ICFAI UNIVERSITY, TRIPURA

REFLECTION

ICFAI SCIENCE SCHOOL

Department of Physics

Newsletter
2025-2026

ICFAI UNIVERSITY, TRIPURA

ICFAI Science School

Department of Physics

Newsletter 2025-2026

From the Desk of the Vice-Chancellor

On behalf of 'The ICFAI University Tripura', I take this opportunity to warmly welcome the entire readers' community to *Reflections*, the Newsletter of the Department of Physics. It gives me immense pleasure to share that this issue is enriched with information highlighting the academic achievements and extracurricular activities of the students and faculty members of the department.

I sincerely appreciate and congratulate each and every member of the department, for their valuable contributions to this innovative endeavour. This Newsletter reflects the collective dedication, coordination, and sustained efforts of the entire department.

I am delighted to acknowledge that our University provides a strong platform for faculty & students community to excel in their pursuits. The University has remained committed to delivering high-quality, engaging classroom teaching and learning, along with the development of professional, soft, and life skills. We continue to strive towards providing a rewarding educational experience and fostering relevant knowledge aligned with best practices.

I hope this dynamic initiative publication of *Reflections*, sets new benchmarks and contributes meaningfully to the well-being of society.

I wish the Newsletter every success.

Prof. (Dr.) Biplab Halder
Vice-Chancellor,
The ICFAI University Tripura

From the Desk of the Registrar

With immense pleasure, I extend my heartfelt congratulations to the Department of Physics of 'The ICFAI University Tripura' for their commendable efforts in bringing out the Physics Newsletter *Reflections*. The Newsletter presents valuable information on departmental activities, research and various achievements that strives for the holistic development of the students.

The current issue of *Reflections* promises meaningful progress across all sections, and I eagerly look forward to seeing it in its published form. I congratulate the editors and faculty members for their untiring efforts and dedication.

Dr. A. Ranganath
Registrar
The ICFAI University Tripura

From the desk of the Dean, Faculty of Science and Technology

I am truly delighted to learn that the Department of Physics, ICFAI Science School, is bringing out its 5th Newsletter on 25th February 2026, commemorating the celebration of National Science Day. The consistent publication of this newsletter reflects the department's vibrant academic culture and its commitment to documenting scientific growth and intellectual engagement.

The impressive number of research papers published by the faculty members in reputed international journals, along with the enthusiastic participation of students in various academic and co-curricular activities, clearly establishes the department as one of the most dynamic and happening centers of learning in our University.

I extend my heartfelt congratulations to the editorial team of the newsletter for their sincere efforts and dedication in compiling and presenting the departmental achievements so beautifully. I express my deep sense of appreciation and gratitude to everyone involved in making this publication possible.

I wish the Department of Physics continued success in its entire academic and research endeavors.

Dr. Priyangshu Rana Borthakur

Dean Faculty of Science & Technology,

The ICFAI University Tripura

From the desk of Principal, ICFAI Science School

It is a matter of great joy to share this newsletter titled ‘Reflection’ of the Department of Physics, ICFAI Science School, ICFAI University Tripura. Physics teaches us not only how the universe works, but also how to think with curiosity, logic, and imagination. I'm happy to see that the department promotes these qualities in students by providing them with engaging classroom instruction, practical experiences, and a lively academic ambiance. This year, I'm particularly proud of the department's expanding outreach efforts to fill the gap between the fields of science and society. The department is encouraging young people to pursue science by conducting workshops, awareness campaigns, and student-centered projects that assist extend scientific thinking beyond the classroom. The real essence of education i.e., learning, sharing, and community service is reflected in such attempts. I value the efforts of the teachers, staff, and students who's drive and cooperation enable these successes.

I appreciate the editorial team for releasing this newsletter and wish the Department of Physics great success.

Dr. Prasenjit Bal

Principal, ICFAI Science School,

The ICFAI University Tripura

From the desk of departmental head,

It is a pleasure to present this issue of *"Reflections"*, highlighting the Department's academic, research, and co-curricular activities from January 2025 to January 2026.

Along with conference, webinars, and celebrations like Quantum Day and Space Day, we have actively promoted holistic development through initiatives such as Yoga sessions and Basics of Karate (Self-Defence), fostering essential life skills. I am proud that every year our students secure ranks in competitive examinations like JAM and CUET for higher studies. Our faculty members also continue to contribute through quality research publications and conference presentations.

I sincerely thank the editors, Dr. Arunabha Saha and Dr. Ganesh Adhikary, for compiling this newsletter, and appreciate everyone who contributed to its success.

May *"Reflections"* continue to inspire excellence and curiosity in Physics.

Dr. Camelia Das
HOD, Department of Physics
The ICFAI University Tripura

From the editor's Desk:

In every quiet laboratory corridor, in every equation written with patience on a blackboard, and in every curious question asked by a young mind, there exists a story waiting to be told. *Reflections*, the newsletter of the Department of Physics, The ICFAI University Tripura, is an attempt to gather those stories — like scattered photons — and let them shine together with meaning and harmony.

Like the gentle unfolding of a wave across space and time, learning in physics is both a journey and a resonance. This newsletter is not merely a collection of pages, but a canvas where **science meets creativity, logic meets imagination, and knowledge meets expression.** Within these pages lie the aspirations of students, the dedication of teachers, and the enduring rhythm of discovery that binds us as a scholarly community.

The universe speaks in silence through stars, atoms, and energy — and physics teaches us how to listen. In that spirit, *Reflections* seeks to preserve the voice of our department: thoughtful, inquisitive, and ever-evolving. Each issue is a small constellation of ideas, illuminating the shared intellectual sky of our institution.

May this humble endeavor continue to inspire curiosity, nurture creativity, and celebrate the timeless beauty of understanding nature through science.

With warm regards,

Dr. Arunabha Saha
&
Dr. Ganesh Adhikary

Editors, *Reflections*
Assistant Professor
Department of Physics
The ICFAI University Tripura

About the ICFAI University Tripura

The ICFAI University, Tripura (referred to hereafter as the University) was established in 2004 through an Act of State Legislature (Tripura Act 8 of 2004). The University has been approved by the University Grants Commission, under Section 2(f) of the UGC Act, 1956. The University has been approved by the University Grants Commission, under Section 2(f) of the UGC Act, 1956. The Visitor of the University is H.E, the Governor of Tripura. The University is administered as per the Act, Statutes, and Rules. The Board of Governors is headed by the Chancellor and has Vice-Chancellor and others as members. The Board of Management is headed by the Vice-Chancellor. The Academic Council is responsible for all academic matters.

The University offers Bachelor, Master, and Doctoral programs in management, finance, science and technology, information technology, education, law, and other areas. The University campus based at Agartala is a lush green campus spread over 32 acres at Kamalghat Sadar, Tripura. It has over 6 lakhs sq. ft. of built-up area with academic blocks, workshops, laboratories, faculty rooms, auditorium, seminar halls, computer labs with the latest computing facility, well-equipped library, canteen, sports and recreation facilities. The campus also provides the latest teaching aids and is Wi-Fi enabled. The University is being widely recognized as an institution devoted to quality research and teaching. The University gives utmost importance to the Industry-University interface.

Faculty of Science & Technology (FST)

Faculty of Science & Technology (FST), a constituent unit of the ICFAI University, Tripura (IUT). FST is committed to providing quality education in the field of science and technology. It helps the students develop professional competence through their exposure to labs and workshops and industry exposure through internships/projects in the industry. with the objective of promoting new areas of Science & Technology and to play the role of a nodal department for organizing, coordinating, and promoting S&T activities in the country.

About the Department of Physics

Established as an independent entity under the ICFAI Science School in August 2018, the Department of Physics began its journey with quiet determination and luminous aspiration. Since its inception, it has moved forward with unwavering resolve—transforming challenges into stepping stones through perseverance, integrity, and collective dedication. What began as a vision has steadily evolved into a vibrant academic space where the beauty of physics is not merely taught, but experienced.

At the heart of the Department stands a constellation of highly accomplished faculty members, devoted not only to the pursuit of cutting-edge research in emerging domains but also to the noble task of mentoring young minds. Their scholarship extends into frontier areas of science and state-of-the-art technological development, yet their true distinction lies in their ability to inspire curiosity, critical inquiry, and intellectual independence. With painstaking care and thoughtful guidance, they nurture a generation of students capable of thinking beyond boundaries and excelling in their chosen paths.

The Department presently offers **B.Sc. (Honors), M.Sc., and Ph.D. programs in Physics**, each designed to cultivate depth of knowledge alongside research acumen. Students are encouraged to broaden their horizons through internships at esteemed institutions, gaining exposure to diverse research cultures. Master's projects flourish across dynamic and contemporary research areas, supported by the Department's steadily growing laboratory and computational facilities.

Academic vibrancy is further sustained through a rich tapestry of seminars, invited lectures, workshops, and scholarly interactions organized throughout the year. These platforms not only keep students attuned to emerging scientific trends but also refine their presentation skills, academic confidence, and spirit of innovation. The Department believes that education must transcend textbooks—it must kindle imagination, cultivate analytical thought, and awaken entrepreneurial vision.

With a steadfast commitment to quality education and meaningful research, the Department of Physics strives to create an environment where intellect meets inspiration and inquiry transforms into discovery. Anchored within the ICFAI University Tripura, the Department envisions its future as a flourishing **Center of Excellence**, illuminating the path of scientific pursuit for years to come.

Issue Editors: ***Dr. Arunabha Saha and Dr. Ganesh Adhikary***

Assistant Professor (Department of Physics)

Courses Offered:

- **B.Sc. (Honours) Physics**: The B.Sc. (Physics) program is designed for six semesters (three years) to provide a systematic understanding of core physical concepts, principles, and theories along with their applications. In the AY 2025-26, there were 12, 15 and 30 students in B.Sc. 1st, 2nd and 3rd years respectively.
- **M.Sc. Physics:** The M.Sc. (Physics) program is designed for four semesters (two years) in a way that a good basic foundation of subjects is laid and applications along with recent developments are covered. The M.Sc. program aims to train the students such that they can make careers in R&D, industries, and academic institutions. In the AY 2025-26, there were 14 and 17 students respectively in M.Sc. Physics 1st and 2nd year.
- **Ph.D. (Physics):** The Ph.D. program in Physics has been designed for individuals who want to seek greater depth of knowledge of Physics and want to contribute towards the overall enhancement of science and technology. It would empower them with the ability to work in research and would enable them to create fresh knowledge, discover new things and develop new skills. By obtaining a Ph.D. in Physics, the candidates would acquire the education, skills, and hands-on experience necessary to access several careers within the field of physics. Ms. Shyamashree Roy, Ms. Souramita Acharjee and Ms. Riya Baidya have newly joined as PhD scholars in Dept. of Physics.

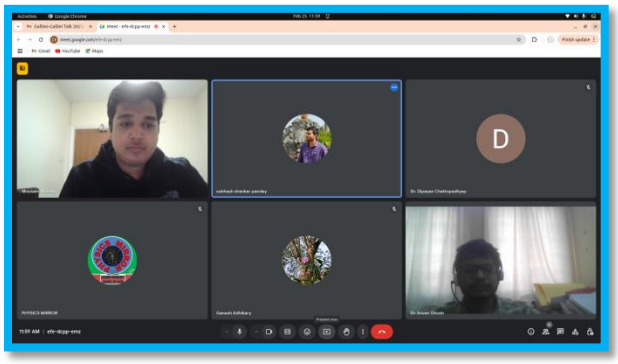
Highlights of the Department

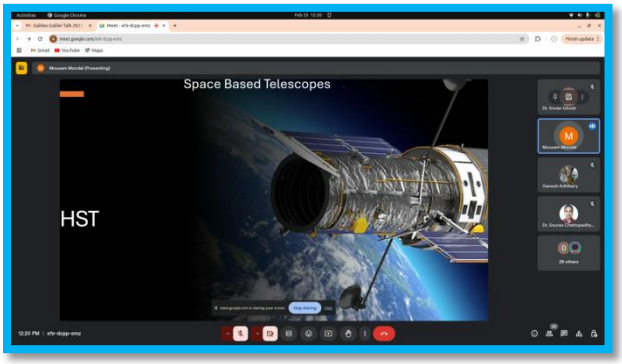
- Undergraduate, Postgraduate, and Doctorate of Philosophy degrees are offered.
- Highly qualified faculty members.
- Well-equipped Laboratory facility.
- Research and publications in emerging research areas.
- Seminars by highly qualified experts from all over India and abroad.
- Preparatory classes for competitive examinations (NET, JEST, GATE, JAM, etc.)

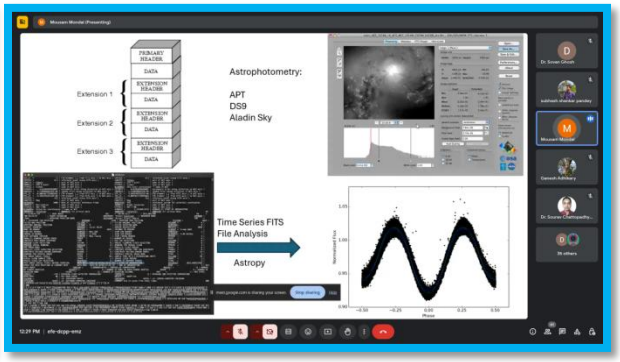
Events

Galileo Galilei Talk 2025

To celebrate the genius of Galileo Galilei, the Department of Physics, ICFAI University Tripura organized a talk related to astronomy on 25th February, 2025. Mr. Mausam Mandal, University of Hertfordshire, UK, was the resource person for the event. The program started at 12:00 noon with an introduction to the speaker by Dr. Sovan Ghosh, Associate Professor, Department of Physics, ICFAI University Tripura. The talk majorly focused on the "Growing importance of ML and AI in Astronomy". In his lecture, Mr. Mandal talked about the nature of Astrophysical data and several techniques to analyze those data using AI and ML. At the end of the talk the speaker interacted with the audience with lots of questions and answers. A total of 36 participants attended the session. The event ended with a vote of thanks from Dr. Camelia Das, HOD, Department of Physics, ICFAI University Tripura.

