Annual REPORT 2024-25

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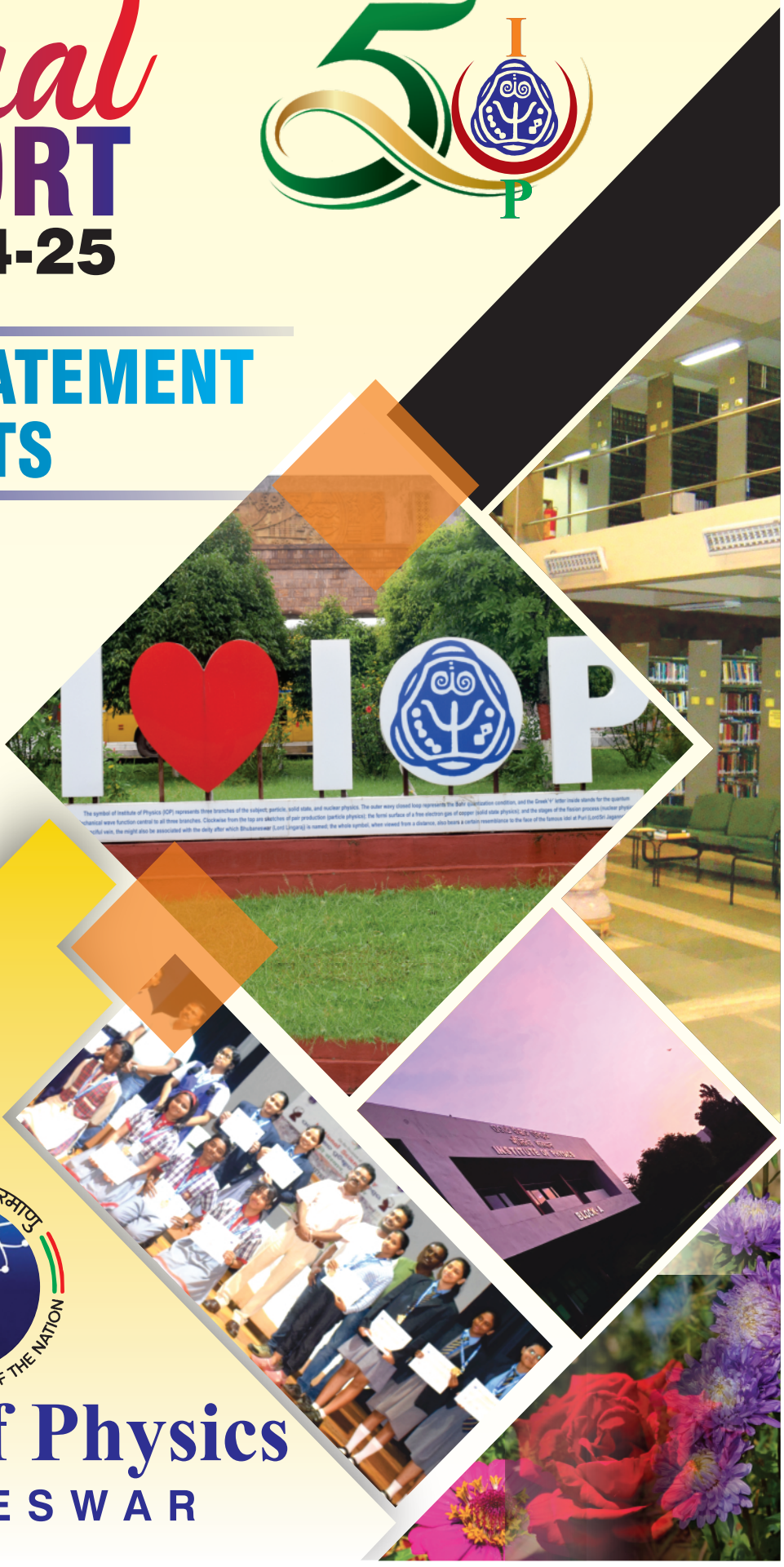
AUDITED STATEMENT OF ACCOUNTS



राष्ट्र की सेवा में परमाणु

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IOP

ATOMS IN THE SERVICE OF THE NATION

Institute of Physics

BHUBANESWAR

Annual REPORT

&

AUDITED STATEMENT OF ACCOUNTS
2024-25

Institute of Physics
BHUBANESWAR

Institute of Physics
Bhubaneswar

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About the Institute

The **Institute of Physics (IOP), Bhubaneswar**, is an autonomous research institute under the **Department of Atomic Energy (DAE), Government of India**. Established in 1972 by the Government of Odisha, the Institute continues to receive financial support from both DAE and the Government of Odisha.

IOP is widely recognized for its vibrant and multifaceted research programs spanning both experimental and theoretical domains. These encompass experimental and theoretical condensed matter physics, including active matter and biological physics, theoretical high-energy physics and string theory, theoretical nuclear physics, ultra-relativistic heavy-ion collisions, cosmology, quantum information, and experimental high-energy and nuclear physics. The Institute houses advanced accelerator facilities, including a 3 MV Pelletron accelerator and a low-energy implanter, supporting cutting-edge research in low-energy nuclear physics, ion beam interactions, surface modification and analysis, trace elemental analysis, materials characterization, and radiocarbon dating. A key focus area at IOP is Nanoscience and Nanotechnology, particularly in surface and interface studies. The Institute is equipped with state-of-the-art instrumentation for sample preparation and for probing the physical and chemical properties of nanostructures and bulk condensed matter systems. IOP maintains strong international collaborations with premier institutions such as CERN (Switzerland), BNL and ANL (USA), GSI (Germany), among others. It is also actively involved in India's flagship scientific endeavours, including the India-based Neutrino Observatory (INO) project.

The Institute offers a Ph.D. program in Physics, with admissions primarily based on performance in the Joint Entrance Screening Test (JEST). Candidates with strong scores in the CSIR-UGC NET or GATE are also considered. Selected students undergo a comprehensive one-year coursework as an integral part of their doctoral training.

The IOP campus is well-equipped with a range of residential facilities, including staff quarters, hostels for research scholars and post-doctoral fellows, compact apartments for visiting scientists, and a guest house. The Institute also has a health dispensary with regular doctor visits to provide medical support. Additionally, the campus features various recreational amenities, including indoor and outdoor sports facilities, a mini-gymnasium, and an auditorium.

The Institute celebrates its **Foundation Day** annually on the 4th of September, commemorating its establishment and legacy of scientific excellence. The Institute also celebrates **National Science Day** on 28th February each year, with the aim of bringing science to the forefront and inspiring scientific curiosity among the public. As part of this observance, IOP conducts an **Open Day**, featuring a wide range of engaging activities such as live experimental demonstrations, guided laboratory visits, and scientific poster presentations, especially designed to captivate students and visitors from all walks of life. In addition, IOP actively organizes various **Outreach Programmes** throughout the year to foster a scientific temper and promote awareness on key national initiatives, including cleanliness drives and sustainability campaigns. These efforts reflect the Institute's commitment to contributing meaningfully to the vision of a developed and sustainable Bharat.

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CHAIRMAN AND MEMBERS OF THE GOVERNING COUNCIL OF IOP, BHUBANESWAR

1.	Prof. Ajit Kumar Mohanty, Chairman (AEC) and Secretary (DAE) Department of Atomic Energy, Anushakti Bhavan, C.S.M.Marg, Mumbai – 400 001.	:	Chairman
2.	Prof. Karuna Kar Nanda, Director, Institute of Physics, Bhubaneswar-751005	:	Member
3.	Prof. Dileep Jatkar, Acting Director, Harish-Chandra Research Institute, Chhatnag Road, Jhunsi, Prayagraj-211019 (up to 31.01.2025)	:	Member
	Prof. Ujjwal Sen, Director, Harish-Chandra Research Institute, Chhatnag Road, Jhunsi, Prayagraj-211019 (from 01.02.2025)	:	Member
4.	Prof. Gautam Bhattacharyya, Director, Saha Institute of Nuclear Physics, Sector-1, Block-A/F, Bidhan Nagar, Kolkata-700064.	:	Member
5.	Prof. Hirendra Nath Ghosh, Director, National Institute of Science Education and Research Post. Bhimpur-Padanpur, Via. Jatni, Khurda - 752050.	:	Member
6.	Dr. Dinesh K. Aswal, Acting Director, Institute for Plasma Research, Bhat Village, Near Indira Bridge, Gandhinagar-382428. (up to 30.06.2025)	:	Member
	Dr.Tapas Ganguli, Director, Institute for Plasma Research, Bhat Village, Near Indira Bridge, Gandhinagar-382428 (from 01.07.2025)	:	Member
7.	Joint Secretary (R&D), Department of Atomic Energy Anushakti Bhavan, C.S.M.Marg, Mumbai-400001.	:	Member
8.	Shri. S. Muthukrishnan, Joint Secretary (Finance) Department of Atomic Energy, Anushakti Bhavan C. S. M. Marg, Mumbai-400 001 (from 01.04.2024)	:	Member
9.	Smt. Chithra Arumugam, IAS Principal Secretary to Govt. of Odisha Science and Technology Department. Bhubaneswar-751001.	:	Member
10.	Prof. Susmita Kar, Professor & Head, P.G. Department of Physics, Sriram Chandra Bhanja Deo University, Baripada-757001.	:	Member
11.	Prof. Manas Ranjan Panigrahi, Department of Physics, Veer Surendra Sai University of Technology (VSSUT), Burla, Sambalpur-768018	:	Member

SECRETARY TO THE GOVERNING COUNCIL, BHUBANESWAR

Dr. Sachindra Nath Sarangi, Officiating Registrar & Secretary to the Governing Council (up to 01.09.2024)
Lt. Col. Bibekananda Pattanaik, Registrar & Secretary to the Governing Council, IOP (from 02.09.2024)

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From the Director's Desk . . .

It is my pleasure to present the **Annual Report and Audited Statement of Accounts** for the Institute of Physics (IoP), Bhubaneswar, for the year 2024-25. This report highlights our key academic and research accomplishments. As a premier autonomous research institute under the Department of Atomic Energy (DAE), Government of India, IoP is committed to conducting high-quality, cutting-edge scientific research in both theoretical and experimental physics.

