philippe Landry, **Phys. Rev. D** **99** (2019) 123026; [<https://doi.org/10.1103/PhysRevD.99.123026>] Impact Factor:4.83
16. ¹Constraints on the moment of inertia of PSR J0737-3039 from GW170817, Philippe Landry, and **Bharat Kumar**, **ApJL** **868** (2018) L22; [<https://doi.org/10.3847/2041-8213/aee76>] Impact Factor:8.20
17. *GW170817: Constraining the nuclear matter equation of state from the neutron star tidal deformability, Tuhin Malik, N. Alam, M. Fortin, C. Providência, B. K. Agrawal, T. K. Jha, **Bharat Kumar**, and S. K. Patra, **Phys. Rev. C** **98** (2018) 034005; [<https://doi.org/10.1103/PhysRevC.98.035804>] Impact Factor: 3.29

¹Important papers which are related to the GW170817 and nuclear fission.

18. Decay properties and reaction dynamics of zirconium isotopes in the relativistic mean-field model, M. Panigrahi, R. N. Panda, **Bharat Kumar** and S. K. Patra, [IJMP E 27 \(2018\) 1850012](https://doi.org/10.1142/S021830131850012X); [https://doi.org/10.1142/S021830131850012X]
Impact Factor:1.174
19. *New relativistic effective interaction for finite nuclei, infinite nuclear matter and neutron stars, **Bharat Kumar**, S. K. Patra, and B. K. Agrawal, [Phys. Rev. C 97 \(2018\) 045806](https://doi.org/10.1103/PhysRevC.97.045806); [https://doi.org/10.1103/PhysRevC.97.045806]
Impact Factor: 3.29
20. A Study of Multi- Λ Hypernuclei within Spherical Relativistic Mean-field Approach, Asloob A. Rather, M. Ikram, A. A. Usmani, **Bharat Kumar**, S. K. Patra, [Braz. J. Phys. 47 \(2017\) 628](https://doi.org/10.1007/s13538-017-0525-9); [https://doi.org/10.1007/s13538-017-0525-9]
21. *New parameterization of the effective field theory motivated relativistic mean field model, **Bharat Kumar**, S. K. Singh, B. K. Agrawal, S. K. Patra, [Nucl. Phys. A 966 \(2017\) 197](https://doi.org/10.1016/j.nuclphysa.2017.07.001); [https://doi.org/10.1016/j.nuclphysa.2017.07.001]
Impact Factor: 1.70
22. *Relative mass distributions of neutron-rich thermally fissile nuclei within statistical model, **Bharat Kumar**, M. T. Senthil Kannan, M. Balasubramaniam, B. K. Agrawal, S. K. Patra, [Phys. Rev. C 96 \(2017\) 034623](https://doi.org/10.1103/PhysRevC.96.034623); [https://doi.org/10.1103/PhysRevC.96.034623]
Impact Factor: 3.29
23. Relative fragmentation in ternary systems within the temperature-dependent relativistic mean-field approach, M. T. Senthil Kannan, **Bharat Kumar**, M. Balasubramaniam, B. K. Agrawal, S. K. Patra, [Phys. Rev. C 95 \(2017\) 064613](https://doi.org/10.1103/PhysRevC.95.064613); [https://doi.org/10.1103/PhysRevC.95.064613]
Impact Factor: 3.29
24. *Tidal deformability of neutron and hyperon star with relativistic mean field equations of state, **Bharat Kumar**, S. K. Biswal and S. K. Patra, [Phys. Rev. C 95 \(2017\) 015801](https://doi.org/10.1103/PhysRevC.95.015801); [https://doi.org/10.1103/PhysRevC.95.015801]
Impact Factor: 3.29
25. Structural and decay properties of $Z=132,138$ superheavy nuclei, Asloob A. Rather, M. Ikram, A. A. Usmani, **Bharat Kumar**, S. K. Patra, [Eur. Phys. J. A 52 \(2016\) 372](https://doi.org/10.1140/epja/i2016-16372-x); [https://doi.org/10.1140/epja/i2016-16372-x]
Impact Factor:2.80
26. Quest for magicity in hypernuclei, M. Ikram, **Bharat Kumar**, S. K. Biswal and S. K. Patra, [IJMP E 25 \(2016\) 1650103](https://doi.org/10.1142/S0218301316501032); [https://doi.org/10.1142/S0218301316501032]
Impact Factor:1.174
27. Effects of isovector scalar meson on neutron star both with and without hyperon, S. K. Biswal, **Bharat Kumar** and S. K. Patra, [IJMP E 25 \(2016\) 1650090](https://doi.org/10.1142/S0218301316500907); [https://doi.org/10.1142/S0218301316500907]
Impact Factor:1.174
28. Nuclear structure and decay properties of even-even nuclei in $Z = 70-80$ drip-line region, S. Mahapatro, C. Lahiri, **Bharat Kumar**, R. N. Mishra and S. K. Patra, [IJMP E 25 \(2016\) 1650062](https://doi.org/10.1142/S0218301316500622); [https://doi.org/10.1142/S0218301316500622]
Impact Factor:1.174
29. Modes of decay in neutron-rich nuclei, **Bharat Kumar**, S. K. Biswal, S. K. Singh, Chirashree Lahiri, and S. K. Patra, [IJMP E 25 \(2016\) 1650020](https://doi.org/10.1142/S0218301316500208); [https://doi.org/10.1142/S0218301316500208]