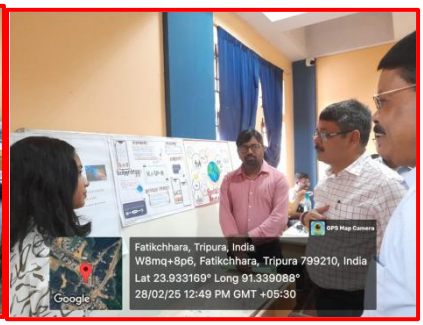






National Science Day 2025

The School of Science, ICFAI University Tripura and the Indian Association of Physics Teachers RC-18 jointly celebrated the National Science Day on 28th February at the University campus with great enthusiasm. The theme for National Science Day-2025 was "Empowering Indian Youth for Global Leadership in Science & Innovation for Viksit Bharat". The inaugural program was graced by Swapan Majumder, Secretary, the Indian Association of Physics Teachers RC- 18 and esteemed dignitaries of the University like- Prof. (Dr.) A. Ranganath, Registrar, Prof. (Dr.) Subhasish Chatterjee, Dean Academic Affairs, Prof. (Dr.) Priyangshu Rana Borthakur, Dean, Faculty of Science and Technology etc. Dr. Dipayan Chattopadhyay, Assistant Professor, Department of Physics, IUT, presented a special lecture on "Glimpse of Physics Informed Neural Network" with valuable insights into the intersection of physics and artificial intelligence. The Principal of ICFAI Technical School, Prof. (Dr.) Prasanta Kumar Sinha delivered a lecture on"Celebrating the Legacy of C.V. Raman", highlighting the contributions of the Nobel Laureate to the field of science. As a part of celebration, various competitions like science model exhibitions, Quizzes, Poster-making, Power Point presentations, Sit & draw and "Best out of Waste" etc. were organized to showcase the creativity and scientific acumen of young minds among the students from different schools and the University. Students from Jawhar Navodaya Vidyalaya, Mohanpur; Fatikcherra High School; Fatikcherra English Medium School; and Don Bosco Higher Secondary School, KairaiMandwi have actively participated in the program.



Basics of Karate — A Step Towards Self-Defense

A hand-on session on the basics of Karate for UG & PG students was organized by the Department of Physics, ICFAI University Tripura on 17th March, 2025 from 3.00 pm – 4.00 pm. The session was attended by all the faculty members of the department and 19 students from various UG & PG courses. The event was inaugurated by Dr. Sovan Ghosh, Head, Department of Physics followed by a brief introductory lecture on the need of self-defense for all. Mr. Amitabha Dey, NSNIS Coach Wushu & Black-belt Karate, was the resource person for this session. He started with a quick summarization of the severe needs of learning self-defence techniques in our daily life. The hand-on session started at 3.15 pm where Mr. Dey demonstrated different self-defending steps to the students. All the participants enthusiastically followed the steps and performed the steps very well. Mr. Dey started with some easy steps and slowly upgraded the level of hardness. The outcome of each defending move was nicely briefed by him during the hand-on session. Finally the session was ended with a vote of thanks by Dr. Bibhabasu De, Assistant Professor, Department of Physics.

Outreach Activity: Visit to Don Bosco Hr. Sec. School, Mandwi

As a part of outreach activities by the Department of Physics, ICFAI University, Tripura, Dr. Sourav Chattopadhyay and Dr. Tuhin Subhra Mukherjee visited the Don Bosco Higher Secondary School, Mandwi on 7th April, 2025. The event consisted of a lecture, titled “Exploring the wonders of Physics: A journey through science” and some simple hands-on activities. The school-students enthusiastically participated with various questions and discussions. The session ended with a vote of thanks by Fr. Juel Ekka, Principal, Don Bosco Higher Secondary School, Mandwi.

World Quantum Day 2025

The Department of Physics of The ICFAI University Tripura celebrated the World Quantum Day for the third time in the campus during 9th to 10th April, 2025. During the inauguration of the event lamp lighting is done using water sensing lithium battery lamps prepared by the students of the Department of Physics. Prof. (Dr.) Amarjyoti Choudhury, the renowned Physicist, former Vice Chancellor of Gauhati University and Pro Vice Chancellor of Tezpur University, inaugurated the program as Chief Guest. Prof. (Dr.) Biplab Halder, Vice Chancellor of the ICFAI University Tripura also presided over the inaugural session and delivered the welcome address. Prof. (Dr.) Amarjyoti Choudhury in his speech as Chief guest described the journey of Quantum Mechanics through stories and anecdotes of the invention. Series of research presentations, Debate competition and Poster Competition were organized for the students. After the valedictory session, prizes were distributed among the winners of each event. The entire program was conceptualized and hosted by Dr. Sovan Ghosh, Associate Professor of the Department of Physics. The celebration ended with a grand success and the University is looking forward to arranging more such engrossing events in the near future.

Summer School 2025

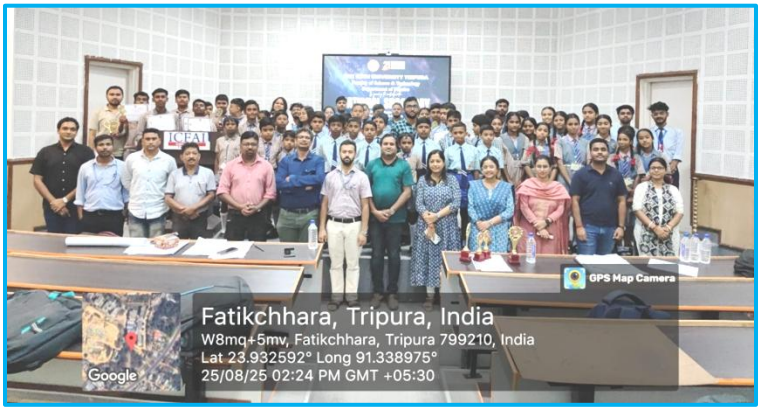
The Faculty of Science and Technology, The ICFAI University Tripura organized an engaging Summer School program from 26th May to 6th June, 2025, aimed at school students across the State. The Department of Physics designed the session to spark curiosity and deepen understanding of fundamental physics concepts through a series of interactive demonstrations and hands-on experiments, where the students had the opportunity to explore and participate in experiments on a wide range of topics, including refraction, polarization, dispersion of light, logic gates, water lamp, and eddy currents. Exciting demonstrations such as the Tesla coil showcased real-life applications of electromagnetism, while telescope viewing sessions introduced students to the basics of observational astronomy. Under the guidance of experienced faculty members, students not only observed the phenomena but also gained practical experience by performing selected experiments themselves. This interactive format made learning both fun and educational, leaving a lasting impact on all participants. The Summer School successfully fostered scientific curiosity among young learners and highlighted the importance of experiential learning in physics education.

Deeksharambh 2025

In alignment with the standardized guidelines of UGC, The Department of Physics, ICFAI University Tripura also organized *Deeksharambh 2025* — induction program for the newly joined students of B.Sc. and M.Sc. Physics from 4th to 8th August, 2025. During Deeksharambh the Department of Physics organized various introductory and interaction sessions, cultural and fun activities for the new students. Dr. Sovan Ghosh introduced the students to various aspects of their program through the departmental website whereas Dr. Sourav Chattopadhyay briefed about the NEP 2020 system and regarding the usage of ERP. The new students also visited Physics labs and the central library during the Deeksharambh session. Mr. Amitabha Dey, Research scholar, Department of Physics, ICFAI University Tripura conducted a one-hour self-defense session for the B.Sc. Physics, 1st year students. Moreover, under the guidance of Dr. Camelia Das, the M.Sc. Physics 2nd year students organized a cultural session and performed a drama to welcome the fresh batch of students.

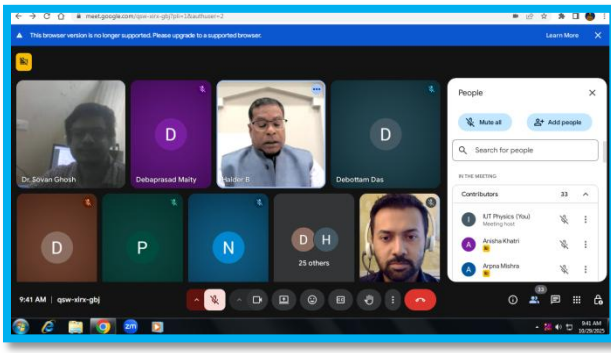
National Space Day 2025

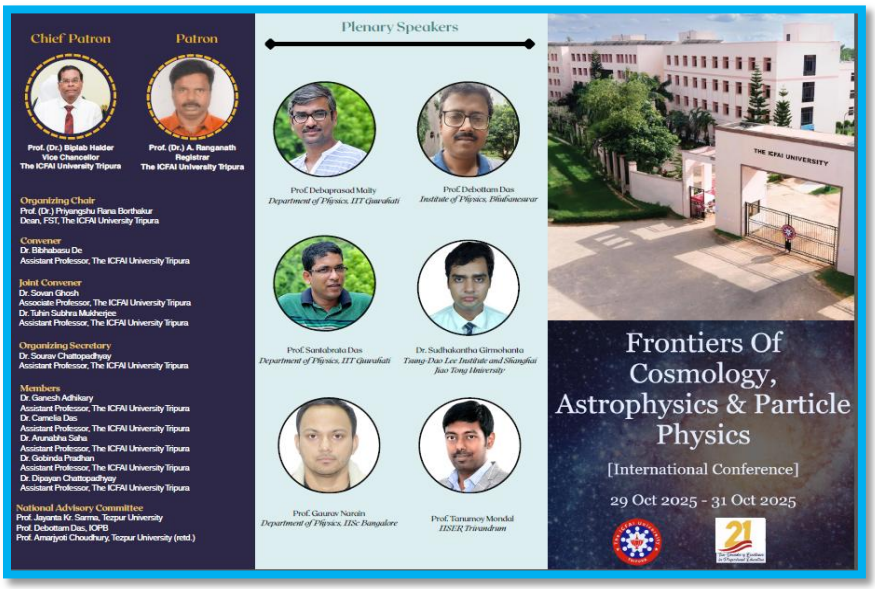
To commemorate the successful soft landing of Chandrayaan-3 on the Moon's south pole, 23rd August has been declared as the National Space Day. In 2025, the Department of Physics, ICFAI University Tripura organized a day-long event to celebrate National Space Day on 25th August. The inaugural session was chaired by Dr. A. Ranganath, Registrar, ICFAI University Tripura and Prof. (Dr.) P. R. Borthakur, Dean, Faculty of Science & Technology, ICFAI University Tripura, along with Dr. Sovan Ghosh, Associate Professor, Department of Physics and Dr. Camelia Das, Convener, National Space Day 2025. The celebration included engaging scientific lectures and various interesting and creative competitions for the school, college and university-level students. Students from different schools actively participated in quiz, scientific model and poster competitions and sit & draw.



International Conference on Frontiers of Cosmology, Astrophysics & Particle Physics (FroCAP2025)

Frontiers of Cosmology, Astrophysics & Particle Physics (FroCAP2025) was an initiative by the Department of Physics, ICFAI University Tripura to provide a platform to the young researchers, scholars, and students of Cosmology, Astrophysics and Particle Physics to meet, collaborate and learn from the experts of the fields. The conference was scheduled from 29th October, 2025 to 31st October, 2025, i.e., for three days in hybrid mode with 6 plenary sessions and 6 parallel sessions. The total number of registered participants was 97, including faculty members, research scholars and M.Sc. students from various institutes and universities. Dr. Bibhabasu De, Assistant Professor, Department of Physics, ICFAI University Tripura was the convener of the conference with Dr. Sovan Ghosh, Associate Professor and Dr. Tuhin Subhra Mukherjee, Assistant Professor, Department of Physics, ICFAI University Tripura working as the joint-conveners. The conference was inaugurated by Prof. (Dr.) Biplab Halder, Vice-Chancellor, ICFAI University Tripura followed by a welcome address by Dr. A. Ranganath, Registrar, ICFAI University Tripura.





Indian Knowledge System (IKS) Talk

The Department of Physics, The ICFAI University, Tripura organized an Indian Knowledge System (IKS) Talk titled "Ancient Indian Astrophysics — A Comparison with Modern Astrophysics" on 13/01/2026. Dr. Sovan Ghosh, Associate Professor, Department of Physics, ICFAI University, Tripura, was the speaker for the aforementioned event. With a well-illustrated presentation he explained various aspects of Indian astrophysics and the measurement of time during the ancient era. The scientific backbone of the Indian calendar system was discussed very precisely. The talk ended with a bombardment of queries from the enthusiastic audience.

Scientific Publications

1. "*Systematic study of cross section for α-induced reaction on ^{nat}Cd up to 70 MeV using TALYS (version 1.96) code*", ***A.Saha***, Applied Radiation and Isotopes **220**, 111777 (2025).