This year, an impressive number (227) of research papers in high-quality international peer-reviewed journals have been published by IoP faculty members. Apart from the peer-reviewed articles, IoP members have also contributed to book chapters, popular articles, and conference proceedings. Importantly, faculty members of the Institute are associated with different reputed international scientific organizations. IoP is also actively involved in international mega project collaborations such as ALICE and CMS.

The year was marked by several prestigious accolades for our faculty. Prof. K. K. Nanda, Director, has been honored with an Adjunct Professorship from Gangadhar Meher University, Sambalpur, and also honored with Fellow of the International Association of Advanced Materials, Sweden. A recent publication from the research group of Prof. Satyaprakash Sahoo on WS_2 memtransistors for neuromorphic computing, which was published in npj 2D Materials and Applications was selected for Nature's cross-journal retrospective collection for the 2024 Nobel Prize. This was the only research article from India to be included in this prestigious collection. Prof. T. Som is associated with members of DST, IIEST, and IBSI, etc. Prof. A. K. Nayak was appointed as Trigger Officer of CMS collaboration. Prof. D. Chaudhuri has been honored with a visiting Professorship of CY Cergy Paris University, France, ICTS-

TIFR and Max-Planck Insitute for the Physics of Complex Systems (MPIPKS), Germany. Prof. Kirtiman Ghosh has been honored with a Visiting Faculty, IISER-BPR.

Our research scholars also continue to demonstrate excellence. Ms. Subhalaxmi Rout, under the supervision of Prof. Aruna Kumar Nayak, received the best poster award at VHEPA 2024 at IIT Kanpur. Similarly, Ashis Kumar Panigrahi, under the supervision of Prof. Satyaprakash Sahoo, won the best poster award at the EESTER-2025 conference at IIT Madras.

Institute of Physics, Bhubaneswar, celebrated a momentous milestone as it marked its Golden Jubilee Year and 50th Foundation Day on 4th September, 2024. Distinguished Scientist Padma Vibhushan, Dr. R. Chidambaram, Former Chairman of the AEC & Secretary of the DAE, Former Principal Scientific Advisor to the Government of India, and Chairman of the School of Advanced Studies in Nuclear Science & Technology at BARC, Mumbai, graciously served as the Chief Guest. IoP has been actively involved in promoting scientific education and outreach. Beyond our own domains, IoP has been deeply engaged in Swachh Bharat, scientific outreach programs for communicating science and scientific temper to school and college students, teachers, and the public, with dedicated programs in the tribal districts of Odisha. Activities such as National Science Day, OPEN DAY, popular science talks, and night sky viewing were conducted to motivate young minds.

The institute has diligently implemented various Government policies such as Official Language Implementation at the workplace, International Women's Day and International Yoga Day, Observance of Vigilance Awareness Week. Notably, IOP Bhubaneswar was awarded the *Second Rank* among all DAE institutes for its Swachhata activities undertaken during Swachhata Pakhwada (16–28 February 2025).

At last, I take this opportunity to acknowledge my sincere gratitude to all the stakeholders of the IoP community including the Governing Council members for their continuous support and advice. I would also like to thank all the faculty and staff for their relentless effort to take the institute to a greater height. My special thanks to the committee members for preparing this Annual Report. I am confident that the Institute will continue to make significant contributions to both fundamental and applied physics research in the years to come.

Professor Karuna Kar Nanda
Director, IoP

Contribution of Institute of Physics (IoP) towards DAE Vision

Brief Summary of Annual Report 2024-2025

The Institute of Physics (IOP), Bhubaneswar, continues to uphold its reputation as one of India's leading research institutions, conducting pioneering research in experimental and theoretical high-energy physics, nuclear physics, and theoretical and experimental condensed matter physics. During the year 2024–25, the Institute published over 120 research papers in international peer-reviewed journals and conference proceedings, reflecting the depth and breadth of its scientific output.

The Institute's vibrant academic environment is exemplified by its successful Ph.D. program, with several scholars completing their doctoral degrees during the year. In addition, postdoctoral researchers played a key role in advancing impactful scientific work across various disciplines.

The Theoretical High Energy Physics group has significantly advanced research in AdS/CFT, neutrino oscillation parameters, long-range neutrino interactions, and dark matter phenomenology, in collaboration with global experiments like DUNE, T2HK, IceCube, and INO. Noteworthy is the application of machine learning to enhance data analysis and interpretation.

In Theoretical Nuclear Physics, the group explored quark-hadron phase transitions, neutron star equations of state, gravitational wave observations, and dark matter effects on neutron star properties. Their robust computational models offer insight into higher-order fluctuations and astrophysical phenomena.

The Experimental High Energy Physics group maintained active involvement in the CMS experiment at CERN and GRAPES-3 at Ooty. Contributions include searches for charged Higgs and leptoquarks, advanced trigger system development, and detector upgrades. In GRAPES-3, they utilized ML techniques for cosmic ray mass composition studies.

The Experimental Condensed Matter Physics division pursued impactful research on neuromorphic computing, nanoscale memristors, photovoltaics, quantum sensors using diamond color centers, and surface nanostructuring using ion sources. Emphasis on material innovation and real-world applications was evident.

The Theoretical Condensed Matter Physics group made notable progress in research areas such as topological insulators, Majorana modes, quantum transport, phase transitions and inertial effects in active matter systems, as well as biological physics, including studies on bacterial cytoskeletal organization during cell division—contributing to both fundamental insights and interdisciplinary applications.

IOP also benefitted from research contributions by long-term academic visitors, enriching collaborative and interdisciplinary engagement. The Institute's academic vitality was further enriched by long-term visiting scholars, fostering collaborative and interdisciplinary research.

IOP also remained active in outreach and public engagement. On National Science Day (28th February), it hosted its annual Open Day, featuring exhibitions, laboratory tours, demonstrations, and poster sessions. The Institute organized extensive outreach programs for schools and colleges across Odisha, along with science popularization initiatives, sky-watching sessions, and cleanliness campaigns. The Hindi Cell conducted Hindi Diwas celebrations, seminars, and workshops to promote the use of Rajbhasha in scientific discourse.

Through its sustained excellence in research, academic rigor, and public engagement, the Institute of Physics continues to make significant contributions towards the Department of Atomic Energy's mission of scientific excellence and nation-building.

CHAPTER 01

ACADEMIC PROGRAMMES

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1.1 PRE-DOCTORAL PROGRAM

One of the key objectives of the Institute is to train and mentor young scholars in conducting research in physics. Since 1975, the Institute of Physics (IOP) has offered a regular Pre-doctoral (Post M.Sc.) program—an essential academic initiative designed to prepare M.Sc. graduates for research careers. This program provides broad-based training in advanced physics and research methodology, aiming to equip students not only for doctoral research but also to become effective physics educators.

To select candidates for the Ph.D. program, the Institute participates in the Joint Entrance Screening Test (JEST). Final selection is based on the candidate's performance in the written test and an interview conducted at the Institute. The current Pre-doctoral course commenced in August 2024. Upon successful completion of the program, students become eligible to undertake research under the supervision of Institute faculty, leading to a Ph.D. degree awarded by the Homi Bhabha National Institute (HBNI).

Pre-doctoral Scholars selected for the AY 2024-25

A total of 182 and 32 candidates were shortlisted for the written test and interview for admission to the Pre-doctoral course in August 2024 and January 2025, respectively. The candidates included JEST qualifiers, UGC-CSIR NET qualifiers, and those with valid GATE scores. The following students have enrolled in the doctoral coursework program for the academic year 2024–2025.:

1. Mr. Bibhubhusan Swain
2. Mr. Dhananjaya Sahoo
3. Mr. Rohit Kumar Pandey
4. Ms. Gargi Rath
5. Mr. Sandeepan Sahoo
6. Mr. Samir Kumar Sahoo
7. Mr. Sashibhusan Sahoo

Details of the courses offered and course instructors are given below :

Semester – I

Advanced Quantum Mechanics	:	Prof. Kirtiman Ghosh
Quantum Field Theory – I	:	Prof. Manimala Mitra
Advanced Experimental Techniques	:	Prof. Satyaprakash Sahoo
Experimental Physics Lab	:	Prof. T. Som
Advanced Statistical Mechanics	:	Prof. Debasish Chaudhuri

Semester – II

Mathematical Methods,Numerical Methods And Research Methodology	:	Prof. P. K. Sahu/Prof. Arijit Saha
Quantum Field Theory – II	:	Prof. Debottam Das

High Energy Physics	:	Prof. Sanjib Kumar Agarwalla
Special Topics in Condensed Matter Physics	:	Prof. Debakanta Samal /
Particle Detection & Statistical Analysis in		Prof. B. R. Sekhar
HEP	:	Prof. Aruna Kumar Nayak

As a part of the coursework, students also worked on projects in the last Semester under the supervision of faculty members of the institute.

Scholars successfully completed Pre-Doctoral Course for AY 2023-24:

1. Mr. Babulu Pradhan
2. Mr. Subhankar Gope
3. Mr. Nutan Das
4. Mr. Abhishek Hota
5. Mr. Jayanta Kumar Panigrahi
6. Mr. Debidatta Mohanty
7. Mr. Ohidul Alam
8. Mr. Dhananjay Moharana
9. Mr. Shanu Bandyopadhyay

To recognize exceptional academic performance, the Institute has established the Lalit Kumar Panda Memorial Endowment Fellowship (L. K. Panda Memorial Fellowship), awarded annually to the most outstanding Pre-doctoral student. For the academic year 2023–24, Mr. Shanu Bandyopadhyay was the recipient of this fellowship, which includes a cash award of Rs. 5,000.

1.2 DOCTORAL PROGRAM

Presently Institute has sixty doctoral scholars working in different areas under the supervision of its faculty members. All the scholars are registered with Homi Bhabha National Institute (HBNI), a deemed-to-be University within DAE. Progress of each doctoral scholar is reviewed annually by a review committee. This year reviews were held in the months of July-August.

1.3 THESES (Defended)/(Submitted)

The following scholars have been awarded Ph.D. degree by Homi Bhabha National Institute on the basis of thesis defended.

1. **Mr. Rupam Mandal**
   Advisor: Prof. T. Som
   Thesis Title:" Tailoring resistive switching properties of metal oxide memristors for neuromorphic applications."

