

Curriculum Vitae

Bharat Kumar

ADDRESS

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Date of Birth: July 2, 1990

ABOUT ME

Currently, I am a researcher at *Institute of Physics, Bhubaneswar, India*. I am working in the field of nuclear theory and astrophysics focusing mainly on developing nuclear energy density functionals of the relativistic mean-field model and have recently generated and tested two newly parameter sets (IOPB-I and G3) in different regimes such as finite nuclei, infinite nuclear matter, and neutron star. Also, I use the equation of state of neutron-star matter to calculate stellar properties of the neutron star such as composition, mass, radii, moments of inertia, tidal deformability, and gravitational wave emissions.

EDUCATION

<i>Ph.D.</i> , Institute of Physics, Sachivalaya Marg, Bhubaneswar-751005 Dissertation - "Implications of nuclear interaction for nuclear structure and astrophysics within the relativistic mean-field model" Adviser- Prof. S. K. Patra	2014-2018
<i>Post M.Sc.</i> , Physics Institute of Physics, Sachivalaya Marg, Bhubaneswar-751005 Thesis - "Shape co-existence and parity doublet in Zr isotopes" Adviser- Prof. S. K. Patra	2013-2014
<i>M. Sc.</i> , Nuclear Physics Aligarh Muslim University, Aligarh India	2010-2012
<i>B.Sc(Hons)</i> , Physics Aligarh Muslim University, Aligarh India	2007-2010

ACHIEVEMENTS

1. PG Merit Scholarship at AMU, Aligarh, UP, India (2011-12)
2. BARC (OCES & DGFS) (2013)
3. JEST: 2013
4. JUNIOR RESEARCH FELLOWSHIP (JRF), (August, 2013 - June, 2014)
Department of Atomic Energy (DAE), India.
5. SENIOR RESEARCH FELLOWSHIP (SRF), (August, 2015 - 2018)
Department of Atomic Energy (DAE), India.

COMPUTER SKILLS

- **Language:** BASIC, C, C++, FORTRAN, Mathematica, HTML
- **Operating Software:** UNIX (Fedora 14, 20 , Ubuntu 14.04) , WINDOWS (XP, 7, 8, vista)

SCHOOLS/SYMPOSIUM/CONFERENCES ATTENDED

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

AREAS OF RESEARCH INTEREST

- **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); Post-Newtonian theory with tidal deformation, Hyperon stars with compositions, gravitational waves

REVIEWER

- Phys. Lett. B Since 2018
- Mod. Phys. Lett. A Since 2018

LIST OF PUBLICATIONS

I. Papers Published in International Refereed Journals

2018:

1. Constraints on the moment of inertia of PSR J0737-3039 from GW170817, Philippe Landry, and **Bharat Kumar**,
[Under review in PRL](#); [arXiv:1807.04727v1 \[gr-qc\]](#)

2. 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,
Under review in PRC; *arXiv:1805.11963v1 [nucl-th]*
3. 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
4. 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; *e-Print arXiv:1711.04940v1[nucl-th]*
5. Theoretical studies on structural and decay properties of Z=119 superheavy nuclei, M. Ikram, Asloob A. Rather, A. A. Usmani, **Bharat Kumar**, S. K. Patra,
Under review in Phys. Rev. C; *e-Print arXiv:1709.07311[nucl-th]*

2017:

6. 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; *e-Print arXiv:1708.00409[nucl-th]*
7. 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; *e-Print arXiv:1705.02621 [nucl-th]*
8. Relative mass distribution 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; *e-Print arXiv:1704.08105 [nucl-th]*
9. Structure effects on fission yields, **Bharat Kumar**, M. T. Senthil Kannan, M. Balasubramaniam, B. K. Agrawal, S. K. Patra,
Under review in Phys. Rev. C; *e-Print arXiv:1701.00731v1 [nucl-th]*
10. 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; *e-Print arXiv:1612.01667 [nucl-th]*
11. 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; *e-Print arXiv:1609.08863v1 [nucl-th]*

2016:

12. 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; *e-Print arXiv:1611.00232 [nucl-th]*
13. Quest for magicity in hypernuclei, M. Ikram, **Bharat Kumar**, S. K. Biswal and S. K. Patra,
IJMP E 25 (2016) 1650103; *e-Print arXiv:1607.04865v1 [nucl-th]*
14. 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; *e-Print arXiv:1602.08888 [nucl-th]*
15. 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; *e-Print arXiv:1512.04665v1 [nucl-th]*

16. 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; *e-Print arXiv:1602.08871 [nucl-th]*

2015:

17. 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; *e-Print arXiv:1508.00391v2 [nucl-th]*
18. Properties of superheavy nuclei: $Z = 124$,
M. S. Mehta, Harvinder Kaur, **Bharat Kumar** and S. K. Patra,
Phys. Rev. C 92 (2015) 054305; *e-Print arXiv:1510.08312 [nucl-th]*
19. Shape co-existence and parity doublet in Zr isotopes,
Bharat Kumar, S. K. Singh and S. K. Patra,
IJMP E 24(2015)1550017; *e-Print arXiv:1409.4645 [nucl-th]*

II. Papers Published 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).

LIST OF TALKS GIVEN AT SYMPOSIUM/SCHOOL/INSTITUTES

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 relativistic effective interaction for finite nuclei, infinite nuclear matter and neutron stars, ICTS-
TIFR, Bangalore.

REFERENCES

Prof. S. K. Patra

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