Applied Radiation and Isotopes 220 (2025) 111777

Contents lists available at ScienceDirect

Applied Radiation and Isotopes

journal homepage: www.elsevier.com/locate/apradiso

Systematic study of cross section for α-induced reaction on ^{nat}Cd up to 70 MeV using TALYS (version 1.96) code

A. Saha

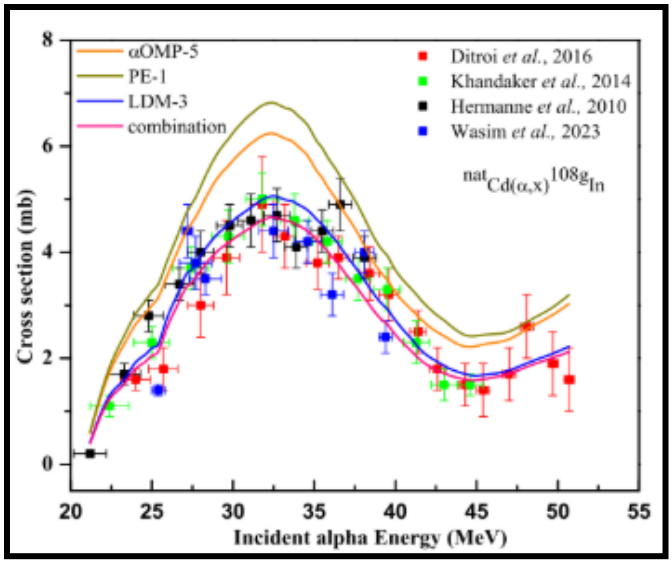
Department of Physics, ICFAI University Tripura, Kamalghat, Tripura 799210, India

ARTICLE INFO

Keywords:
Nuclear reaction cross section
TALYS code
Level density models
Pre-equilibrium models
Alpha optical model potentials
Compound nucleus mechanism

ABSTRACT

Systematic study of statistical model calculations for production cross section of medically and technologically important radioisotopes like ^{108g}In, ^{110m}In, ^{111g}In, ^{114m}In, ^{115m}In, ^{116m}In, ^{117g}In,^{110}Sn, ^{113g}Sn, ^{117m}Sn and ^{111m}Cd nuclei were performed via α-induced reaction on natural cadmium target using the TALYS code (version 1.96) for beam energies up to 70 MeV. The theoretically estimated results based on TALYS were also compared with the experimental data reported in literature by the different groups and with the latest evaluations of the TENDL-2023 libraries. The influence of various nuclear level density models, alpha optical model potentials and pre-equilibrium models on the production cross section of reaction channels opened up via alpha on ^{nat}Cd were investigated. Most consistent results in comparison with the experimental data have been found out utilizing the mean weighted deviation analysis in addition to an eye estimation. Such systematic studies of theoretically measured cross sections are extremely important for understanding the theoretical models of nuclear reaction, validating the nuclear model codes and improving the evaluated nuclear data compilations required for fundamental nuclear applications.



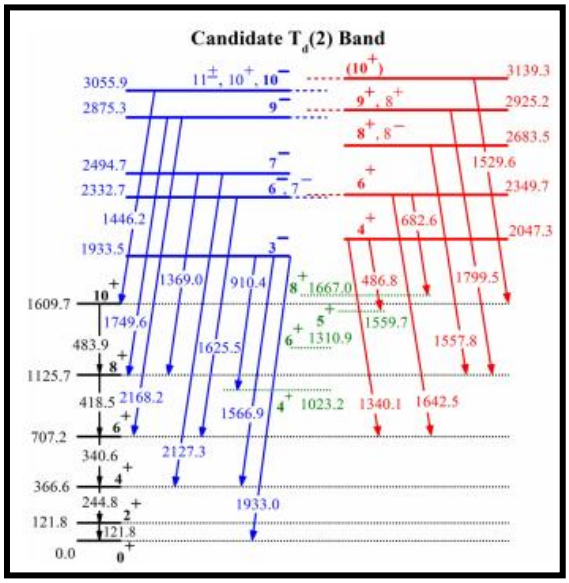
2. "*New evidence of interplay between tetrahedral and octahedral symmetries and symmetry breaking: exotic rotational bands in Sm*", ***S. Basak*** *et al.* , Physical Review C **111**, 034319 (2025)

PHYSICAL REVIEW C **111**, 034319 (2025)

New evidence of interplay between tetrahedral and octahedral symmetries and symmetry breaking: Exotic rotational bands in ^{152}Sm

S. Basak,[1,2] D. Kumar,[1,2] T. Bhattacharjee,[1,2,*] I. Dedes,[3] J. Dudek,[3,4,5] A. Pal,[1,2] S. S. Alam,[6] A. Saha,[7] A. K. Sikdar,[1,2] J. Nandi,[1,2] Shabir Dar,[1,2,†] A. Baran,[5] A. Gaamouci,[3] D. Rouvel,[4,8] S. Samanta,[9] S. Chatterjee,[9] R. Raut,[9] S. S. Ghugre,[9] A. Adhikari,[10] Y. Sapkota,[11,‡] R. Rahaman,[10] Ananya Das,[12] A. Gupta,[10] A. Bisoi,[10] S. Sharma,[13] S. Das,[10] A. Bhattacharyya,[14] P. Das,[14] U. Datta,[14] I. Ray,[15] J. Yang,[16] D. Curien,[4] and G. Duchêne[4]

We report on experimental evidence for a new, second tetrahedral band in $^{152}_{62}Sm_{90}$. It was populated via fusion evaporation reaction ^{150}Nd(α, $2n$)^{152}Sm, employing a 26 MeV beam of α particles from the K-130 cyclotron at the Variable Energy Cyclotron Centre, Kolkata, India. The newly observed possible mixed parity sequence with absence of $E2$ and strong indication of $E3$ transitions is consistent with the spectroscopic criteria for a tetrahedral-symmetry rotational band that could be constructed from the allowed spin-parity assignments. This structure differs from the structure of the band previously found in the same nucleus, the new one manifesting tetrahedral symmetry not accompanied by the octahedral one. Our new experimental results are interpreted in terms of group representation theory and the collective nuclear-motion theory of Bohr. We propose to generalize the notion of the tetrahedral vibrational bands and believe that our new experimental results support a number of theory predictions related to nuclear tetrahedral symmetry published earlier and bring a new light into the issue of spontaneous symmetry breaking in heavy nuclei.



3. "*Systematic study of effect of theoretical models on cross sections for ^{nat}Ca(α,x)^{47,46,44g,44m,43}Sc reactions*", ***A.Saha***, Applied Radiation and Isotopes **225**, 111938 (2025).

Applied Radiation and Isotopes 225 (2025) 111938

Contents lists available at ScienceDirect

Applied Radiation and Isotopes

journal homepage: www.elsevier.com/locate/apradiso

Systematic study of effect of theoretical models on cross sections for ^{nat}Ca(α, x)^{47,46,44g,44m,43}Sc reactions

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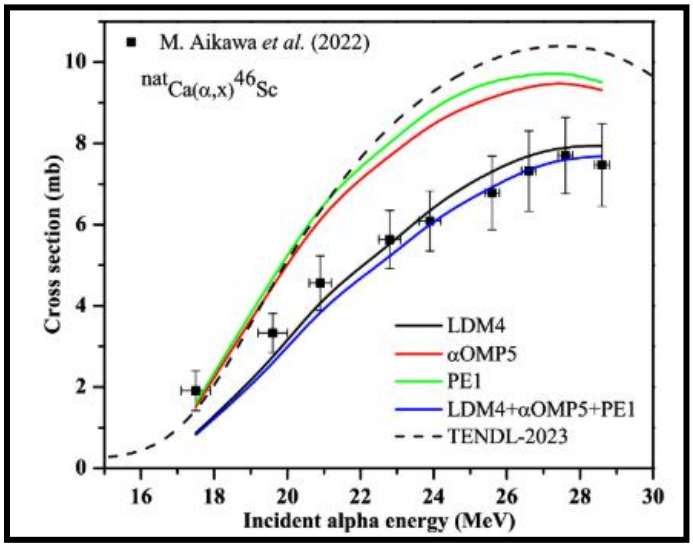
ARTICLE INFO

Dataset link: https://doi.org/10.1016/j.nds.2014.07.065

Keywords:
Cross section
TALYS code
Level density models
Pre-equilibrium models
Alpha optical model potentials
Compound nucleus mechanism

ABSTRACT

Cross section of medically important ^{47,46,44g,44m,43}Sc radionuclides produced via alpha induced reactions on natural Calcium are estimated theoretically using statistical model calculations employing TALYS (version 1.96) code up to 30 MeV incident alpha particle energy. The most suitable level density model, alpha optical model potential and pre-equilibrium model for theoretical estimation of production cross section of each of the Sc isotopes have been investigated and effect of their simultaneous application have also been studied. The theoretical results have been compared to the experimental data taken from literature and the latest evaluations of TENDL-2023 libraries. Such systematic studies are extremely important for understanding the influence of different theoretical models on the production cross section of different radioisotopes and for validation of different nuclear model codes.



4. "*Effect of level density models and alpha optical model potentials on theoretical estimation of cross sections for 64,66,67,68Zn(α,x) reactions using TALYS code (version 1.96)*", ***A.Saha***, Radiation Physics and Chemistry **238**, 113222 (2026).

Contents lists available at ScienceDirect

Radiation Physics and Chemistry

journal homepage: www.elsevier.com/locate/radphyschem

Effect of level density models and alpha optical model potentials on theoretical estimation of cross sections for ^{64,66,67,68}Zn(α, x) reactions using TALYS code (version 1.96)

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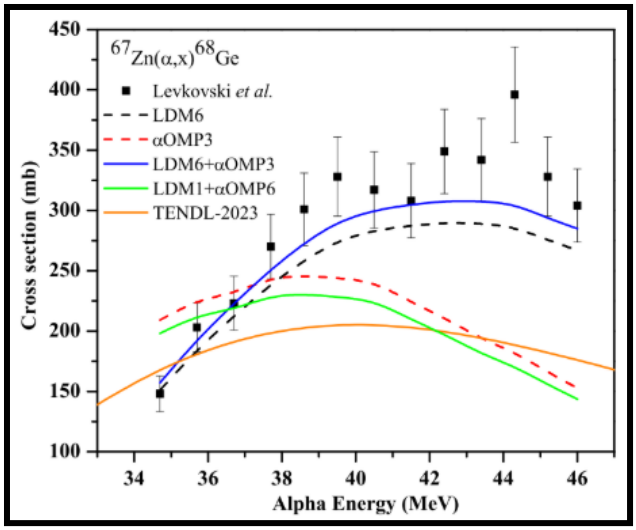
ARTICLE INFO

Dataset link: 10.1016/j.nds.2014.07.065

Keywords:
Nuclear reaction cross section
TALYS code
Level density models
Pre-equilibrium models
Alpha optical model potentials
Compound nucleus mechanism

ABSTRACT

Statistical model calculations for production cross sections of medically important radioisotopes like ^{68,69}Ge, ^{66,67}Ga and ^{65}Zn, which are useful in nuclear medicine for therapeutic and diagnostic purposes, have been performed systematically via α-induced reaction on ^{64,66,67,68}Zn targets using the TALYS code (version 1.96) for beam energies up to 50 MeV. The present work determines, for the first time, the most suitable level density model and the alpha optical model potential for each of the investigated reactions utilizing the technique of mean-weighted deviation analysis. The effect of combined use of the most compatible level density model and alpha optical model potential for each of the studied reactions have also been examined. Theoretical results of cross section have been compared with the experimental data taken from EXFOR together with the latest evaluations of the TENDL-2023 libraries. Such type of theoretical calculations are of extreme importance for understanding the influence of various nuclear models on the production cross section of various radioisotopes and validating the available nuclear model codes.



5. "*Nuclear model calculations on alpha-induced reactions on ^{nat}Cu: Evaluation of excitation functions of the ^{nat}Cu(α,x)^{67,66}Ga,^{65}Zn reactions*" , ***A.Saha***, Applied Radiation and Isotopes **226**, 112166 (2025).

Applied Radiation and Isotopes 226 (2025) 112166

Contents lists available at ScienceDirect

Applied Radiation and Isotopes

journal homepage: www.elsevier.com/locate/apradiso

Nuclear model calculations on alpha-induced reactions on ^{nat}Cu: Evaluation of excitation functions of the ^{nat}Cu(α, x)^{67,66}Ga,^{65}Zn reactions

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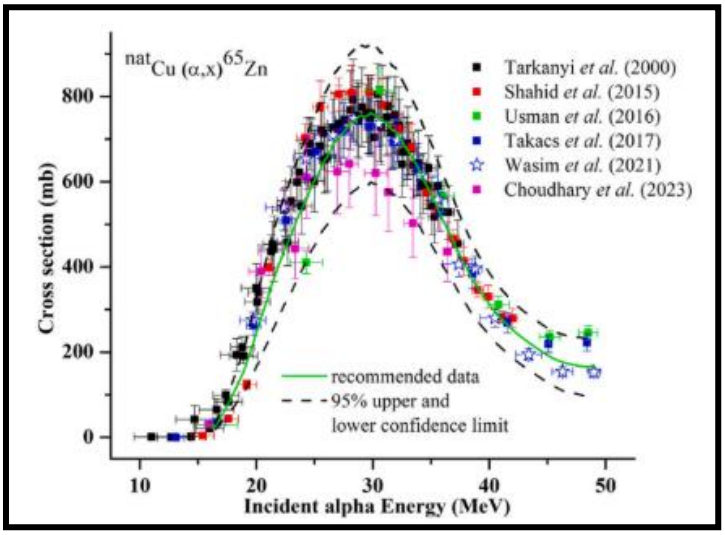
ARTICLE INFO

Keywords:
Nuclear cross section
TALYS code
Level density models
Alpha optical model potentials

ABSTRACT

Statistical model calculations were carried out in order to produce medicinally and technologically important radionuclides like ^{67,66}Ga and ^{65}Zn by means of alpha induced reaction on natural Copper using TALYS code (version 1.96). Theoretical results were compared with the experimental data taken from EXFOR library and TENDL 2023 data. The best combination of level density model and alpha optical model potential out of 48 possible combinations have been investigated for each of the reactions utilizing the mean-weighted deviation analysis. A statistical procedure supported by nuclear model calculations using the TALYS code was employed to derive recommended excitation function together with 95% confidence limits.