2. **Mr. Sidharth Prasad Maharathy**
Advisor: Prof. Manimala Mitra
Thesis Title:" Collider phenomenology of charged Higgs in neutrino mass models"

3. **Mr. Abhishek Roy**
Advisor: Prof. Manimala Mitra
Thesis Title: "Exploring Particle Physics Models: Implications for Dark Matter Phenomenology"

4. **Mr. Sudipta Das**
Advisor: Prof. Sanjib Kumar Agarwalla
Thesis Title: "Probing Beyond the Standard Model Scenarios in Long-baseline and Astrophysical Neutrino Experiments"

5. **Ms. Sandhyarani Sahoo**
Advisor: Prof. Satyaprakash Sahoo
Thesis Title: "Studies of Gate-bias Controlled 2D Material-based Devices for Photodetector Applications"

6. **Mr. Chitrak Karan**
Advisor: Prof. Debasish Chaudhuri
Thesis Title: "Activating semiflexible filaments: Impact of motor protein drive and inertia"

7. **Mr. Arpan Sinha**
Advisor: Prof. Debasish Chaudhuri
Thesis Title:" Active nematics: Exploring reciprocity and its absence"

8. **Mr. Mousam Charan Sahu**
Advisor: Prof. Satyaprakash Sahoo
Thesis Title: "Studies of metal oxide and chalcogenide thin film based memristors for memory and neuromorphic computing applications"

9. **Mr. Pritam Chatterjee**
Advisor: Prof. Arijit Saha
Thesis Title: "Topological Superconductivity in Magnet/Superconductor Heterostructures"

10. **Mr. Sameer Kumar Mallik**
Advisor: Prof. S P Sahoo
Thesis Title: Development of large scale CVD grown two dimensional materials for field-effect transistors, thermally-driven neuromorphic memory, and spintronics applications"

11. **Mr. Pragyanprasu Swain (Submitted)**
Advisor: Prof. S.K. Agarwalla
Thesis Title: Testing beyond the Standard Model scenarios in next-generation long-baseline neutrino oscillation experiments

12. **Mr. Subhadip Bisal (Submitted)**
Advisor: Prof. Debottam das
Thesis Title: Next-to-leading order corrections to dark matter direct detection and precision observables

13. **Ms. Aisha Khatun (Submitted)**
Advisor: Prof. Dinesh Topwal
Thesis Title: Strongly correlated structural, magnetic and charge transport properties in mixed valent manganites.

1.4 Summer Student's Visiting Program (SSVP):

The Summer Student Visiting Program (SSVP) is designed to inspire and introduce young students to cutting-edge research, particularly in areas actively pursued at the Institute. In 2024, the program was conducted from May 6 to June 17, with three students participating. Each student was provided with round-trip train fare, on-campus accommodation, and a monthly stipend of Rs. 6,500. During the program, students worked closely with faculty mentors on specific research projects. The program concluded with a seminar in which the students presented their work on their assigned topics.

Name of the Student	Advisor
Rajdeep Chatterjee	Prof. S.K.Agarwalla
Tusharkanta Sahoo	Prof. Aruna K Nayak
Baishali Pradhan	Prof. P.K. Sahu

1.5. Conferences/Workshops organized by IOP

1.5.1 Topical School of Advanced Condensed Matter Physics (May 20th - 31st, 2024)

The summer school titled "Topical school of advanced condensed matter" (TSACMP) has been arranged at IOP during 20th -31st May, 2024. Out of the total estimated expenditure of Rs.16.00 lakh, an amount of Rs.12.00 lakh was approved by DAE and Rs.4.00 lakh collected from the participants as registration fee. The school has been attended by 90 registered participants which is considered a large number for such school in India. Apart from the very timely topics, the school arranged three colloquium and three talks on experimental condensed matter to give the audience a broad understanding. The students find the school very engrossing and the school

teachers went beyond their scheduled time to answer all the queries and doubts of the participants. The speakers of the school constitute very dynamic and enthusiastic experts in various fields as mentioned in the webpage. The full list of the speakers are: S. R. Hassan (IMSc, Chennai), Subhro Bhattacharjee (ICTS, Bengaluru), Navinder Singh (PRL, Ahmedabad), Sumilan Banerjee (IISc, Bengaluru), Arnab Sen (IACS, Kolkata), Adhip Agarwala (IITK, Kanpur), Priya Mahadevan (SNBNCBS, Kolkata) and Sanjib Ghosh (BAQIS), Pratap Raychaudhuri (TIFR, Mumbai), Sudhansu S. Mandal (IITKGP, Kharagpur). Prof Shikha Varma, Prof. Ajit M. Srivastava and Prof. B. R. Shekhar from IoP also contributed to the success of the school.

The speakers felt that the content of the school is very timely and there is scope of arranging such school periodically so that a broad knowledge is imparted to the young graduate students.

1.5.2 ALICE-STAR India Collaboration Meeting

The ALICE-STAR India collaboration meeting is being organized by the ALICE and STAR Collaboration during 24th-27th June 2024. The collaboration meeting is being hosted by Institute of Physics (IOP) Bhubaneswar in physical mode only. The goal of the meeting is to discuss physics results, analysis details, detector and upgrade activities, future plan, and budget related issues. There are more than 60 participants from more than 10 ALICE participating Institutes. The participants were team leaders along with their students, post-doctoral fellows and scientists. Almost all members presented their talks. There were few online presentation from outside India. ALICE spokesperson also presented a talk and discussed the future of ALICE experiments

that is ALICE3. The estimated budget was around Rs.3 lakhs. It was part of Institute Golden jubilee celebration, organized by Prof P. K. Sahu with approval of Director Prof. K. K. Nanda, Institute of Physics, Bhubaneswar.

1.5.3 Machine Learning for Particle and Astroparticle Physics (ML4HEP – 2024)

A school-cum-workshop program on "Machine learning for Particle and Astroparticle physics (ML4HEP)" was held at the Institute of Physics, Bhubaneswar. The program had two components: (1) an online pre-school held using Zoom from 10th to 22nd June 2024, (2) an in-person school-cum-workshop at IOP from 1st to 13th July 2024. The pre-school consisted of lectures and tutorials on essential programming language Python, data HEP data analysis software PyROOT and Uproot, basics of statistical data analysis, basics of deep machine learning methods such as Artificial neural network (ANN), Deep neural network (DNN), and convolutional neural network (CNN) along with tutorials using Tensorflow and PyTorch frameworks. There were two sessions of 1.5 hours each per day for two weeks during the pre-school. All the applicants for the program were allowed and invited to participate in the pre-school with the aim of imparting at least basic knowledge to all interested students and postdocs.

Out of all the applicants, about fifty students from outside Bhubaneswar were selected for the in-person program, along with about thirty students and postdocs together from IOP and NISER, Bhubaneswar. The main program had first eight days devoted to school on advanced machine learning techniques. The school part of the in-person program covered lectures and hands-on sessions on statistical data analysis in high

energy physics such as hypothesis testing, estimation of confidence intervals, exclusion limits and significance evaluation etc., various advanced machine learning techniques such as support vector machines (SVM), graph neural networks (GNN), generative and sequence models, autoencoders, normalizing flow, unsupervised learning, quantum machine learning. Hands-on tutorials were conducted with the emphasis on their applications in the field of high energy particle and astroparticle physics. Furthermore, a few lectures were also delivered on OpenMPI, an open-source message passing interface for high-performance computing. Faculty members in the field of theoretical or experimental high-energy physics from eminent research and education institutions in India, such as TIFR, SINP, PRL, IISERs, and IITS have contributed to the program as lecturers, tutors, and mentors. A workshop was held during the last four days of the program, where, apart from some talks on the applications of the ML in HEP by some faculty members and students, several collaborative projects were floated by some of the experts in the field. Each participant chose one of the projects and worked in groups with other participants, where faculty members mentored the groups. This allowed students and postdocs to apply the ML techniques learned during the lectures to real problems in high energy physics to gain expertise as well as start collaborative studies with students and postdocs from other institutions. The partially or fully completed projects were discussed by the student's in short oral presentations on the last day of the program.

1.5.4 Workshop On Dark matter and astroparticle physics (August 7th-9th 2024)

A three day workshop on pressing issues on dark matter and astroparticle physics had been held at the Institute of Physics, Bhubaneswar, from 7th to 9th August, 2024. A

total 95 participants actively participated in scientific discussions. The 1st day was dedicated to the discussion on models and signatures of dark matter, on 2nd day, application of machine learning was discussed, and on 3rd day, gravitational wave, leptogenesis, inflation, and cosmic imprints of new physics were discussed.

There was a dedicated student/postdoc talk session on 8th of August and poster presentation by the students on 7th of August. Finally, on 9th of August, young faculties and postdoctoral fellows presented novel ideas in working group discussions. Prof. Manimala Mitra was the Convener and Prof. Debottam Das was the Co-Convener of the workshop. A budget of Rs.7,93,250/- has been provided by DAE for holding the workshop.

Prof. Subhandra Mohanty (IIT Kanpur), Prof. Partha Konar (PRL), Prof. Arka Banerjee (IISER Pune), Prof. Ranjan Laha (IISc) and Prof. Nirmal Raj of IISc., Bangalore, Prof. Pratik Majumdar (SINP), Prof. Rishi Khatri (TIFR) and others. Online presentation was made by Prof. Tracy R. Slatyer (MIT), Prof. Genevieve Belanger (LAPTh, Annecy), Prof. Miguel Escudaro (CERN), Dr. Silvia Manconi (LAPTh, Annecy).

1.5.5 IANCAS-ERC Workshop on 17.08.2024

The Indian Association of Nuclear Chemists & Allied Scientists - Eastern Regional Chapter (IANCAS-ERC), in collaboration with the Institute of Physics (IOP), Bhubaneswar, organized a one-day IOP-IANCAS Golden Jubilee Workshop titled "I will also be a Scientist" on 17th August 2024 at IOP Bhubaneswar. This event aimed to

inspire science graduates by highlighting the importance of Material Sciences, Nuclear Sciences, Advanced Physics, and their societal applications. Approximately 200 students from classes IX and X, representing around 25 Odia Medium High Schools across Odisha, attended the day-long program.