Impact Factor:1.174

30. Examining the stability of thermally fissile Th and U isotopes,
Bharat Kumar, S. K. Biswal, S. K. Singh and S. K. Patra,
[Phys. Rev. C 92 \(2015\) 054314](https://doi.org/10.1103/PhysRevC.92.054314); [https://doi.org/10.1103/PhysRevC.92.054314]
Impact Factor: 3.29
31. Properties of superheavy nuclei: $Z = 124$,
M. S. Mehta, Harvinder Kaur, **Bharat Kumar** and S. K. Patra,
[Phys. Rev. C 92 \(2015\) 054305](https://doi.org/10.1103/PhysRevC.92.054305); [https://doi.org/10.1103/PhysRevC.92.054305]
Impact Factor: 3.29
32. Shape co-existence and parity doublet in Zr isotopes,
Bharat Kumar, S. K. Singh and S. K. Patra,
[IJMP E 24\(2015\)1550017](https://doi.org/10.1142/S0218301315500172); [https://doi.org/10.1142/S0218301315500172]
Impact Factor:1.174

Papers Published in in National Symposium and Conferences

1. Analysis of parity doublet in medium mass nuclei,
Bharat Kumar, S. K. Singh and S. K. Patra,
Proceedings of the DAE Symp. on Nucl. Phys. **59**, 96 (2014).
2. β -decay half-life of Th and U isotopes,
Bharat Kumar, S. K. Biswal, S. K. Singh and S. K. Patra,
Proceedings of the DAE Symp. on Nucl. Phys. **60**, 406 (2015).
3. Nucleus and its application: Neutron-rich thermally fissile nuclei,
Bharat Kumar, S. K. Biswal and S. K. Patra,
National seminar on recent trends in physics & 33rd convention of Orissa Physical Society.
4. Evolution of $N = 32,34$ shell closure in relativistic mean field theory,
Bharat Kumar, S. K. Biswal and S. K. Patra,
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 196 (2016).
5. Tidal effects in equal-mass binary neutron stars,
Bharat Kumar, S. K. Biswal and S. K. Patra,
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 868 (2016).
6. Curvature of a neutron star,
Bharat Kumar, S. K. Biswal and S. K. Patra,
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 916 (2016).
7. Search For Λ Shell Closures in Multi- Λ Hypernuclei,
Asloob A. Rather, M. Ikram, M. Imran, **Bharat Kumar**, S. K. Biswal, S. K. Patra,
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 178 (2016).
8. Competition between α , β decay and Spontaneous Fission in $Z=132$ Superheavy Nuclei,
Asloob A. Rather, M. Ikram, **Bharat Kumar**, S. K. Biswal, S. K. Patra
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 202 (2016).
9. Effects of δ -meson on the maximum mass of the hyperon star,
S. K. Biswal, **Bharat Kumar**, S. K. Patra,
Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **61**, 912 (2016).
10. I-Love relation in low-mass neutron stars ...**Accepted** (2016).
Bharat Kumar, S. K. Biswal and S. K. Patra,

National Conference On Nuclear and Accelerator Physics (NCNAP-2016) October 4-6, 2016, Centre for Applied Physics Central University of Jharkhand, Brambe, Ranchi, India.

11. Effective relativistic mean field model for finite nuclei and neutron stars, **Bharat Kumar**, B. K. Agrawal and S. K. Patra, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **62**, 716 (2017).
12. Tidal deformability of neutrons and hyperon star, **Bharat Kumar** and S. K. Patra, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **62**, 37 (2017).
13. Determination of the nuclear incompressibility and symmetry energy from neutron star tides, Tuhin Malik, N. Alam, M. Fortin, C. Providência, B. K. Agrawal, T. K. Jha, **Bharat Kumar**, and S. K. Patra, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **63**, 816 (2018).
14. Properties of a neutron star in the presence of dark matter, Abdul Quddus, Grigorios Panotopoulos, **Bharat Kumar**, Shakeb Ahmad, and S. K. Patra, Proceedings of the DAE-BRNS Symp. on Nucl. Phys. **63**, 810 (2018).
15. Neutron skins of heavy nuclei and tidal deformability of neutron star, **Bharat Kumar**, OMEG15 at Kyoto University, Japan; <https://arxiv.org/abs/1908.02909>

References

Prof. S. K. Patra

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University of Tsukuba, Japan

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Sincerely,


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