6. "*The revival of* $U(1)_{L_e-L_\mu}$*: a natural solution for* $(g-2)_\mu$ *with a sub-GeV dark matter*", ***B. De***, European Physical Journal C, *Eur.Phys.J.C* 85 (2025) 81.

Eur. Phys. J. C (2025) 85:81
https://doi.org/10.1140/epjc/s10052-025-13829-3

THE EUROPEAN PHYSICAL JOURNAL C

Regular Article - Theoretical Physics

The revival of $U(1)_{L_e-L_\mu}$: a natural solution for $(g-2)_\mu$ with a sub-GeV dark matter

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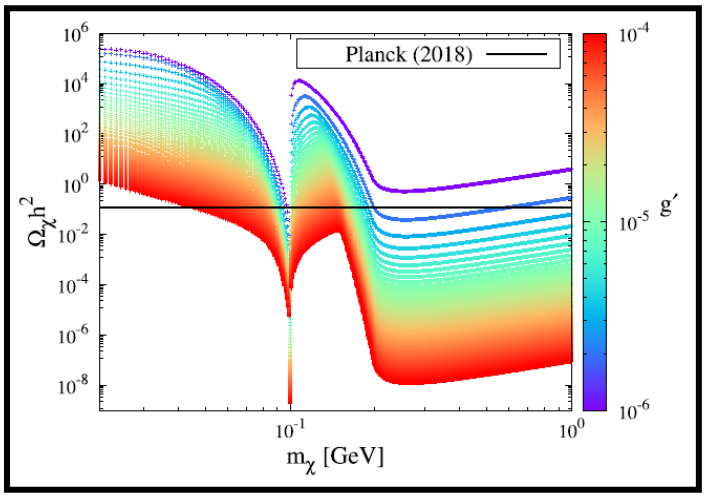
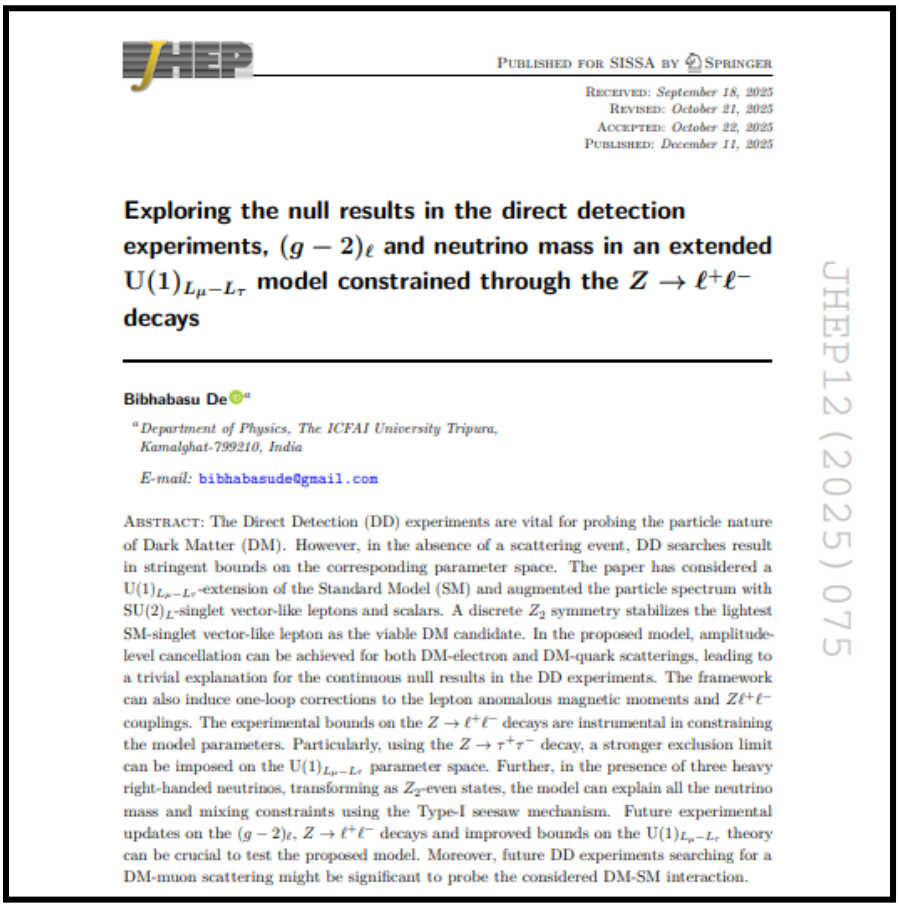
Received: 20 November 2024 / Accepted: 15 January 2025

Abstract The experiments searching for a hidden gauge sector with a leptophilic neutral gauge boson have already ruled out $U(1)_{L_e-L_\mu}$ as a feasible extension of the Standard Model (SM) gauge group ($\mathscr{G}_{\rm SM}$) for explaining the observed discrepancy in $(g-2)_\mu$. The paper proposes a simple extension of the minimal particle content of $\mathscr{G}_{\rm SM} \otimes U(1)_{L_e-L_\mu}$ with a TeV-scale scalar leptoquark S_1. Due to the non-trivial transformation of S_1 under $U(1)_{L_e-L_\mu}$, the model generates additional one-loop contributions to $(g-2)_\mu$, reviving the considered gauge extension within the experimentally allowed regions of the parameter space. The model can also accommodate a viable Dark Matter (DM) candidate χ – a vector-like SM-singlet fermion in the sub-GeV mass regime. The theory provides a natural framework to test the proposed DM phenomenology through electron excitation signals. Moreover, the DM-specific observables and $(g-2)_\mu$ being connected through the *New Physics* (NP) parameters, the future beam dump experiments hunting for light, feebly interacting particles and the DM direct detection experiments are complementary to each other for constraining/falsifying the model.

retical framework, SM falls short to explain certain observations, e.g., the astrophysical and cosmological signatures of dark matter [5–9], the discrepancy between the observed and predicted values of the anomalous magnetic moments of muon [10] and electron [11,12], neutrino oscillations [13], etc. In the SM, particularly, the anomalous magnetic moment of muon (i.e., $(g-2)_\mu/2$) has been predicted with a significant precision, including the EW and hadronic contributions [14], while experiments have also measured it very precisely. Thus, $(g-2)_\mu$ is a crucial parameter to test the precision of the SM at the quantum level. However, the observations indicate a non-negligible difference between the experimentally measured and predicted values of $(g-2)_\mu$ [10]. Though a similar discrepancy has been observed for the electrons, measurements using the recoil on Cs [11] and Rb [12] atoms result in a relative sign between the reported values. Definitely, such observations strengthen the possibility of having a theory beyond the standard model (BSM). However, the NP can only exist either at a higher energy scale or has to be weakly/selectively coupled to the SM fields to be consistent with the current experimental results. From the theoretical perspective, a quite natural and well-



7. "*Exploring the null results in the direct detection experiments, $(g-2)_\ell$ and neutrino mass in an extended $U(1)_{L\mu-L\tau}$ model constrained through the $Z \to \ell^+\ell^-$ decays*", ***B. De***, Journal of High Energy Physics, *JHEP12(2025)075.*



PUBLISHED FOR SISSA BY SPRINGER

RECEIVED: *September 18, 2025*
REVISED: *October 21, 2025*
ACCEPTED: *October 22, 2025*
PUBLISHED: *December 11, 2025*

Exploring the null results in the direct detection experiments, $(g-2)_\ell$ and neutrino mass in an extended $U(1)_{L_\mu - L_\tau}$ model constrained through the $Z \to \ell^+\ell^-$ decays

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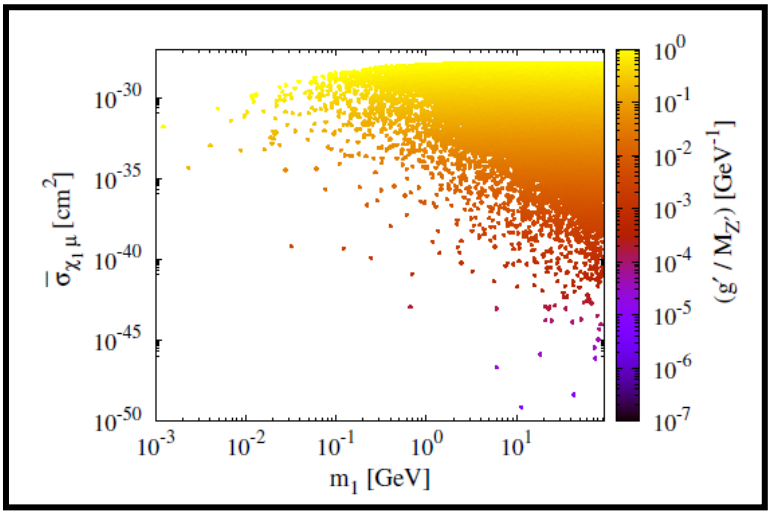
ABSTRACT: The Direct Detection (DD) experiments are vital for probing the particle nature of Dark Matter (DM). However, in the absence of a scattering event, DD searches result in stringent bounds on the corresponding parameter space. The paper has considered a $U(1)_{L_\mu - L_\tau}$-extension of the Standard Model (SM) and augmented the particle spectrum with $SU(2)_L$-singlet vector-like leptons and scalars. A discrete Z_2 symmetry stabilizes the lightest SM-singlet vector-like lepton as the viable DM candidate. In the proposed model, amplitude-level cancellation can be achieved for both DM-electron and DM-quark scatterings, leading to a trivial explanation for the continuous null results in the DD experiments. The framework can also induce one-loop corrections to the lepton anomalous magnetic moments and $Z\ell^+\ell^-$ couplings. The experimental bounds on the $Z \to \ell^+\ell^-$ decays are instrumental in constraining the model parameters. Particularly, using the $Z \to \tau^+\tau^-$ decay, a stronger exclusion limit can be imposed on the $U(1)_{L_\mu - L_\tau}$ parameter space. Further, in the presence of three heavy right-handed neutrinos, transforming as Z_2-even states, the model can explain all the neutrino mass and mixing constraints using the Type-I seesaw mechanism. Future experimental updates on the $(g-2)_\ell$, $Z \to \ell^+\ell^-$ decays and improved bounds on the $U(1)_{L_\mu - L_\tau}$ theory can be crucial to test the proposed model. Moreover, future DD experiments searching for a DM-muon scattering might be significant to probe the considered DM-SM interaction.

JHEP12(2025)075



8. "*Dynamics of Magnetization Reversal and Enhanced Magnetic Properties in FeTaC/SiO_2 Multilayer Thin Films*", **C. Das**, Journal of Magnetism and Magnetic Materials 634,173590 (2025).

Journal of Magnetism and Magnetic Materials 634 (2025) 173590

Contents lists available at ScienceDirect

Journal of Magnetism and Magnetic Materials

journal homepage: www.elsevier.com/locate/jmmm

Dynamics of magnetization reversal and enhanced magnetic properties in FeTaC/SiO_2 multilayer thin films☆

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ARTICLE INFO

Keywords:
Stripe domain
Transcritical loop
Magnetization reversal
Interlayer coupling

ABSTRACT

We systematically explore the impact of the number and thickness of the spacer layer on the magnetic properties in multilayer FeTaC/SiO_2 films fabricated on thermally oxidized Si substrate using the DC and RF magnetron sputtering system. At room temperature, 100 nm $Fe_{80}Ta_8C_{12}$ film shows a transcritical hysteresis loop characterized by large coercivity (H_C) and saturation field (H_S) due to the formation of stripe domain. This study builds upon our earlier findings on single-layer $Fe_{80}Ta_8C_{12}$ films and focuses on the magnetization reversal dynamics and enhanced magnetic properties of multilayer films as influenced by the number (n), thickness (z) of the spacer layer and temperature (T). The introduction of the spacer layers transform the transcritical loop observed in thick FeTaC (> 50 nm) film into rectangular loop, enabling single or multi-step magnetization reversal. Also it results in significant reductions in H_C from 1.96 kA/m for 100 nm single-layer film to 0.43 kA/m and H_S from 66.4 kA/m to 2.42 kA/m for multilayer film with $n = 2$, while improving the remanent-to-saturation magnetization ratio. Analysis of domain configuration exhibits Kerr loops at different angles, revealing the role of transverse components that vary with the coupling strength between the adjacent layers. Additionally, the temperature-dependent hysteresis behavior of multilayer films varies significantly with n, z, and the nature of interlayer coupling. These factors lead to significant changes in magnetic domain structure and switching dynamics. Overall, this work highlights the role of multilayer structure and interlayer coupling in tuning the magnetic properties of FeTaC/SiO_2 films, allowing significant control over domain dynamics.