The seminar was inaugurated by Prof. Karuna Kar Nanda, Director of IOP and President of IANCAS-ERC. Dr. R. Acharya from Bhabha Atomic Research Centre, Mumbai, served as the Guest of Honour. Esteemed speakers, including Prof. P. K. Sahu, Dr. S. N. Sarangi, and Dr. B. Mallick, Secretary of IANCAS-ERC delivered invited talks. The workshop featured five scientific motivational talks, hands-on demonstration experiments on Gamma-ray measurement and Beta particle counting, engaging science experiments using liquid nitrogen, and a Science Quiz by Dr. K. C. Patra to encourage students towards a career in science. To mark this Golden Jubilee occasion, the Director of IOP donated a scientific instrument kit to each participating Odia Medium High Schools.

1.5.6 Emerging Trends in Quantum Condensed Matter Physics (EQCMP- 2024)

The conference on "Emerging trends in Quantum Condensed Matter Physics (EQCMP@2024)" was organized by the condensed matter theory group of IoP (Convenor: Prof. Arijit Saha) in celebration of the Golden Jubilee year of the institute. The conference was held during August 21-23, 2024 at IoP. The main theme of the conference was topological states of matter, strongly correlated electronic systems, non-Hermitian systems, twisted bi-layer systems etc. These are some of the modern topics of research in the field of quantum condensed matter physics. Around 30 invited scientists and 45 PhD scholars+postdocs (from IIT, IISER, NISER, Research Institutes and Central Universities) participated in this conference. Among them Prof. Tanmoy Das (IISc, Bangalore), Prof. G. J. Sreejith (IISER Pune), Prof. Soumya Bera (IIT, Bombay), Prof. Sourin Das (IISER, Kolkata), Prof. Rajesh Narayanan (IIT, Chennai) etc. are the young stars of Indian quantum condensed matter theory research community who were invited in this conference as speakers. Total budget of this conference was approximately 10.5 Lakhs among which 7.93 Lakhs was supported by the institute and around 3 lakhs were collected from the registration fees (Rs. 6000/- for the invited speakers and Rs. 4000/-for the PhD students and postdocs). Around 36 students presented posters in this conference on their current research work. Overall, the conference was a great success with many informal discussion sessions, poster sessions etc. The link of the conference: https://iopb.res.in/eqcmp2024/index.php

1.5.7 Frontiers of Ion Beam Science (FIBS-2024)

The National Conference "Frontiers of Ion Beam Science (FIBS-2024)" was organized at the In-stitute of Physics, Bhubaneswar from 4-7 November 2024. This conference

focused on the funda-mentals of ion beam science and their application in various fields. FIBS united the Indian experts and researchers in the ion beam community to share knowledge and foster collaboration.

The topics included in the conference were: Ion-matter interaction, simulation of radiation damage, ion-induced surface pattern formation, defect engineering, ion-beam induced modification of ma-terials, synthesis of nanostructures and modifications by energetic ions, ion-beam analysis, quan-tum technology, and ion accelerators.

There were 34 invited talks and several posters were presented as well. The conference was at-tended by nearly 80 people from different national institutes and universities.

This meeting was a part of the IoP Golden Jubilee year celebration and was chaired by Prof. Ta-pobrata Som

1.5.8 IoP Golden Jubilee Young Women Scientist's meet (IGJYWSM-2024)

The main objective of this conference was to bring together leading young women scientists across India. There were both overview talks and more specific and technical ones on the latest work and developments in different scientific fields. Panel discussion was held to empower women research-ers / scientists as also to discuss further research opportunities and open problems

The broad areas included in the conference were: Theoretical High Energy Physics, Experimental High Energy Physics, Theoretical Condensed Matter Physics, Experimental Condensed Matter Physics, Astrophysics & Cosmology, and Bio-Physics.

There were 23 invited talks and was concluded by a panel discussion which was led by 6 top women scientists. The conference was attended by nearly 75 people from different national insti-tutes and universities.

This meeting was a part of the IoP Golden Jubilee year celebration. Prof. Manimala Mitra and Prof. Tapobrata Som were the joint Conveners for this meeting.

1.5.9 National Conference on Sensing and Technologies (NCST-2024)

NATIONAL CONFERENCE ON SENSING AND TECHNOLOGIES (NCST-2024)

Organised by Institute of Physics, Bhubaneswar 27th - 29 thNovember 2024, Toshali Sands, Puri

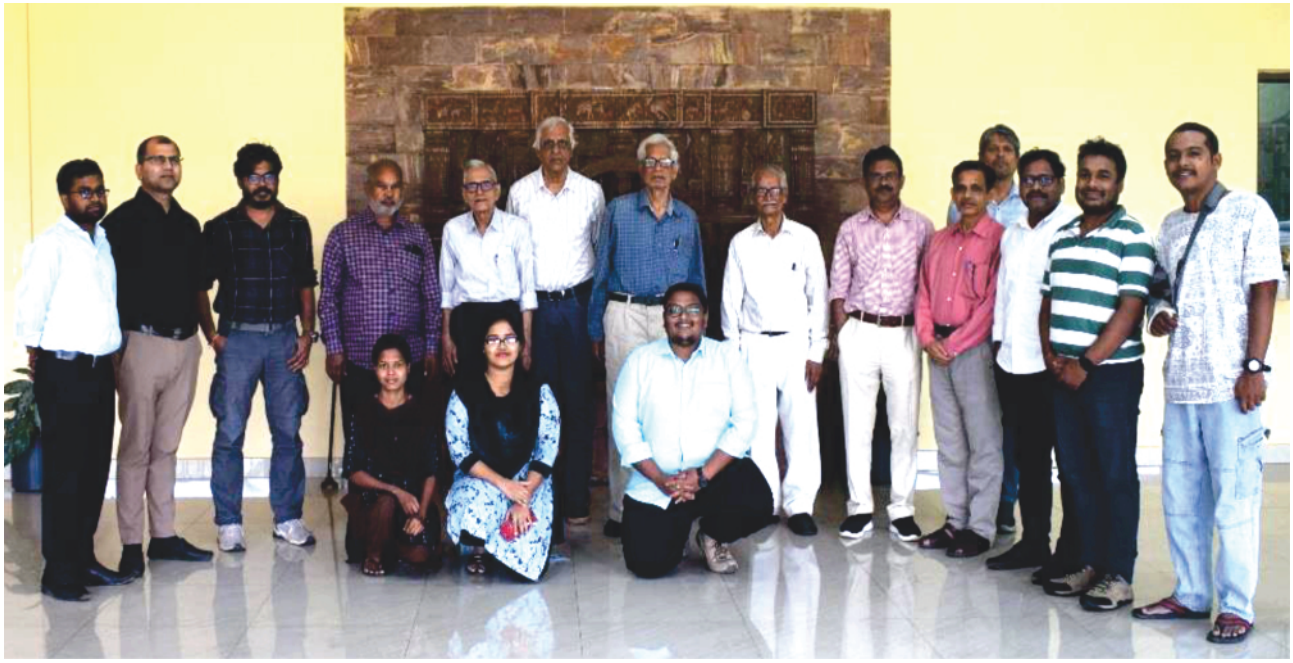
The National Conference on Sensing and Technologies (NCST-2024) took place from 27th - 29th November, 2024 at Toshali Sands in Puri, hosted by the Institute of Physics Bhubaneswar. This event aimed to bring together the research community dedicated

to the field of sensors. A total of 50 participants from various parts of India attended the conference. The agenda featured 15 invited speakers, 8 oral presentations, and over 20 poster presentations, along with contributions from many other attendees. Notable scientists in attendance included Prof. Karuna Kar Nanda from IOP, Prof. R.T. Rajendra Kumar from Bharathiar University, Prof. N. Ravishankar from IISc, Bangalore, Dr. Arun K Prasad from IGCAR, Prof. B.K. Panigrahi from IOP, Prof. Priyabrat Dash from NIT Rourkela, Prof. Rajan Jha from IIT Bhubaneswar, Prof. S.B. Krupanidhi from IISc, , Bangalore, Dr. S.L. Shinde from IIT Hyderabad, Prof. Sathyaprakash Sahoo from IOP, Prof. S. Rath from IIT Bhubaneswar, Prof. Sathish Sugumaran from VTU, Bangalore, Prof. Shikha Verma from IOP, Dr. Somnath Koley

from CSIR CMRI, Prof. Subhasish Basu Majumder from IIT Kharagpur, and Dr. Sachindra Nath Sarangi from IOP. The conference served as a platform for leading scholars and experts in the field to convene and delve into the latest advancements in sensor technologies. The outcomes of this gathering included a rich exchange of knowledge among participants, fostering connections between research scholars and scientists. Attendees were able to apply their insights to enhance sensor technology, develop diverse research methodologies, and inspire young individuals to engage in research focused on sensors. This collaborative environment not only promoted the sharing of ideas but also encouraged the next generation of researchers to explore the exciting possibilities within the realm of sensor technology.

1.5.10 New Frontiers in Extreme Nuclear Matter: Understanding the Intersection of Nuclear and Particle physics

The seminar, titled New Frontiers in Extreme Nuclear Matter: Understanding the Intersection of Nuclear and Particle Physics, was organised by Dr. Mrutunjaya Bhuyan (Convener), and Prof. P. K. Sahu (Chairman) at Institute of Physics on 14th February 2025. The seminar covered a wide range of fascinating topics, including low-energy nuclear physics, high-energy particle physics, and astrophysics. The event began with an opening address by Prof. K. K. Nanda, Director of the Institute of Physics, who set the stage for the discussions ahead. Our expert speakers provided in-depth insights into nuclear, particle, and astrophysics, offering valuable perspectives on current trends and challenges. The seminar featured 5 plenary speakers and 6 invited speakers, with interactive sessions and Q&A discussions allowing us to engage with these topics in greater depth. The seminar also highlighted the intersection of nuclear and particle physics at the frontiers of extreme nuclear matter,



which is an exciting and ever-evolving field of study. By understanding how matter behaves under these extreme conditions, scientists hope to answer some of the most fundamental questions about the universe—such as the nature of the early universe, the structure of neutron stars, and the properties of quantum matter at its most extreme

1.5.11 Ice Cube Master Class at IOP – Be a Scientist for a Day

The Ice Cube Neutrino Observatory, situated at the South Pole, is a monumental scientific instrument embedded within a cubic kilometer of Antarctic ice. It detects neutrinos - elusive subatomic particles - that traverse the Earth, providing invaluable insights into cosmic events and the fundamental nature of the universe.

On 27th March 2025, the Institute of Physics (IOP), Bhubaneswar, successfully hosted the IceCube Master Class, an enriching event that brought together school students, educators, and science enthusiasts for an in-depth exploration of neutrinos and the groundbreaking research conducted at the IceCube Neutrino Observatory in Antarctica.

The masterclass commenced at 9:30 a.m. with an inaugural session led by Prof. K. K. Nanda, Director of IOP, who emphasized the institute's dedication to advancing scientific knowledge and fostering curiosity among young minds.

Coordinated by Prof. Sanjib Kumar Agarwalla and his team, who have been working in the IceCube experiment for the past three years, the event featured a series of insightful lectures from eminent scientists. Prof. Sanjib Kumar Agarwalla provided an engaging introduction to neutrinos, elucidating their fundamental properties. Prof. Christian Spiering, a leading figure in astroparticle physics at DESY Zeuthen, Germany, and a pioneer in high-energy neutrino astronomy, delved into the design and operation of the IceCube Neutrino Observatory. Prof. Marek Kowalski, a distinguished scientist at DESY Zeuthen and Humboldt University Berlin, Germany, discussed multi-messenger neutrino astronomy, highlighting how this emerging field integrates observations across different wavelengths and particle types to unveil the universe's deepest secrets.

During this masterclass, students learned about the fascinating properties of neutrinos and the IceCube neutrino observatory located at the South Pole. They gained insights into the cutting-edge scientific research of the IceCube neutrino project through expert-led discussions, hands-on activities, and data analysis.

The highlight of the day was a live video call from 6:15 p.m. to 7:00 p.m. with the "winterovers" stationed at the South Pole. Winterovers are dedicated personnel who

commit to approximately a year-long tenure at the observatory, ensuring its maintenance and continuous operation during the harsh Antarctic winter months, from mid-March to October, when the continent is enveloped in complete darkness and temperatures can plummet to extreme lows.

During the session, the two winterovers shared insights into their unique lifestyle, discussing the challenges of isolation, limited resources, and the ingenuity required to sustain themselves. They showcased their living quarters, specialized winter gear, and a small greenhouse they've cultivated to supplement their diet with fresh produce. Students were captivated by their stories, asking numerous questions about daily life at the South Pole, the psychological and physical demands of their role, and the scientific endeavors they support.

The event saw participation from around 50 attendees, including students and faculty from various schools, namely Cohen International School, Loyola School, Sai International School, PM Shri KV-1, DPS Kalinga, DAV - Unit 8, KIIT International School, DAV Chandrasekharpur, and Mother's Public School. Each participant received a kit containing a pen, notebook, sticker, postcard, an introductory document on neutrinos, a magazine, and a badge. The event concluded with the distribution of participation certificates to all attendees, recognizing their engagement and enthusiasm throughout the masterclass.

The success of the IceCube Masterclass 2025 underscores the Institute of Physics, Bhubaneswar's commitment to promoting scientific research and education. Students thoroughly enjoyed the event and found it to be an exceptional learning experience. The opportunity to interact with distinguished scientists, analyze scientific data, and gain insights into the world of neutrino physics made it a truly unique and inspiring event.

1.6. Awards & Recognitions (Faculty Members)

Prof. K. K. Nanda

1. Honored with Samanta Chandrasekhar Award for the year 2006 by the Odisha Bigyan Academy, Govt. of Odisha;
2. Materials Research Society of India Lecture Medal for the year 2010

3. Japan Society for the Promotion of Science (JSPS) Fellowship for the year 2013-14

4. Prof. N.N.Dasgupta Memorial Award, 2023 by the Indian Photobiology Society, Jadavpur University, Kolkata for his pioneering contributions in the area of Nanoscience and Nanotechnology, especially on the applications in sensing and catalysis.

5. Honored with Adjunct Professorship of Gangadhar Meher University, Sambalpur from 05.01.2024

6. A Fellow of International Association of Advanced Materials, Sweden.

7. He is a member of the Staff Council of Deptt. of Physics Berhampur University as per the need of the different accreditation agencies.

8. He is also a member of the Programme Advisory Committee (PAC) for International Cooperation in the area of Physics, Astrophysics and Laser for three years from 05.11.2024.

Prof. Tapobrata Som

1. DST Review Committee: Solar Energy Hub established at Indian Institute of Engineering Science and Technology (IIEST), Shibpur

2. International Scientific Advisory Committee Member, International Conference on Atomic Collision in Solids (ICACS)

3. International Committee Member, International Symposium on Nanopatterning

4. Vice-President (Eastern India), Ion Beam Society of India

5. Vice-Chairman, Materials Research Society of India (MRSI), Bhubaneswar Chapter

6. Scientist in-Charge, UGC-DAE CSR Bhubaneswar Node

7. Convener, Expert Committee for UGC-DAE CSR Bhubaneswar Node

8. Invited Member, Scientific Advisory Committee, UGC-DAE CSR

9. Invited Member, Governing Board, UGC-DAE CSR

10. Invited Member, Governing Council, UGC-DAE CSR

Prof. P.K. Sahu

1. Institute of Physics Publisher Trusted Reviewer 2024.

2. INSPIRE Fellowship Subject Expert (since 2024 till 2027)

3. 2014 -till date – Indian Grid Certificate Authority (IGCA), Registration Authority, Bhubaneswar, India.

4. Reviewer as F.R.S.-FNRS expert (Fund for Scientific Research-FNRS, Belgium), 2024.

5. National Advisory Committee in "10th Asian Triangle Heavy-Ion Conference - ATHIC 2025, Jan 13 – 16, 2025, IISER, Berhampur.

Prof. Sanjib K Agarwalla

1. Selected to deliver the First Prof. Ravipati Raghavarao Memorial Lecture at the Physical Research Laboratory (PRL), Ahmedabad, Gujarat, on 21st February 2025

2. Rajib Goyal Young Scientist Prize for the year 2021-2022 in the Physical Science category by the Kurukshetra University, Kurukshetra, Haryana (awarded on 6th September 2024)

Prof. Satyaprakash Sahoo

1. Nobel Prize in Physics 2024 has been awarded to Prof. John J. Hopfield and Prof. Geoffrey E. Hinton "for foundational discoveries and inventions that enable machine learning with artificial neural networks". Nature journal organizes cross-journal retrospective collections for the Nobel Prize annually. A recent publication from the group of Prof. Satyaprakash Sahoo on Ionotronic WS2 memtransistors for 6-bit storage and neuromorphic adaptation at high temperature (Nature npj 2D Materials and Applications, https:// www.nature.com/ articles/s41699-023-00427-8) has been selected for the Nature's cross-journal retrospective collections for 2024 Nobel prize. This is the only research article from India to be included in such prestigious collection.

Prof. Aruna Kumar Nayak

1. Trigger officer in Physics coordination in CMS collaboration for Sep 2024 – Aug 2026. [Level-2 position in CMS physics coordination]

Prof. Debasish Chaudhuri

1. D Chaudhuri has been honored with a Labex Excellence Chair Professorship by CY Cergy Paris University, Paris, France, with support for a three-month visit from May to July 2025.

2. He has been honored with an Associateship of ICTS-TIFR, Bangalore.

3. He was supported and hosted by MPI-PKS, Dresden, Germany, with a Visiting Scientist position in October-November 2024.

Prof. Kirtiman Ghosh

1. Awarded (Co-PI) ANRF Research Grant of Rs. 44,48,592 for 3 Years
2. Visiting Faculty, IISER-BPR

1.7. Invited Talks/Lectures Delivered :

Prof. K. K. Nanda

1. Deliver an invited talk on "Applications of Nanostructured Materials Associated with Oxygen Breathing" in International Conference on frontiers in Nanomaterials sciences: Aspects in biotechnology and chemical Engineering (FINS 2024) NIT Patna.
2. Deliver an invited talk on "The Untold Story of Fuel Cells" in ICST 2024 at NIT Durgapur
3. Deliver an invited talk on "Introduction to the world of Sensors" at NCST 2024, Puri.
4. Deliver an invited talk on "Future Sources of Energy", at International Symposium on Ceramics and Advanced Materials for Green Energy Value Chain, Green Energy Materials Meet during 23rd September -24th September 2024.

Prof. Tapobrata Som

1. Faculty Development Programme on New Frontiers in Semiconductor Technology and Quan-tum Technology, Amity University, U. P., May 13-17, 2024.
2. AICTE VAANI Workshop on Recent Advancement in Materials, Rare-earth, Critical Minerals and their Characterization (RAMC-24), BIT Mesra, June 24-28, 2024.
3. 2nd Materials Chemistry Symposium, IMMT Bhubaneswar September 6, 2024.
4. International Conference on Semiconductor Technologies – Materials to Chips (ICST-2024), Amity Institute of Nanotechnology, Noida, September 18-20, 2024.
5. 30th International Conference on Atomic Collisions in Solids (ICACS) & 12th International Symposium on Swift Heavy Ions in Matter (SHIM), Australian National University, Canberra, November 24-29, 2024.
6. Panellist in 1st International Conference on Sustainable Technologies (ICST-24), NIT Durga-pur, December 12-14, 2024).

7. National Seminar on Advances in Societal Applications of Radiation (ASAR-2025), KIIT Uni-versity, Bhubaneswar, March 21, 2025.

Prof. P.K.Sahu

1. Delivered an invited talk on "High Density Nuclear Matter and Application to Society" in the seminar on "Recent Advances in Science and Technology (RAST-2K25)" on 16th of February 2025 at the Department of Physics, Indira Gandhi Institute of Technology, Sarang.

2. Delivered an talk on "Understanding Nuclear high energy Physics and its Applications" in National Conference on "Emerging Aspects of Physics: New Directions and Societal Applications" scheduled to be held at Department of Physics, MSCB University, Mayurbhanj, Odisha, India, during 21 – 22 February, 2025.

Prof. Dinesh Topwal

1. DD Transition, Pune (2024): Rashba states with unconventional spin texture in Ag-Bi self-assembled network

2. 2nd Materials Chemistry Symposium (2024): Role of cationic ordering in structure- prop-erty relation of mixed valent perovskite

Prof. Sanjib Agarwalla

1. Imaging the Deep Earth with Neutrinos. First Professor Ravipati Raghavarao Memorial Lecture, Physical Research Laboratory (PRL), Ahmedabad, Gujarat, India, 21st February 2025.