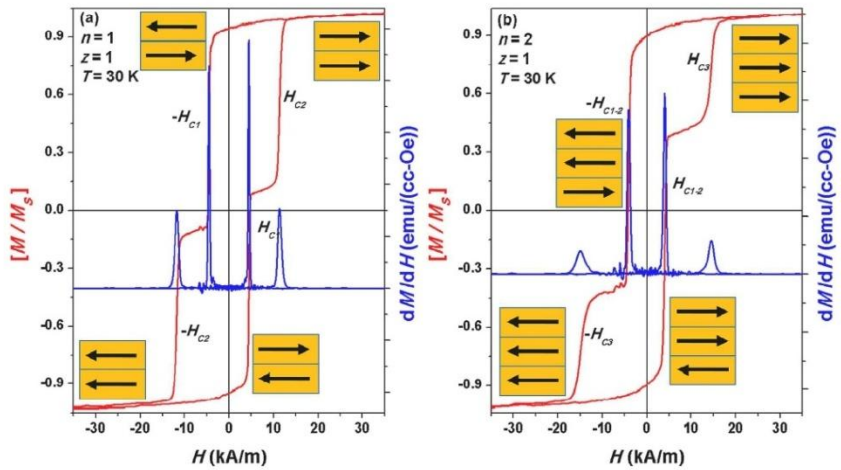

Fig. 8. Normalized M-H loops measured at 30 K along with field derivative of magnetization for multilayer [FeTaC (y nm)/SiO_2 (z nm)]$_n$/FeTaC (y nm) films with (a) $n = 1$, $z = 1$ and (b) $n = 2$, $z = 1$.

9. "*Recent Advances in the Synthesis of Nanostructured WS: A Mini-Review*", B Bhattacharjee, & **G. Pradhan**, Phys. Solid State, 67, 574–581 (2025)

Recent Advances in the Synthesis of Nanostructured WS_2: A Mini-Review

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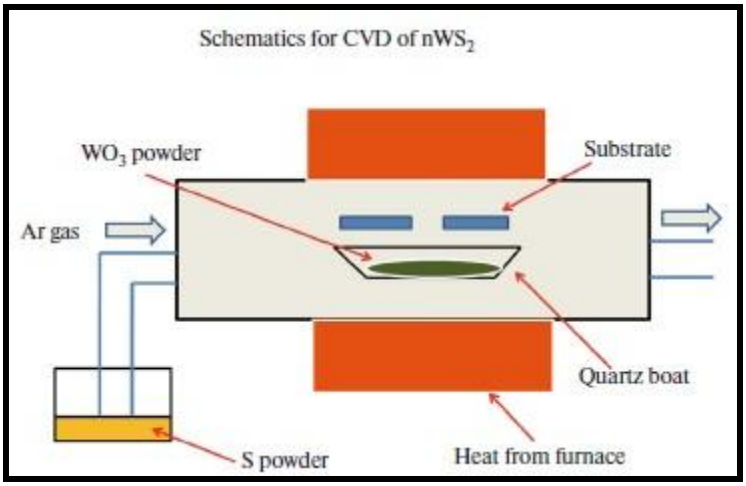
Received January 26, 2025; revised April 30, 2025; accepted May 1, 2025

Abstract—The nanostructured transition metal dichalcogenides, ranging from two-dimensional layers, one-dimensional nanotubes or rods, and zero-dimensional quantum dots, have been investigated extensively in the recent past because of their unique and promising properties, including a suitable non-zero band gap that can be tailored, tuned, and engineered by varying different extrinsic parameters, making them suitable for targeted applications. Tungsten disulfide, which belongs to the transition metal dichalcogenide group, is suitable for various types of electronic and optoelectronic applications. The properties of transition metal dichalcogenides, suitable for different applications, depend on the method of synthesis and are even influenced by variations in synthesis parameters for a particular method. Different top-down and bottom-up methods of synthesis have been reported for nanostructured WS_2, mentioning the advantages and disadvantages of each method, different types of synthesis parameter variations, and possible permutations and combinations—comparing methods, mapping them to the quality of the end product, and then to the targeted applications. This paper reviews recent reported advances in the synthesis of WS_2, with underlying opportunities and challenges, with emphasis on different types of reported applications. This review will provide a roadmap for future work related to further advancements in the synthesis of nanostructured WS_2 and its applications.



10. "*Facile synthesis of pulsed laser deposited polymorphic WS_2 nanolayers and manipulation, of layer thickness by tuning laser energy*", B. Bhattacharjee, A. K. Sharma, **G. Pradhan**, Surface Science 766 (2026) 122893

Contents lists available at ScienceDirect

Surface Science

journal homepage: www.elsevier.com/locate/susc

Facile synthesis of pulsed laser deposited polymorphic WS_2 nanolayers and manipulation of layer thickness by tuning laser energy

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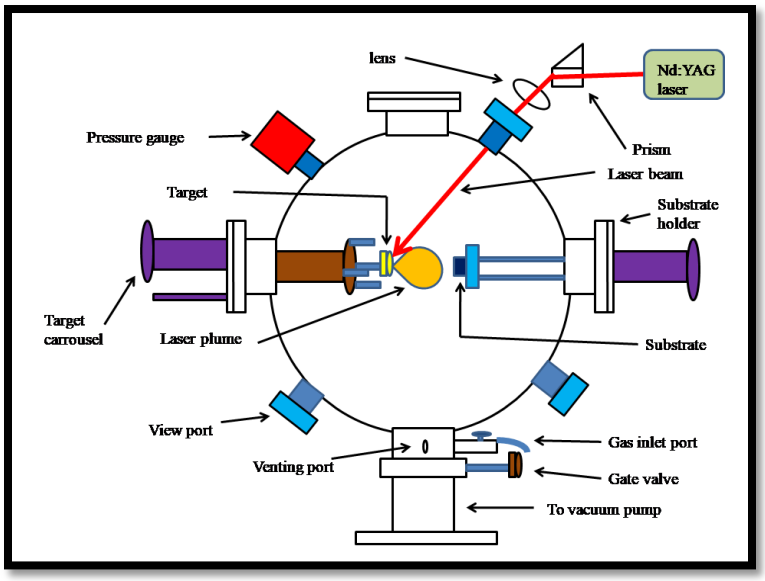
ARTICLE INFO

Keywords:
WS2 layers
Pulsed laser deposition
Laser energy
Layer thickness
Spectroscopic ellipsometry

ABSTRACT

The WS_2 thin layers were deposited on SiO_2 /Si substrate by pulsed laser deposition (PLD). The third harmonic Q switched Nd:YAG (Neodymium-doped Yttrium Aluminum Garnet) laser of 355 nm wavelength and nanosecond pulse duration was used. The laser energy was tuned between 20 mJ to 30 mJ. The influence of the laser energy on the thickness, optical and electrical transport properties of the layers was studied. The A_{1g} (Γ) & E^1_{2g}(Γ) Raman peak position difference increased and the I E^1_{2g}/I A_{1g} peak intensity ratio decreased with the increase of the laser energy. It indicated the increase in the number of WS_2 layers with the increase of the laser energy. The X-ray diffraction (XRD) showed a mixed polymorphic phase of 2H and 1T WS_2. It also indicated prominent (002) 2H WS_2 peak for 25 mJ and 30 mJ laser energy and an additional 1T WS_2 peak for 20 mJ laser energy. The energy-dispersive X-ray (EDX) analysis showed S (Sulfur) deficient WS_2 layers. The spectroscopic ellipsometry (SE) was used to determine layer thickness, bandgap, electrical conductivity and carrier mobility of the layers. The SE fitted results showed WS_2 layer thickness of 0.7 nm, 1.4 nm & 2.0 nm for laser energy of 20 mJ, 25 mJ & 30 mJ, respectively. The SE fitted data showed that the conductivity and the bandgap decreased with the increase of the laser energy. The uniqueness of the study lies on low laser energy investigation of PLD and optical and electrical characterization of WS_2 layers by SE.



11. "*Sub-Coulomb breakup of ^{6}Li (→α+d) off ^{209}Bi target*", **<u>D. Chattopadhyay</u>** , S. Santra , A. Pal, A. Kundu, K. Ramachandran, R. Tripathi, S. Kailas, Nucl. Phys. A 1053, 122965, 2025.

Nucl. Phys. A 1053 (2025) 122965

Contents lists available at ScienceDirect

Nuclear Physics A

journal homepage: www.elsevier.com/locate/nuclphysa

Sub-Coulomb breakup of ^{6}Li (→α+d) off ^{209}Bi target

D. Chattopadhyay [a,b,*], S. Santra [a,c], A. Pal [a,c], A. Kundu [a], K. Ramachandran [a], R. Tripathi [c,d], S. Kailas [a]

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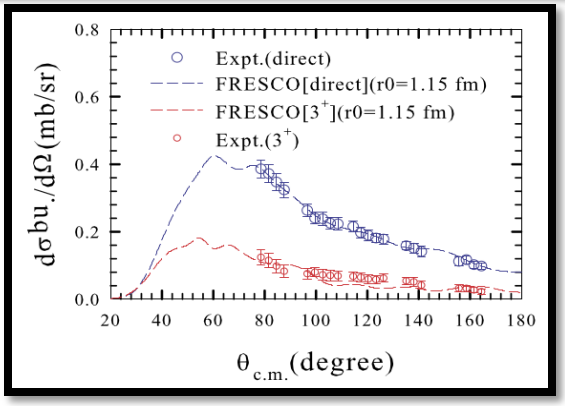
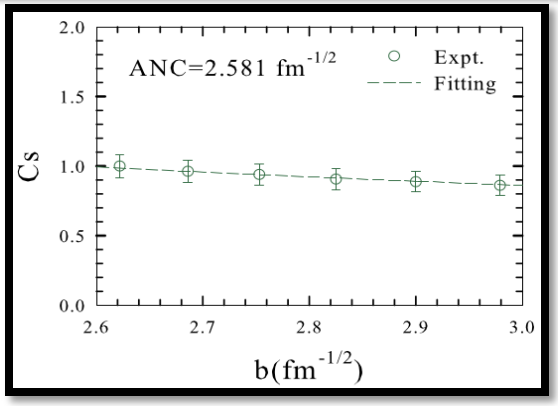
ARTICLE INFO

Keywords:
Direct and sequential breakup
Relative energy
Q-value
CDCC calculation
Asymptotic normalization constant

ABSTRACT

Cross section for dissociation of ^{6}Li into $\alpha+d$ in the field of ^{209}Bi target nucleus has been measured at an energy about 20% below the Coulomb barrier by detecting α and d in coincidence using a segmented Si-Strip detector array. Measured distribution of relative energy '$E_{\alpha d}$' suggests that the dissociation of the projectile at present beam energy proceeds dominantly through direct breakup and by a small fraction through sequential breakup via 3^{+} resonance state. The Q-value distribution shows that the events are accompanied by the residual target nuclei remaining at the ground state. Measured angular distributions of direct breakup cross-section are analyzed within the framework of Continuum Discretized Coupled Channel (CDCC) calculations. Asymptotic Normalization Coefficient (ANC) describing the amplitude of the tail of the bound state wave function in α+dis obtained from the variation of spectroscopic amplitude with the Single particle asymptotic normalization coefficient. The estimated ANC parameter (2.581 ± 0.212 fm$^{-1/2}$) is in excellent agreement with the values previously found in the literature.





12. "*Deconstructing the emission order of protons, neutrons, and α particles following fusion in 28,30,32 Si + 28 Si*", Rohit Kumar , H. Desilets , J. E. Johnstone, S. Hudan , **D. Chattopadhyay** , R. T. deSouza , D. Ackermann , M. Basson , K. W. Brown , A. Chbihi , K. J. Cook , M. Famiano , T. Genard, I. M. Harca , and S. N. Paneru, Phys. Rev. C 111, 034601 (2025).

PHYSICAL REVIEW C **111**, 034601 (2025)

Deconstructing the emission order of protons, neutrons, and α particles following fusion in ^{28,30,32}Si + ^{28}Si

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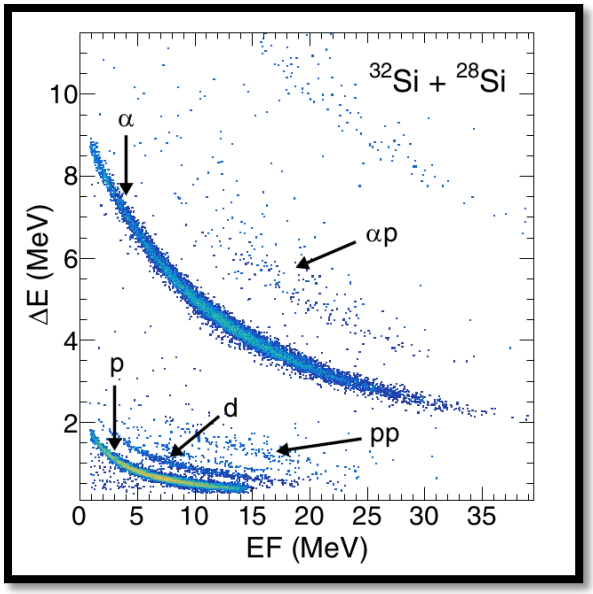
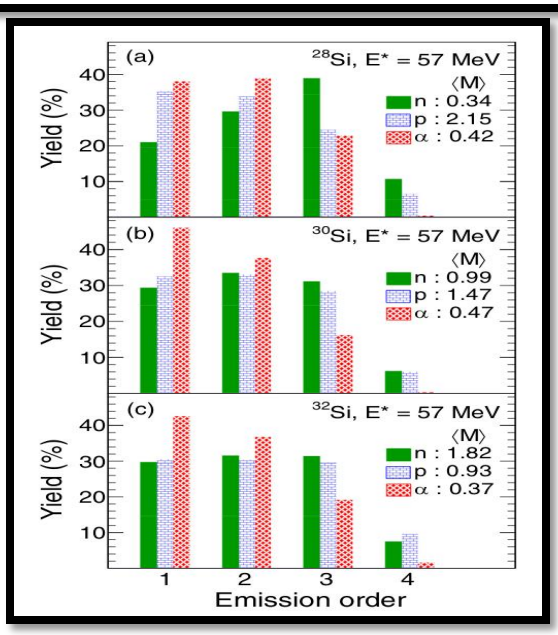
(Received 1 January 2025; accepted 18 February 2025; published 3 March 2025)

A high-quality measurement of proton and α-particle emission associated with fusion of ^{28,30,32}Si with a ^{28}Si target is described. Evaporation residues produced by de-excitation of the compound nucleus were identified by an energy time-of-flight measurement while emitted light-charged particles were identified using the ΔE-E technique. Comparison of the experimentally measured charged particle multiplicities and energy spectra with the predictions of the statistical decay model code GEMINI++ allows one to deduce interesting details of the de-excitation cascade and its dependence on neutron-excess. The impact of modifying the sequence of particle emissions on the average energy and multiplicity is examined.