2. Highlights from the IceCube Neutrino Observatory. Invited plenary talk given at the XXVI DAE-BRNS HEP Symposium 2024, Banaras Hindu University, Varanasi, Uttar Pradesh, India, 23rd December 2024.

3. Imaging the Deep Earth with Neutrinos. Invited plenary talk given at the BCVSPIN Conference 2024, Tribhuvan and Kathmandu University, Kathmandu, Nepal, 12th December 2024.

4. Neutrino Tomography of Earth. Invited plenary talk given at the "Vitalizing Indian Earth Science" meeting, Indian Academy of Sciences, Bengaluru, Karnataka, India, 26th October 2024.

5. Neutrino Tomography of Earth. Invited plenary talk given at the DAE Conclave 2024, NISER, Bhubaneswar, Odisha, India, 25th October 2024.

6. Neutrino Astrophysics to Particle Physics with IceCube. Invited plenary talk given at the XVII International Conference on Interconnections between Particle Physics and Cosmology (PPC 2024), Indian Institute of Technology Hyderabad, Hyderabad, Telangana, India, 15th October 2024.

7. A journey into the interior of Earth with Neutrinos. Seminar given at the Department of Physics, Kurukshetra University, Kurukshetra, Haryana, India, 6th September 2024.

8. Neutrino Astrophysics to Particle Physics with IceCube. Invited plenary talk given at the Workshop on Dark Matter and Astroparticle Physics (WDMAP), Institute of Physics, Bhubaneswar, Odisha, India, 8th August 2024.

9. Beyond the Standard Model Searches in Neutrino Experiments. Invited parallel talk given at the PASCOS 2024 conference, ICISE, Quy Nhon, Vietnam, 10th July 2024.

10. Recent Results from the IceCube Neutrino Observatory. Invited plenary talk given at the PASCOS 2024 conference, ICISE, Quy Nhon, Vietnam, 8th July 2024.

11. Neutrino Sources: From meV to EeV. Invited talk given at the Radio Neutrino & Cosmic Rays Astronomy Workshop, Aligarh Muslim University, Aligarh, Uttar Pradesh, India, 18th April 2024.

12. Exciting Journey into the World of Invisible Neutrinos. Talk given at the IceCube Master Class 2025, Institute of Physics, Bhubaneswar, Odisha, India, 27th March 2025.

13. Science Learning. Invited talk given at the Children's Day Celebration, Institute of Physics, Bhubaneswar, Odisha, India, 14th November 2024.

14. Looking inside the Earth with Neutrinos. Invited talk given during the Hindi Fortnight Celebration at the Institute of Physics, Bhubaneswar, Odisha, India, 28th September 2024.

15. Neutrino Physics with IceCube. One lecture (1 hour) during the School on Experimental Astroparticle Physics (SEAP - 2025), Cosmic Ray Laboratory - TIFR, Ooty, The Nilgiris, Tamil Nadu, India, 12th March 2025.

16. Neutrino Phenomenology. Two lectures (1.5 hours each) during the 8th Vietnam School on Neutrinos, ICISE, Quy Nhon, Binh Dinh, Vietnam, 16th to 17th July 2024.

17. Neutrino Phenomenology. Three lectures (1 hour each) during the neutrino school "Understanding the Universe through Neutrinos", ICTS-TIFR, Bengaluru, Karnataka, India, 29th April to 1st May 2024.

Prof. Saptarshi Mandal

1. Gave three lectures and one colloquium at PRL during visit 9-12, December, 2024. The topic for lectures was Kitaev Model. Title for colloquium was "A leisurely walk through few exotic manifestation of interacting spin systems".
2. Gave a talk at IISc Bangalore during visit 5-6th March, 2025. Title of the talk was "Emergent topological phases in an extended Su-Schrieffer-Heeger model with Rashba spin-orbit interaction, higher order hopping and domain wall"

Prof. Arijit Saha

1. "Topological Superconductivity in Magnet/Superconductor Heterostructures", Workshop on "Frontiers of Theoretical Condensed Matter Physics", Landau Institute for Theoretical Physics, Russia, 10th July (2024).
2. "Higher-order Topological Systems: Floquet Engineering", Conference on "Academic meeting on Consortium for Quantum Materials", SN Bose National Center for Basic Sci-ences, Kolkata, 18th November (2024).
3. "Topological Superconductivity hosting Majorana states in Magnet/ Superconductor Het-erostructures" Workshop on "Quantum Many Body Physics in the age of Quantum Infor-mation, ICTS Bangalore, 29th November (2024).
4. "Distinguishing between topological Majorana and trivial zero modes in altermagnet het-erostructures", Conference "QMAT-2024", IIT Guwahati, 22nd December (2024).

Prof. Satyaprakash Sahoo

1. National Conference on Sensing and Technologies,
2. NCST-2024, Puri, Keynote speaker at International Conference on "Recent Developments in Functional Materials for Sustainable Application-2024" (RDFMSA-2024), GIET University, Gunupur, Odisha,
3. Plenary talk at International Conference on Nanotechnology Research and Innovation" (2024), University of Aveiro, Portugal (ONLINE), 4. KIIT University (9th February 2025, ICETP- 2025).

Prof. Aruna Kumar Nayak

1. Higgs boson measurements at CMS, Invited talk, PHANC2025, Puri, 27 – 30 March 2025.
2. An introduction to machine learning in HEP, Invited lecture, SEAP 2025, 9-13 March 2025, CRL (TIFR), Ooty.

3. Machine learning applications at LHC, Invited talk, ICFHEP2025, IIT Bhilai, 15th Feb 2025.
4. Review of 2024 trigger menu and trigger strategy for 2025, December CMS Week plenary session on Run coordination and Trigger coordination, 12 Dec 2024
5. Lecture on Basic concepts of probability and probability distributions, 13 June 2024, Online preschool, ML4HEP-2024, IOP, Bhubaneswar
6. Lecture on Parameter estimation, 14 June 2024, Online preschool, ML4HEP-2024, IOP, Bhu-baneswar
7. Lecture of maximum likelihood method and least square method, 15 June 2024, Online pre-school, ML4HEP-2024, IOP, Bhubaneswar
8. Basics of machine learning and neural network, UN autonomous college of science and tech-nology, Adaspur, Cuttack, 5th Oct 2024.
9. Applications of machine learning in HEP, UN autonomous college of science and technology, Adaspur, Cuttack, 5th Oct 2024.

Prof. Debasish Chaudhuri

1. "Inertial equilibration in active matter" Physics Seminar at IIT-Bombay, Mumbai, on 20.03.2025.
2. Invited seminar in the conference on "Frontiers in Non-equilibrium Physics – II" at the Institute of Mathematical Sciences (IMSc), Chennai; topic: "Inertial impact on active matter", during 7.01.2025 -10.01.2025.
3. "Persistent motion, equilibrium polymers, and analysis of inertial active systems," Physics Seminar at TU-Berlin, Berlin, Germany on 23.10.2024.
4. "How do activity and inertia influence active Brownian particles? Biological Physics Seminar at MPI-PKS, Dresden, Germany on 18.09.2024.

Prof. Debakanta Samal

1. "Emergent magnetic response in Cu-based quasi 2D hybrid perovskites" Symposium on magnetism and Spintronics (SMS2024), July 18-20, 2024, IIT Bombay
2. "Emergent electronic and magnetic response in an antiferromagnetic proximitized SrIrO3 and Cu based quasi 2D hybrid perovskites " Workshop on Engineered 2D Quantum Materi-als, July 15-26, 2024, ICTS Bangalore.

3. "Atomistic origin of emergent magnetic response in (C7H9NBr)2CuX4 (X = Cl,Br)" Indo-Ger-man Kick-Off Workshop on "Recent Progress in Topological Magnetism, November 5-8,2024, NISER and Puri.

4. "Ligand Tunability of Emergent Non-collinear Magnetism in Cu-based Layered Hybrid Per-ovskites" Conference on Advances in Functional Solids, Nov 09-12, 2024, IIT Kharagpur.

5. "Ligand Tunability of Emergent Non-collinear Magnetism in Cu-based Layered Hybrid Per-ovskites" Asia specific conference on Condensed Matter Physics, Dec 08-11, 2024, IIT Patna.

6. "Designer Quantum Materials and Emergent Phenomena"AICTE Training and Learning (ATAL) Academy Programme on Cryogenic & Vacuum Technology, Dec 16-21, 2024, C V Raman Global University, Bhubaneswar.

7. "Ligand Tunability of Emergent Non-collinear Magnetism in Cu-based Layered Hybrid Per-ovskites" International conference on evolution electronic structure theory and experimental realization (EESTER 2025), January 8-11, 2025, IIT Madras.

8. "Designer Quantum Materials and Emergent Phenomena" International conference on emerg-ing trends in physics (ICETP-2025) along with the 41st Annual Convention of the Orissa Phys-ical Society (OPS), Februarary 8-11, 2025, KIIT Bhubaneswar.

9. "Ligand Tunability of Non-collinear Spin Structure in Cu-based Hybrid Quasi 2D Magnets" International conference on magnetic materials and applications (ICMAGMA 2025), Febru-ary12-14,2025

Prof. Debottam Das

1. Implications of Sgr A* on the gamma rays searches for Bino DM with (g-2) of Muon. Talk delivered at SNU (26th July, 2024) (SNU: Shiv Nadar University)

Prof. Manimala Mitra

1. 'Neutrino Mass Models and Signatures' on January 30th 2025 at Conference on Cosmology, Astrophysics, and Particle Physics, SRM University, January 30thFebruary 2nd, 2025.

2. 'Quest for Heavy Neutral Lepton: Phenomenology and Experimental Searches' on March 7th at IITGN Flavour Physics Week: Exploring Quark and Lepton Frontiers, March 3rd-8th, 2025 at IITGN, Gandhinagar.

3. Online Talk 'Tri-Lepton Signal of HNL in an EFT Framework' on February 25th, 2025 at the workshop (Re)interpretation of the LHC results for new physics, CERN, February 25th-28th, 2025.

4. 'Heavy Neutral Lepton and Collider Signatures' on February 19th, 2025 during Neutrino Plat-form Pheno Week, CERN, February 17th-21st, 2025.

5. 'Journeys in Particle Physics Rohini Godbole Memorial Conference, IISc, Bengaluru, March 13th-15th, 2025'.

6. 'Extended Higgs Sector in Singlet-Triplet Fermionic Model for Dark Matter and Neutrino Mass' at CERN on May 15th, 2024 during the workshop Roadmap of Dark Matter models for Run 3, CERN, May 13th-17th, 2024.

7. Frontiers in Particle Physics 2024, CHEP, IISc, on August 11th, 2024.

Prof. Kirtiman Ghosh

1. Revisiting Universal Extra-Dimension Model with Gravity Mediated Decays, (Re) interpretation of the LHC results for new physics, Feb 25 – 28, 2025, CERN

2. Machine Learning-Based BSM Search Strategies at the LHC, International Conference On Frontiers of High Energy Physics (ICFHEP-2025) IIT Bhilai, Kutelabhata, Durg – 491002

Dr. Mrutunjaya Bhuyan

1. Constraining the isospin properties of neutron star within effective energy density functional, Frontiers in Gamma-ray Spectroscopy" (FIG2025) at Tata Institute of Fundamental Research, Mumbai, India, from 9th - 12th March 2025.

2. Neutron star merger events: A new window into the extreme Universe Guest Seminar of Department of Physics at Shailabala Women's (Auto.) College, Cuttack, Odisha, India on 28th March 2025.

3. Nucleon-Nucleon Interaction Potential: Understanding the Reaction Dynamics, International Conference in Recent Advances in Science and Technology (RAST-2K25), Department of Physics, Indira Gandhi Institute of Technology, Sarang, India on 16th 17th February 2025.

4. Relativistic Nucleon-Nucleon Potential: Understanding the Reaction Dynamics of Nuclear System, Reinforcing the Basics: A Workshop on Faculty Growth, Department of Physics and Material Science, Thapar University (TIET), Patiala, Panjab, India on 16th and 17th December 2024.

5. Gravitational Wave: Next Generation Communication Technology, 47th WCASET "World Conference on Applied Science, Engineering and Technology", "Theme: WCASET Nexus: Where Science, Education and Technology Converge" an international conference organized by Institute for Educational Research and Publication (IFERP), Bangkok, Thailand on 27th and 28th December 2024.

6. Gravitational Wave: A new window for understanding matter wave, Two-day Technical Seminar on Next Generation Communication and Computing towards Industry 5.0, Indira Gandhi Institute of technology, Sarang, India on 5th - 6th November 2024.

7. Nuclear Fusion Dynamics: Relativistic Energy Density Functional, International Conference on Nuclear Physics and Application (ICNPA-2024), University of Delhi, North Campus, New Delhi India on 21st -24th October 2024.

Dr. Pinaki Banerjee

"Regge Limit of One-Loop String Amplitudes" invited seminar in National Strings Meeting at IIT Ropar on Dec 13, 2025.

Dr. Sachin Sarangi

1. Invited talk at Conference on Materials for Energy, Environment and Healthcare (MEEHCON '24), the title of the talk was "Hybrid Organic-Inorganic Functional Materials: A New Strategy of Material Design" at NIT, Calicut during December 20th and 21st, 2024.

2. Presented talk at National conférence on Sensing and Technologies (NCST-2024). The title of the talk was "Non-Enzymatic Optical Glucose Biosensor: A Possible Approach for Accurate Glucose Estimation". Organized by Institute of Physics, Bhubaneswar at Toshali Sands Puri, during November 27-29, 2024.

1.8. Conferences/Workshops/Schools & Outreach Events organized:

Prof. K. K. Nanda

1. National Conference on Sensing and Technologies, NCST-2024, Puri, (RDFMSA-2024)

Prof. T. Som

1. Chair, National Conference on Frontiers on Ion Beam Sciences (FIBS-2024) at IoP, during November 4-7, 2024.

2. Co-Convener, IoP Golden Jubilee Young Women Scientists' Meet (IGJYWSM-2024) at IoP, during November 14-15, 2024.

3. Co-Chair, 1st International Conference on Sustainable Technologies (ICST-2024) at NIT Durgapur during December 12-14, 2024.

Prof. Sanjib Kumar Agarwalla

1. Organizer of a science outreach event called "IceCube MasterClass at IOP: Be a Scientist for a Day" on 27th February 2025. During this masterclass, students learned about the fascinating properties of neutrinos and the IceCube neutrino observatory located at the South Pole. They gained insights into the cutting-edge scientific research of the IceCube neutrino project through expert-led discussions, hands-on activities, and data analysis.
   https://www.iopb.res.in/awards files/Ice Cube Master Class.pdf

2. One of the co-chairs of the Neutrino Physics conference to be held at the ICISE centre in Quy Nhon, Vietnam, from 21st to 25th July 2025.
   https://www.icisequynhon.com/conference-calendar/

3. One of the conveners of Working Group – 1 (Neutrino Oscillation Physics) of the NuFact 2024 International Workshop, which was held at the Argonne National Laboratory (ANL), Illinois, USA, from 16th to 21st September 2024.
   https://indico.fnal.gov/event/63406/

Prof. Saptarshi Mandal

1. Topical School of Advanced Condensed Matter Physics (May 20-31, 2024)

2. Conference on Emerging trends in Quantum Condensed Matter (Aug 21-23, 2024)

Prof. Arijit Saha

1. Convenor of the conference "Emerging Trends in Quantum Condensed Matter Physics (EQCMP 2024)" held at IoP, Bhubaneswar from 21st – 23rd August (2024).

Prof. Aruna Kumar Nayak

1. Machine Learning for Particle and Astroparticle Physics (ML4HEP-2024), 10 – 22 June 2024 (Online Pre-school) and 1 – 14 July 2024 (Main School), Institute of Physics, Bhu-baneswar.

Prof. Debottam Das

1. Machine Learning for Particle and Astroparticle Physics (ML4HEP) – 2024, Jul 01 – 13, 2024

2. Workshop on Dark Matter and Astroparticle physics, Aug 07 – 09, 2024

Prof. Manimala Mitra

1. Workshop on Dark Matter and Astroparticle Physics (WDMAP@IoP), August 7th-9th, 2024
2. IOP Golden Jubilee Young Women Scientists' Meet (IGJYWSM-2024), November 13th-14th, 2024

Dr. Mrutunjaya Bhuyan

1. One Day Seminar on "New Frontiers in Extreme Nuclear Matter: Understanding the interaction of Nuclear and Particle Physics", Institute of Physics, Bhubaneswar, 14th February 2025. Role in the Event: Convener
2. National Science Day (NSD-2025) based on the theme "Science and Technology for a Sustainable Growth", Institute of Physics, Bhubaneswar, 28th February 2025. Role in the Event: Organizing Committee Member
3. IOP Open Day on the occasion of 40 years of Institute of Physics association with the Department of Atomic Energy, Institute of Physics, Bhubaneswar, 25th March 2025.Role in the Event: Organizing Committee Member

1.9 Externally funded Projects (India + Foreign sponsorships):

Prof. P.K.Sahu

1. BI/IFCC, DST project for CBM at FAIR, GSI, Germany.
   Total Cost of project : Rs. 25,00,000/-
2. GRID computing, DST project for ALICE and STAR project.
   Total cost of project : Rs. 30,00,000/-

Prof. Dinesh Topwal

1. CRS project: Enhanced Rashba spin-orbit splitting in nonmagnetic surface alloys: Un-derstanding its origin
2. INDIA@DESY cooperation project "Magnetic field induced structural phase transition in A-site ordered NdBaMn2O6 Manganite" for performing experiments at Petra-III Syn-chrotron centre, DESY, Hamburg, GERMANY
3. Indo-Italian POC project "Evolution of structural order in Heusler alloys" for perform-ing experiments at Elettra Synchrotron centre, Trieste, ITALY

Prof. Sanjib Kumar Agarwalla

1. Project details: DST-SERB SwarnaJayanti Project (SB/SJF/2020-21/21)
   Project Title: Landscape of Beyond the Standard Model Physics at Neutrino Experiments
   Total cost of Project: Rs. 1,00,27,040/-

Prof. Satyaprakash Sahoo

1. Project details: SERB Core Research Grant (CRG)
   Project Title: Research project entitled 2D materials based CMOS compatible crossbar array for neuromorphic computing applications
   Total cost of Project: Rs. 57,50,697/-

Prof. Manimala Mitra

1. Indo-French bilateral CEFIPRA Grant (completed in 2024 July)
   Total cost of Project: Rs. 38,36,000/-

Prof. Kirtiman Ghosh

1. Project details: Principal Investigator (2023–2026)
   SERB-sponsored MATRICS research project: Project No.: MTR/2022/000989
   Project Title: "Exploring Next-to-Minimal Realizations of Universal Extra-Dimension Scenarios"
   Total Project Cost: INR 6,00,000.00

2. Project details: Co-Principal Investigator (2024–2027)
   SERB-sponsored CORE research project: Project No.: CRG/2023/008570
   Project Title: "Systemic probes of hitherto unexplored supersymmetric parameter space"
   Total Project Cost: INR 26,00,000.00

Dr. Mrutunjaya Bhuyan

1. Project details: Anusandhan National Research Foundation (ANRF), File No. RJF/2022/000140 Role: Principal Investigator, Executed Institution: Institute of Physics
   Period: 60 Months
   Total Project Cost: 1,19,00,000 INR
   Period: 60 Months

2. Project details: Fundamental Research Grant Scheme (FRGS), File No. FRGS/1/2020/STG07/UM/01/2 Role: Co-Principal Investigator Executed Institution: Universiti Malaya, Malaysia

Period: 36 Months
Total Project Cost: 66,25,000 INR

3. Project details: Science Engineering Research Board (SERB), Files No. CRG/2021/001229
Role: Co-Principal Investigator, Executed Institution: Thapar University, India
Period: 36 Months
Total Project Cost: 42,22,000 INR

1.10. Visits to & Collaboration with other Institutes

Prof. T. Som

1. Dr. Alain Claverie: CEMES-CNRS, Toulouse, France; Dr. Alexis Franquet: IMEC, Belgium; Prof. Hans Hofsäss, Göttingen University, Germany; Dr. Tanmoy Basu: CQuERE, TCG-CREST, Kolkata; Prof. Sanjeev K. Srivastava: IIT Kharagpur; Prof. Anirban Mitra: IIT Roorkee; Dr. Arup Samanta: IIT Roorkee; Dr. Anirban Pal, Benaras Hindu University, Varanasi; Dr. Mukesh Ranjan: IPR, Gandhinagar; Dr. Safiul Alam Mollick: Rabindra Mahabidyalaya, Hooghly, West Bengal

2. Visiting Students: Mr. Alok Ranjan Dash, IISER Berhampore did his Integrated M.Sc. project for one year (from April 1, 2024 – March 31, 2025).