DOI: 10.1103/PhysRevC.111.034601





13. "*Evaluation of fusion suppression factors for 6Li and 7Li using multilayer perceptron neural networks*", **D. Chattopadhyay**, Nucl. Phys. A 1058, 123071 (2025).

Nucl. Phys. A 1058 (2025) 123071

Contents lists available at ScienceDirect

Nuclear Physics A

journal homepage: www.elsevier.com/locate/nuclphysa

Evaluation of fusion suppression factors for ^{6}Li and ^{7}Li using multilayer perceptron neural networks

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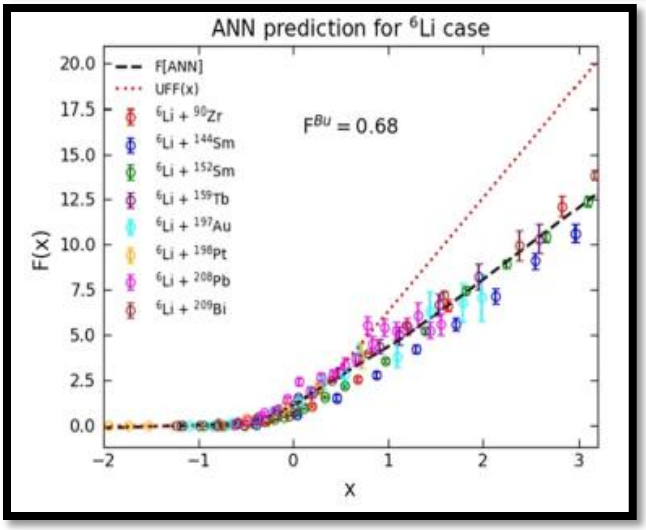
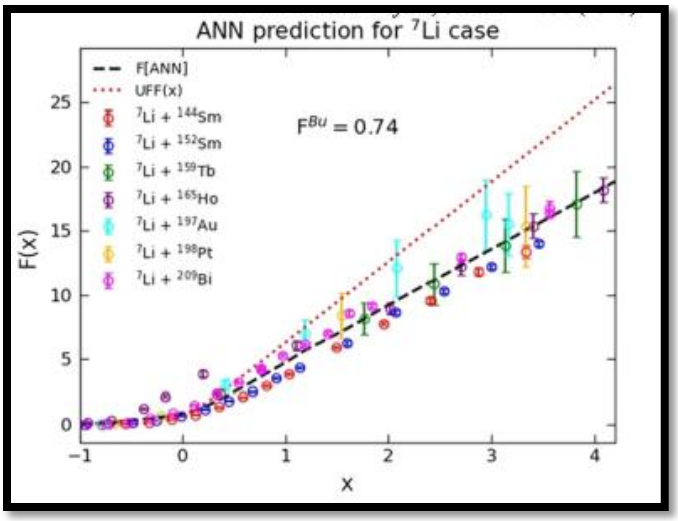
ARTICLE INFO

Keywords:
Nuclear fusion
Fusion suppression
Weakly bound nuclei
Artificial neural network
Support vector regression
Random forest regression
Gaussian process regression

ABSTRACT

Recent advancements have enhanced the measurement of complete fusion cross-sections, particularly for reactions involving weakly bound projectiles. It is well-established that the complete fusion cross-section for these nuclei is suppressed at above-barrier energies due to breakup effects. This study utilized feedforward Artificial Neural Networks (ANNs) with a Multilayer Perceptron architecture to estimate the complete fusion suppression factor for reactions involving ^{6}Li and ^{7}Li projectiles. By comparing ANN-predicted reduced fusion functions $F(x)$ with the Universal Fusion Function $F_0(x)$, average suppression factors of 0.68 and 0.74 were determined for ^{6}Li and ^{7}Li, respectively. The Normalized Mean Squared Error (NMSE) for ^{6}Li was 1.85% (training) and 1.92% (testing), while for ^{7}Li it was 3.73% and 6.48%. Comparisons with Support Vector Regression, Random Forest Regression, and Gaussian Process Regression showed that ANNs provided superior accuracy, suggesting their viability for estimating fusion suppression factors. The study is further extended to ^{8}Li, ^{7}Be, ^{9}Be, ^{10}B, ^{11}B, ^{12}C, and ^{13}C projectiles, revealing that fusion suppression is strongly influenced by the breakup threshold energy, with direct breakup dominating at sub-barrier energies.





14. "*One-neutron stripping followed by breakup of 9Be in the field of 209Bi*", Tanya Singh , S. Santra , A. Baishya , A. Pal , P. C. Rout, Ramandeep Gandhi , A. Kundu , **D. Chattopadhyay**, R. Tripathi, Phys. Rev. C 111, 054615 (2025).

PHYSICAL REVIEW C **111**, 054615 (2025)

One-neutron stripping followed by breakup of ^{9}Be in the field of ^{209}Bi

Tanya Singh,* S. Santra,† A. Baishya, A. Pal, P. C. Rout, Ramandeep Gandhi,‡ A. Kundu,§ and D. Chattopadhyay‖
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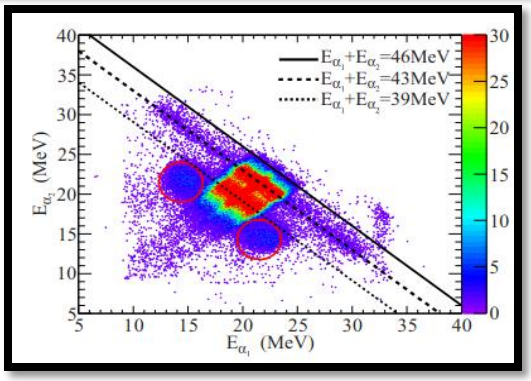
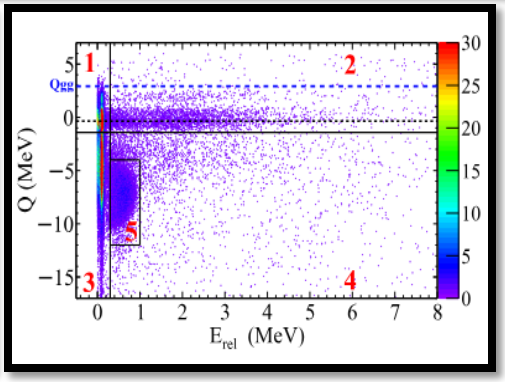
(Received 11 February 2025; revised 11 April 2025; accepted 21 April 2025; published 14 May 2025)

Background: Experimental data on the breakup cross sections of weakly bound nuclei, especially ^{9}Be, are essential and particularly interesting, in order to understand the underlying reaction mechanisms and its Borromean-like nuclear structure. However, very few data are available in the literature.
Purpose: The aim is to understand the possible reaction mechanisms in the ^{209}Bi(^{9}Be, ^{8}Be $\rightarrow 2\alpha$) reaction by measuring the cross sections of the 2α breakup of the projectile ^{9}Be.
Methods: A large Si strip detector array covering an angular range of about 100° was used to carry out exclusive measurements of 2α events for the above reaction at $E_{\rm beam} = 47$ MeV. The distribution of E_{α_1} versus E_{α_2}, $E_{\rm rel}$, Q value, and $E_{\rm rel}$ versus Q value were analyzed to identify different mechanisms of α production. Monte Carlo–simulated detector efficiencies were employed to determine breakup cross sections. The continuum-discretized coupled-channels (CDCC) calculations were performed, modeling ^{9}Be as a cluster of $n + {}^{8}$Be, to interpret the measured cross sections for various outgoing channels.
Results: The distribution of Q value versus $E_{\alpha\alpha}$ indicates the dominance of the events corresponding to the ^{209}Bi(^{9}Be, ^{8}Be $\rightarrow 2\alpha$) reaction, particularly at larger Q values ($Q \geqslant 0$). Differential cross sections for the $1n$ stripping followed by breakup of ^{8}Be into 2α, along with the elastic, inelastic, and $1n$-pickup channels, were derived and interpreted using the CDCC and Coupled Reaction Channels (CRC) formalisms. The coupling effects of transfer, breakup, and inelastic channels on the elastic channel were found to be highly significant.
Conclusions: Using appropriate experimental and analytical techniques, it was possible to obtain absolute cross sections for the ^{209}Bi(^{9}Be, ^{8}Be $\rightarrow 2\alpha$) reaction. A simultaneous description of elastic, inelastic, transfer, and breakup channels using a unified coupled-channels calculation was also possible, which suggests that modeling ^{9}Be as a cluster of $n + {}^{8}$Be is a reasonable assumption. The coupling of breakup channels was found to generate an attractive polarization potential, whereas the coupling of inelastic and transfer channels introduces a repulsive polarization potential.

DOI: 10.1103/PhysRevC.111.054615





15. "*Estimation of electron screening potential in the 6Li(d,α)4He reaction using multi-layer perceptron neural network*", **D. Chattopadhyay**, Radiation Physics and Chemistry 239, 113366 (2026).

Radiation Physics and Chemistry 239 (2026) 113366

Contents lists available at ScienceDirect

Radiation Physics and Chemistry

journal homepage: www.elsevier.com/locate/radphyschem

Estimation of electron screening potential in the ^{6}Li(d, α)^{4}He reaction using multi-layer perceptron neural network

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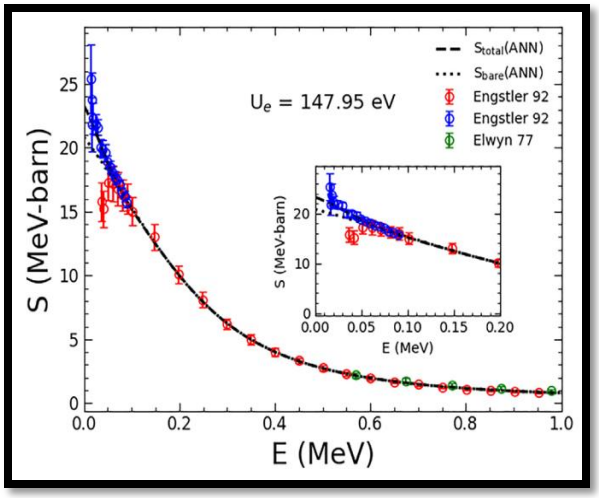
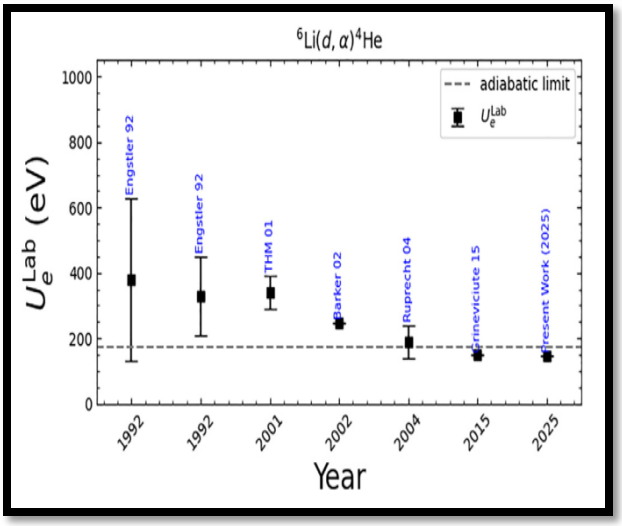
ARTICLE INFO

Keywords:
Nuclear reactions
Electron screening potential
Nuclear astrophysics
Artificial neural network
^{6}Li(d,α)^{4}He

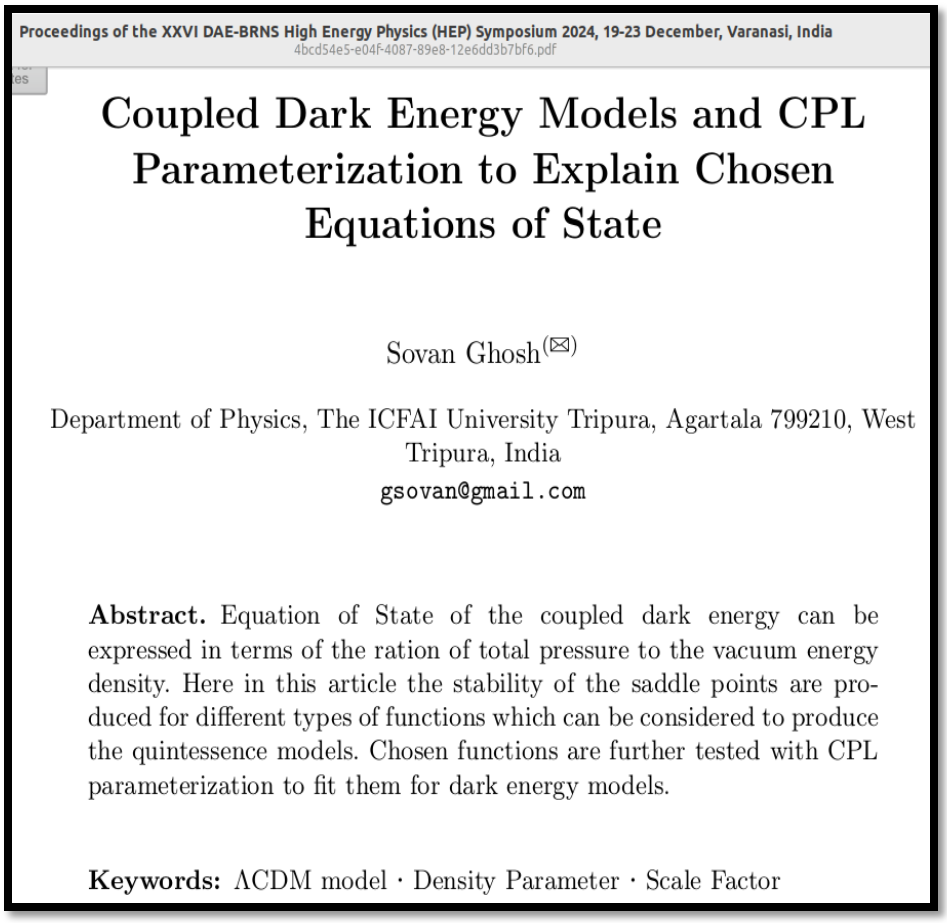
ABSTRACT

Reactions between light charged nuclei at sub-Coulomb energies are crucial in astrophysical environments, but accurate cross-section measurements are hindered by electron screening. Conventional approaches, such as polynomial extrapolation and the Trojan Horse Method, frequently predict screening potentials that exceed adiabatic estimates. Building on the success of a Multi-Layer Perceptron (MLP)-based Artificial Neural Network (ANN) for the ^{6}Li(p, α)^{3}He reaction (Chattopadhyay, 2024), this work applies the same methodology to the ^{6}Li(d, α)^{4}He reaction. The experimental data on the astrophysical S-factor from the literature are reanalyzed using the ANN to model the energy dependence of the S-factor. The bare S-factor is extracted from data above 70 keV, where screening effects are minimal, and the screening potential is determined by comparing it with the screened S-factor in the low-energy region. The resulting screening potential is 147.95 ± 13 eV, demonstrating the effectiveness and robustness of ANN-based methods for evaluating electron screening in low-energy nuclear reactions involving light nuclei.

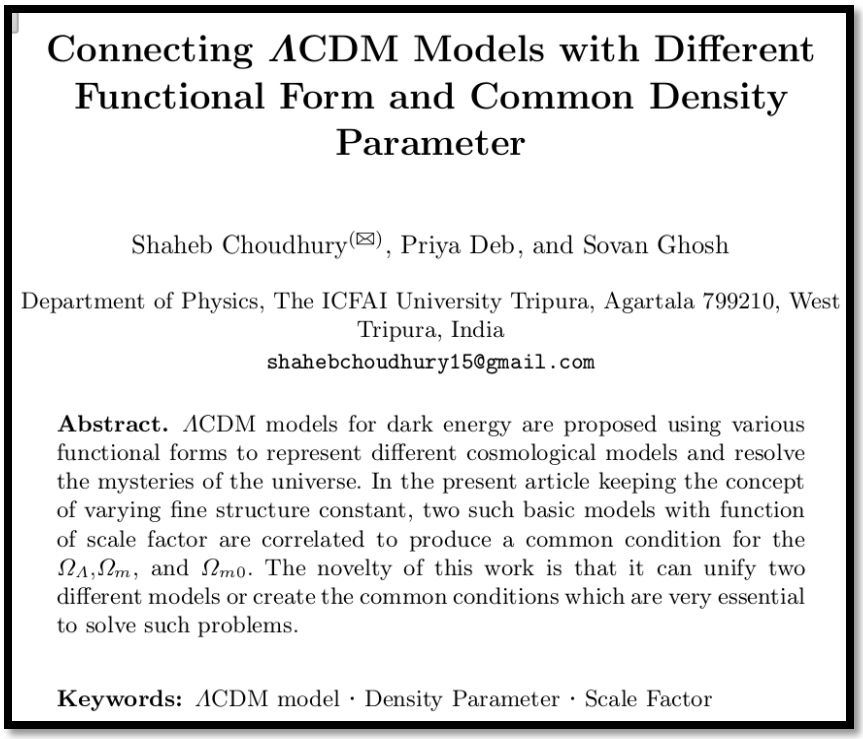




16. "*Coupled Dark Energy Models and CPL Parameterization to Explain Chosen Equations of State*" in Proceedings of the XXVI DAE-BRNS High Energy Physics (HEP) Symposium 2024, 19-23 December, Varanasi, India; Springer Proceedings in Physics, Vol: 432, Page: 252



17. "*Connecting ΛCDM Models with Different Functional Form and Common Density Parameter*" in Proceedings of the XXVI DAE-BRNS High Energy Physics (HEP) Symposium 2024, 19-23 December, Varanasi, India; Springer Proceedings in Physics, Vol: 432, Page: 206; Co-authors: Shaheb Choudhury and Priya Deb



Connecting ΛCDM Models with Different Functional Form and Common Density Parameter

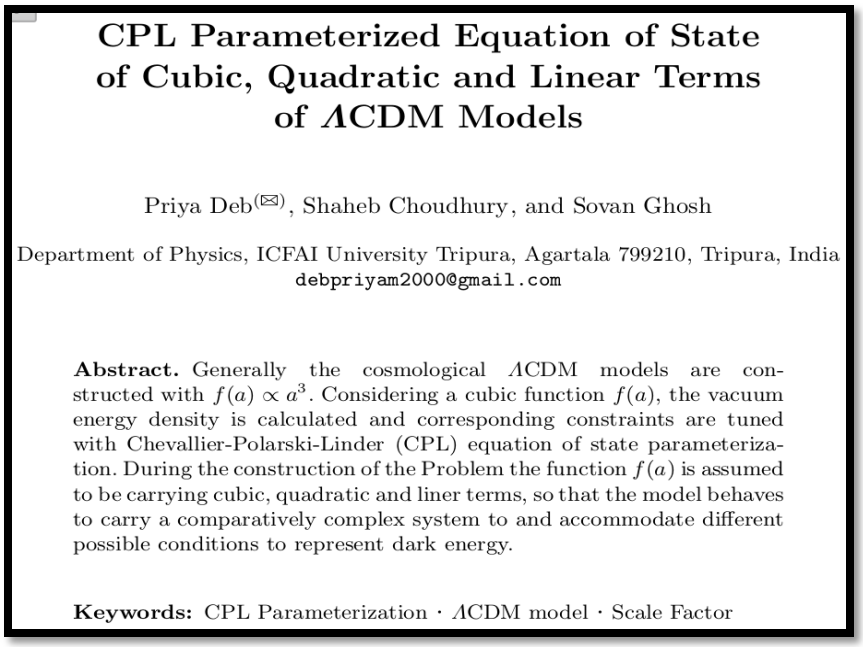
Shaheb Choudhury(✉), Priya Deb, and Sovan Ghosh

Department of Physics, The ICFAI University Tripura, Agartala 799210, West Tripura, India
shahebchoudhury15@gmail.com

Abstract. ΛCDM models for dark energy are proposed using various functional forms to represent different cosmological models and resolve the mysteries of the universe. In the present article keeping the concept of varying fine structure constant, two such basic models with function of scale factor are correlated to produce a common condition for the Ω_Λ,Ω_m, and Ω_{m0}. The novelty of this work is that it can unify two different models or create the common conditions which are very essential to solve such problems.

Keywords: ΛCDM model · Density Parameter · Scale Factor

18. "*CPL Parameterized Equation of State of Cubic, Quadratic and Linear Terms of ΛCDM Models*" in Proceedings of the XXVI DAE-BRNS High Energy Physics (HEP) Symposium 2024, 19-23 December, Varanasi, India; Springer Proceedings in Physics, Vol: 432, Page: 210; Co-authors: Priya Deb and Shaheb Choudhury



CPL Parameterized Equation of State of Cubic, Quadratic and Linear Terms of ΛCDM Models

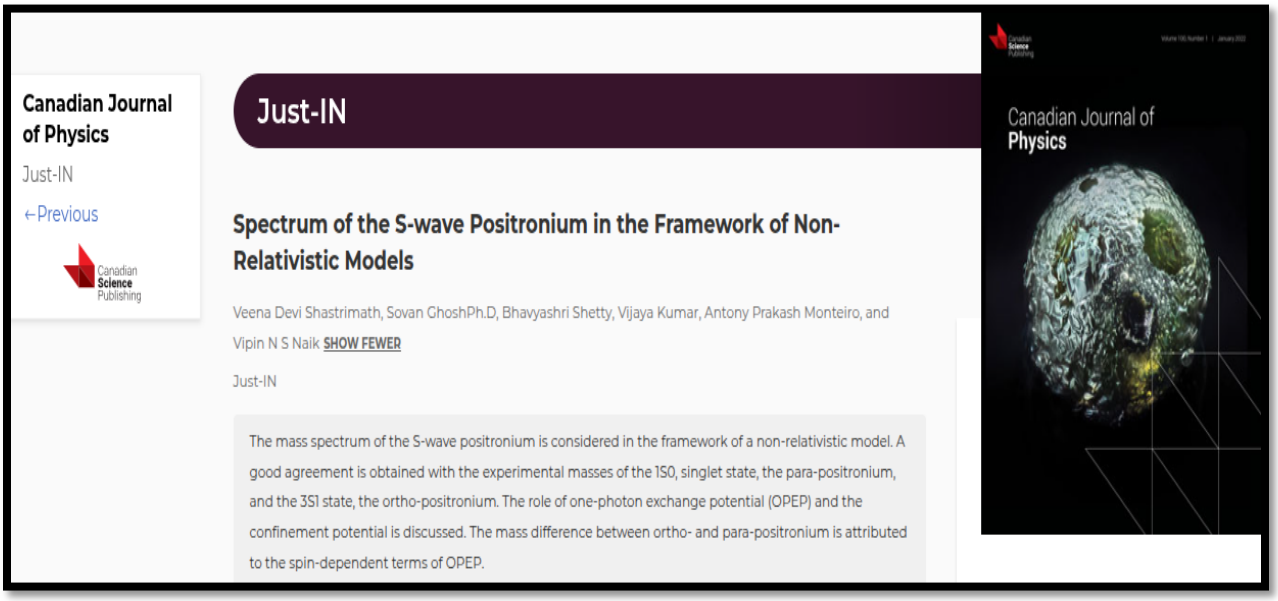
Priya Deb(✉), Shaheb Choudhury, and Sovan Ghosh

Department of Physics, ICFAI University Tripura, Agartala 799210, Tripura, India
debpriyam2000@gmail.com

Abstract. Generally the cosmological ΛCDM models are constructed with $f(a) \propto a^3$. Considering a cubic function $f(a)$, the vacuum energy density is calculated and corresponding constraints are tuned with Chevallier-Polarski-Linder (CPL) equation of state parameterization. During the construction of the Problem the function $f(a)$ is assumed to be carrying cubic, quadratic and liner terms, so that the model behaves to carry a comparatively complex system to and accommodate different possible conditions to represent dark energy.

Keywords: CPL Parameterization · ΛCDM model · Scale Factor

19. "*Spectrum of the S wave Positronium in the Framework of Non-Relativistic Models*" in Canadian Journal of Physics; DOI: 10.1139/cjp-2025-0189
Co-authors: V D Shastrimath, B Shetty, K B Vijaya Kumar, A P Monteiro, Vipin N S Naik



INVITED LECTURE AS A RESOURCE PERSON IN THEME MEETING ON NUCLEAR ASTROPHYSICS AT IUAC, NEW DELHI ON 20/5/2025

Dr. Dipayan Chattopadhyay delivered an invited lecture as a Resource Person at the Theme Meeting on Nuclear Astrophysics held at IUAC, New Delhi, on 20 May 2025. The invited talk was attended by researchers and students from various institutions working in nuclear astrophysics. The lecture focused on the determination of Asymptotic Normalization Coefficients (ANC) from sub-Coulomb breakup reactions. Detailed discussion was presented on the underlying reaction mechanisms and the advantages of sub-Coulomb conditions in minimizing theoretical uncertainties. The role of ANC in constraining low-energy nuclear reaction cross sections was emphasized. The lecture highlighted the broader impact of such studies on reliable astrophysical reaction rate calculations relevant to stellar environments.

DELIVERED LECTURE AS A RESOURCE PERSON ON NATIONAL SCIENCE DAY ORGANIZED BY THE ICFAI UNIVERSITY TRIPURA ON 28/02/2025

Dr. Dipayan Chattopadhyay delivered a lecture as a Resource Person on the occasion of National Science Day, organized by The ICFAI University Tripura on 28 February 2025. The lecture introduced Physics-Informed Neural Networks (PINNs) as quantum-mechanics–inspired neural networks for modeling nuclear fusion reactions in stars. Emphasis was placed on integrating fundamental physical laws, such as quantum tunneling and differential equations, within machine learning frameworks. The talk highlighted applications of PINNs in predicting nuclear reaction dynamics under stellar conditions. The session was attended by faculty members, researchers, and students from diverse scientific disciplines. The lecture contributed to promoting interdisciplinary research and modern

Faculty wise research interests:-

- **Prof. (Dr.) Priyangshu Rana Borthakur**

Research interests: - Steady State and Time-resolved Fluorescence spectroscopy.

- **Dr. Camelia Das**

Research Interest: (i) Experimental Condensed Matter Physics
(ii) Magnetism
(iii) Magnetic Interactions in Multilayer Thin Films

- **Dr. Sovan Ghosh**

Research Interest: (i) Dark Energy
(ii) Black Hole
(iii) Electron Structure
(iv) Binary Star system

- **Dr. Ganesh Adhikary**

Research interests:- (i) Experimental condensed matter physics
(ii) High-Temperature Superconductivity

(iii) Ultrafast electron dynamics

- **Dr. Arunabha Saha**

Research interests:- (i) Experimental study of nuclear structure using gamma-gamma and beta-gamma coincidence studies.
(ii) Measurement of beta decay endpoint energies using LEPS detectors
(iii) Theoretical study of nuclear reactions using different nuclear models.

- **Dr. Gobinda Pradhan**

Research Interest: (i) Condensed Matter Physics
(ii) Photonics
(iii) 2D materials
(iv) DFT

- **Dr. Bibhabasu De**

Research Interest: (i) Dark Matter Phenomenology
(ii) BSM theories with Vector-like leptons, Leptoquarks and scalars
(iii) Charged lepton-flavor violating processes
(iv) Lepton anomalous magnetic and electric dipole moments

- **Dr. Sourav Chattopadhyay**

Research Interest: (i) Phase transitions and Critical phenomena in equilibrium and out of equilibrium situations.
(ii) Computational Statistical Physics.
(iii) Elementary Physics Education.

- **Dr. Dipayan Chattopadhyay**

Research interests:- (i) Experimental Nuclear Physics
(ii) Experimental Nuclear Astrophysics
(iii) Artificial Intelligence and Machine Learning

Alumni Student's Speak

Shyamasree Saha (M.Sc. Physics, 2021-23 batch): As an ex-student I can say that the Physics Department feels like a place where curiosity is constantly encouraged and challenged. The department offers a balanced mix of strong theoretical foundations and hands-on laboratory experience, helping students truly understand how physics works beyond textbooks. Professors are knowledgeable and supportive, often approachable for discussions, guidance, and research ideas. They explain complex concepts with clarity and patience, often using real-life examples to make abstract theories easier to understand. They are readily available during office hours to provide one-to-one guidance, help with problem-solving, and mentor students in research projects.Well-equipped labs, engaging seminars, and a collaborative academic environment make learning both rigorous and inspiring. Overall, the department nurtures critical thinking, problem-solving skills, and a genuine passion for exploring the laws of nature.

Astha Paul Choudhury (B.Sc. Physics, 2018-21 batch): I am Astha Paul Choudhury, I have done BSc Physics Honours from ICFAI University (2018-2021). We were in the 1st batch, it was an amazing experience for me. Attending classes, hanging out with friends, all are very much exciting. Apart from this we had our very talented faculties, who supported us in each and every step. What I am today because of their support and help. Presently I am working as CSA (Customer Service Associate) at Canara Bank.

Current Student's Speak

Kunjal Sharma (B.Sc. Physics, 2025-28 batch): Looking back through the window of time, I realize how truly special my days at ICFAI University are. They remain among the most cherished memories of my life. I am fortunate to learn under the guidance of highly qualified and devoted teachers who not only teach us academic lessons but also inspire us with their constant support and care beyond the classroom. Though the journey is filled with trials, moments of uncertainty, and emotional ups and downs, the encouragement of our teachers stands as our greatest strength, empowering us to face every challenge with confidence. I carry deep gratitude for my teachers, whose belief in me and dedication to my growth shape the person I am today. My present achievements stand as a testament to the invaluable support, guidance, and motivation I receive from the Physics Department at ICFAI University, Tripura. With heartfelt gratitude, I thank all my respected teachers for everything.

Prithvij Ray (B.Sc. Mathematics, 2025-28 batch):My Journey at ICFAI UNIVERSITY has been a truly meaningful and enriching experience. As a student of the Department of Mathematics, I have gained not only strong academic knowledge but also improved my logical thinking, confidence and discipline. The constant support, encouragement and guidance of my teachers have helped me overcome challenges and stay motivated throughout my academic journey. Their dedication has inspired me to work harder and aim higher in my goals. I am sincerely grateful to all the faculties of our college who have helped me in shaping my learning experience and helping me grow both personally and academically.

Sohani Dey (B.Sc. Physics, 2025-28 batch):
Looking at my journey so far, studying at ICFAI University Tripura has been one of the most enriching experiences of my life. As a BSc Physics student, I am continuously learning under the guidance of dedicated and inspiring teachers who support us with patience and commitment inside and outside the classroom. The journey is challenging, but it is also exciting and full of learning. Through lectures, practical classes, and discussions, I am slowly building a strong foundation in Physics. The positive environment of the department encourages curiosity and creativity. I feel proud to be a part of this institution, and I am thankful to my teachers for shaping my academic path and inspiring me to aim higher in life.

Anuradha Acharya (B.Sc. Physics, 2025-28 batch): When I look back at my journey so far at ICFAI University Tripura, I realize how deeply it has shaped both my academic growth and personal confidence. Choosing to pursue B.Sc. Physics was not just about studying a subject, it was about learning to observe, analyze, and question the world around me. The rigorous curriculum challenges me to think logically and work consistently, but it is this very challenge that makes the journey meaningful. What truly makes the experience enriching is the constant guidance of our teachers. Their dedication goes far beyond delivering lectures; they patiently clarify doubts, encourage discussions, and motivate us to push beyond our comfort zones. Whether in the classroom, during practical sessions, or in academic interactions outside class hours, their support creates a learning environment that feels both disciplined and encouraging.

The department fosters curiosity and critical thinking, allowing us to explore ideas freely while maintaining academic rigor. I feel proud to be part of this institution and grateful for the mentors who are helping me build not only a strong foundation in Physics but also the determination to aim higher in life.

PhD Scholar's Speak

Ms. Shyamashree Saha: I joined The ICFAI University, Tripura as a B.Sc. Physics student in 2020, with a strong desire to understand the fundamental concepts of Science. Over the course of my undergraduate studies, I developed a clear and structured understanding of Physics, and my interest gradually grew toward Solid State Physics. The encouragement from faculty members, regular laboratory practice, and the healthy academic atmosphere greatly contributed to my academic growth. During my M.Sc. (2023-2025), my approach toward learning became more focused and research-driven. This period provided me with meaningful research exposure, which strengthened my analytical skills and improved my ability to think critically and independently. It also helped me shape my future academic direction with greater clarity. At present, pursuing my Ph.D. at the same University feels both rewarding and significant. This institution has been central to my academic development, and I feel proud to continue contributing to its scholarly environment through my research work.

Ms. Souramita Acharjee: I started my academic journey at The ICFAI University, Tripura as a B.Sc. Physics student, filled with curiosity and enthusiasm to learn. During my undergraduate years, I built a strong foundation in Physics and gradually developed a keen interest in Solid State Physics. The constant support of my teachers, practical laboratory sessions, and a positive academic environment helped me strengthen my concepts and grow in confidence. In my M.Sc. (2023-2025), my interests became more focused and research-oriented. This phase gave me valuable exposure to research work, which enhanced my analytical thinking and problem-solving abilities. It also helped me gain clarity about my academic goals. Now, as a Ph.D. scholar, it feels truly meaningful to continue my journey at the same University where it all began. This institution has

played a significant role in shaping me as a student and researcher, and I am proud to contribute to its academic and research community.

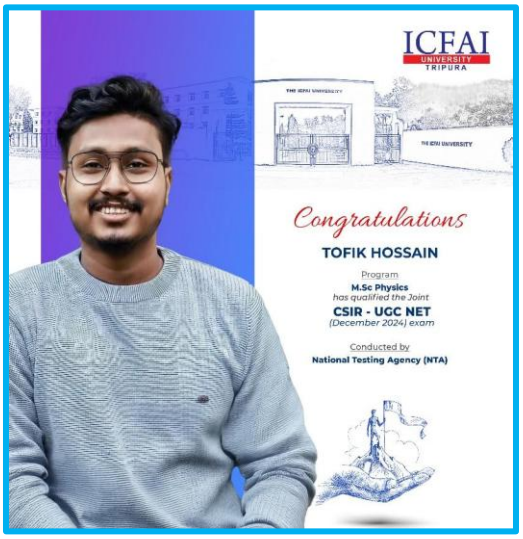
Student Achievements (2025)

Four students of B.Sc. Physics (3rd Year) have successfully qualified in the prestigious IIT JAM 2025 examination. Ms. Satiwika Bhattacharya, Mr. Pratik Biswas, Mr. Chinmoy Debnath, and Md. Mussaraf Mia have been declared successful in this highly competitive national-level examination.

This noteworthy accomplishment has been attained through sustained dedication, academic rigor, and commendable perseverance. Qualification in IIT JAM enables admission to postgraduate programmes in premier institutions, including the esteemed Indian Institutes of Technology and other leading research institutes across the country.

The Department extends its heartfelt congratulations to the successful candidates. Their achievement is regarded as a matter of immense pride for the institution and is expected to inspire fellow students to pursue academic excellence.

Mr. Tofik Hossain of M.Sc. Physics (2nd Year) has successfully qualified in the prestigious CSIR-UGC NET (December 2024) examination. He has been declared successful in this highly competitive national-level examination.



This significant achievement has been attained through sustained dedication, rigorous preparation, and exemplary academic commitment. Qualification in CSIR-UGC NET opens opportunities for research fellowships and admission to doctoral programmes at premier institutions across the country.

The Department extends its heartfelt congratulations to Mr. Hossain. His accomplishment is a matter of immense pride for the institution and serves as an inspiration for fellow students to pursue excellence in academia.

Ms. Satwika Bhattacharya, a final-year student of B.Sc. Physics (Hons.), has been selected for a position at Tata Consultancy Services through the University's Career Development Cell (CDC).

This accomplishment reflects her dedication, professionalism, and consistent academic performance. Selection in a leading organization such as TCS underscores her potential and readiness to contribute effectively in a professional environment.

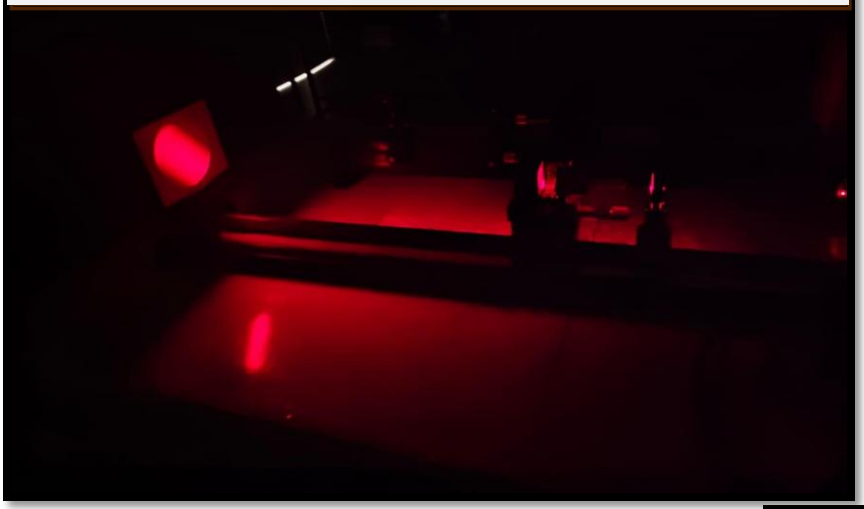
The Department extends its warmest congratulations to Ms. Bhattacharya. Her achievement brings great pride to the institution and serves as an inspiration to her peers to excel both academically and professionally.

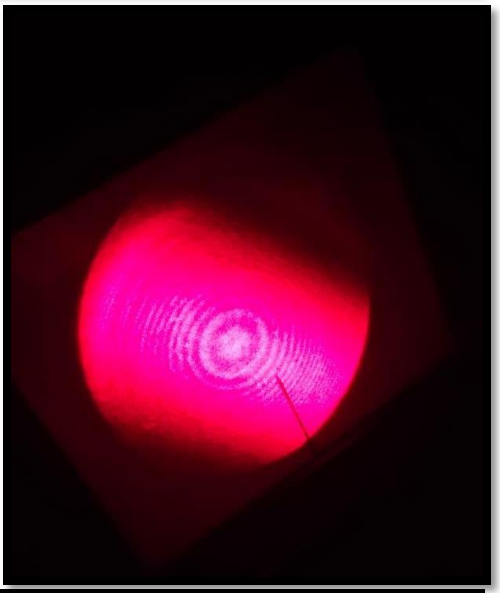
Laboratory Highlights

Geiger-Muller counter setup-study of radioactivity

Lattice Dynamics Kit-study of monoatomic and diatomic chain model

Fabry-Perot experimental setup-to study interference of light





To study Hall effect

Bending Loss Experiment-Multimode optical fiber