Prof. P.K.Sahu

1. Visited to CERN for ALICE experiments on 10th -26th May 2024.

2. Visiting Students: Summer Student: 1) (May 2024) Baishali Pradhan
    1. Post-Doctoral Student 1) (June 30th 2024) Sagarika Swain
    2. Post-Doctoral Student 2) (October 2024) Deepak Kumar

Prof. Dinesh Topwal

1. NISER, Bhubaneswar, Odisha
2. Indian Institute of Technology Bhubaneswar.
3. Indian Institute of Technology Kharagpur.
4. Indian Institute of Technology Roorkee.
5. Indian Institute of Technology Patna
6. Indian Institute of Science Education and Research, Mohali.
7. Indian Institute of Science Education and Research, Berhampur
8. DESY Photon Science, Deutsches Elektronen-Synchrotron, 22603 Hamburg, Germany
9. CSIR -Institute of Minerals and Materials Technology, Bhubaneswar
10. Institute of Chemical Technology-IOC, Bhubaneswar

Prof. S.K.Agarwalla

1. Academic connection with ICISE, Quy Nhon, Vietnam: We have made significant contributions to promoting the academic activities of the International Centre for Interdisciplinary Science and Education (ICISE) in Quy Nhon, Vietnam. We regularly deliver lectures at the Vietnam School on Neutrinos held at the ICISE and actively participate in the annual neutrino physics conference there.
2. Active participation in the IceCube neutrino project: We are working on the IceCube neutrino experiment located at the South Pole. Currently, four PhD students are working with me in analyzing 10 years of IceCube atmospheric neutrino data.

3. Visiting Students:

1. Mr. Anuj Kumar Upadhyay, DST/INSPIRE Ph.D. Fellow started in August 2021.
2. Mr. Krishnamoorthi Jayakumar, currently Senior Research Fellow under the DST-SERB SwarnaJayanti Project, started as a Junior Research Fellow in April 2022.
3. Mr. Gopal Garg, DST/INSPIRE Ph.D. Fellow started in April 2023.

Prof. Saptarshi Mandal

1. Started collaboration with Prof. Navinder Singh at PRL

2. Visiting Students:
Mentored four summer student from Utkal University

Prof. Arijit Saha

1. National Institute of Science Education and Research (NISER), Bhubaneswar, India.
2. Physical Research Laboratory (PRL), Ahmedabad, India.
3. Birla Institute of Science & Technology (BITS), Hyderabad Campus, India.
4. Indian Institute of Technology (IIT), Kanpur, India.

Prof. Satyaprakash Sahoo

1. IIT Madras, IIT BHU, IIT KGP, NISER, KIIT Bhubaneswar

Prof. Aruna Kumar Nayak

1. Visit to CERN for 3 weeks in September 2024 for CMS collaboration related tasks.

2. Visit to CERN for 2 weeks in December 2024 for organizing a one day meeting on "deep-dive on trigger strategies for 2025" in CMS collaboration and presented a talk on trigger strategy at the plenary session of the December CMS week.

3. Visit to CRL (TIFR), Ooty for 10 days in March 2025 for GRAPES-3 collaboration meeting and being a lecturer in a school.

4. Visiting Students

1. Summer students in 2024: Ms. Prakarti Bharti, Ms. Keerthana Ramesh (through SRFP of In-dian Academy of Sciences)

Prof. Debasish Chaudhuri

1. Visit to Department of Physical Sciences, IISER-Mohali from 14th -18th April, 2025.

2. Visit to Physics Department of IIT-Bombay, Mumbai. From 19th-21st March 2025.

3. Visited the Max-Planck Institute for the Physics Complex systems (MPIPKS), Dresden Germany from 2nd September to 31st October 2024.

4. Visit to the physics Department of TU-Berlin, Germany from 22nd-24th October 2024.

5. Visiting Students: S S Khuntia of IISER Mohali, visited from February-April, 2025.

Prof. Debakanta Samal

1. There is collaboration with various institutions namely NISER Bhubaneswar, IIT Bhubaneswar, IISER Berhempur, NIT Rourekela. IIT Kharagpur, IISc Bangalore, IIT Indore, IIT Kanpur, IISER Thiruvananthapuram, SRM Institute of Science and Technology, Tamil Nadu, ICT-IOC Bhubaneswar and PSI, Switzerland.

Prof. Debottam Das

1. Collaboration with outside Institutions: SNU (Delhi), IACS (Kolkata), WBWU (WB), IMSC (Chennai)

2. Visiting Students: Haraprasad Moharana from Utkal University have done their semester dissertation (Field-Coupling Induced Lorentz Violation in 1D Potentials)

Prof. Manimala Mitra

1. Visit to LAPTh, Annecy as part of Indo-French CEFIPRA collaborative visit- May, 2024 and February, 2025
2. Visiting Students: Postdoctoral mentorship: Dr. Dibyendu Nanda, Dr. Ishaque Khan, Dr. Arvind Bhaskar, Dr. Antara Dey

Dr. Mrutunjaya Bhuyan

1. Thapar University, Patiala, Panjab, India
   Host Person: Dr. Raj Kumar (Associate Professor)
2. Institute Tecnologico de Aeroneutica (ITA), Sao Jose dos Campos, Sao Paulo, Brazil
   Host Person: Prof. Brett Vern Carlson (Professor)
3. Department of Physics, Universiti Malaya, Kuala Lumpur, Malaysia
   Host Person: Prof. Ramesh T. Subramania (Professor)
4. University of Hafr Al–Batin College of Science, Hafer Al-Batin, Saudi Arabia
   Host Person: Dr. Nujud Badawi (Assistant Professor)
5. HUN-REN Institute for Nuclear Research (ATOMKI), Debrecen, Hungary
   Host Person: Prof. Peter Mohr (Professor)
6. Department of Physics, University of Surrey, United Kingdom
   Host Person: Prof. P. D. Stevenson (Professor)

6. Visiting Students:

1. Praveen Kumar Yadav, Doctoral Scholar (01-08-2024 – 15-08-2024), Thapar University (TIET), Patiala, Panjab, India
2. Jeet Amreet Patnaik, Doctoral Scholar (01-08-2024 – 31-10-2024), SOA University (ITER), Bhubaneswar, Odisha, India
3. Santosh Kumar, Doctoral Scholar (12-02-2025 – 18-02-2025), Patliputra University, Patna, Bihar, India
4. Jeet Amreet Patnaik, Doctoral Scholar (01-03-2025 – 31-03-2025) SOA University (ITER), Bhubaneswar, Odisha, India

Dr. Pinaki Banerjee

1. Visited ICTS-TIFR Bangalore to attend a workshop on “Positive Geometry in Scattering Amplitudes and Cosmological Correlators” during Feb 12-19, 2025

2. Visited Institute for Advanced Study at Princeton, New Jersey, USA to collaborate with Prof. Nima Arkani-Hamed's group during Jan 29 - Feb 08, 2025.

3. Visited Perimeter Institute at Waterloo, Ontario, Canada to collaborate with Prof. Pedro Vieira's group during Jan 08 - Jan 29, 2025.

4. Visited Department of Physics at IIT Gandhinagar during Dec 29- Jan 03.

5. Visited SN Bose Institute during Oct 24-31, 2024 to collaborate with Prof. Parijat Dey and give a set of lectures.

6. Visited Chennai Mathematical Institute to collaborate with Prof. Alok Laddha during Sep 21- Oct 02, 2024.

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CHAPTER 02

RESEARCH

राष्ट्र की सेवा में परमाणु
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2.1. Theoretical High Energy Physics

(S. Mukherji, S. K. Agarwalla, D. Das, M. Mitra and K. Ghosh)

Research Contribution by Prof. Sudipta Mukherji and his Group

AdS/CFT and strongly coupled gauge theory: The Entropy of a field theory at a finite temperature and at strong coupling, having AdS dual, is expected to satisfy Cardy-Verlinde formula. Using a phenomenologically constructed matrix model expected to describe this field theory, we explicitly check the entropy formula.

Examining properties of massive and massless particles around black holes in massive gravity, we unearth a novel Ashenbach effect.

Research Contribution by Prof. S. K. Agarwalla and his Group

Improved precision on 2-3 oscillation parameters using the synergy between DUNE and T2HK:

We have thoroughly investigated the potential complementarities and synergies between the two next-generation long-baseline experiments: DUNE in the United States and T2HK (Tokai-to-Hyper-Kamiokande) in Japan. Our focus has been on how the combination of these two experiments can enhance sensitivities in determining the deviation from maximal mixing of θ_{23} , excluding the wrong-octant solution of θ_{23}, and obtaining high precision on 2-3 oscillation parameters (see JHEP 10 (2024) 243), suppressing various parameter degeneracies in three-flavor framework.

Constraining non-unitary neutrino mixing using matter effects in atmospheric neutrinos at INO-ICAL:

Remarkable precision on neutrino mixing parameters over the last decade or so has opened the prospects for testing the possible non-unitarity of the standard three-neutrino mixing matrix. Because of this non-unitary neutrino mixing (NUNM), the oscillation probabilities among the three active neutrinos would be altered as compared to the probabilities obtained assuming a unitary three-neutrino mixing matrix. In such a NUNM scenario, neutrinos can experience an additional matter effect due to the neutral current interactions with the ambient neutrons. Atmospheric neutrinos, having access to a wide range of energies and baselines, can experience significant modifications in Earth's matter effect due to NUNM. We studied in detail how the NUNM parameter α_{32} affects the muon neutrino and antineutrino survival probabilities in a different way. Then, we place a comparable and complementary constraint on α_{32} in a model-independent fashion using the proposed 50 kt magnetized Iron Calorimeter (ICAL) detector under the India-based

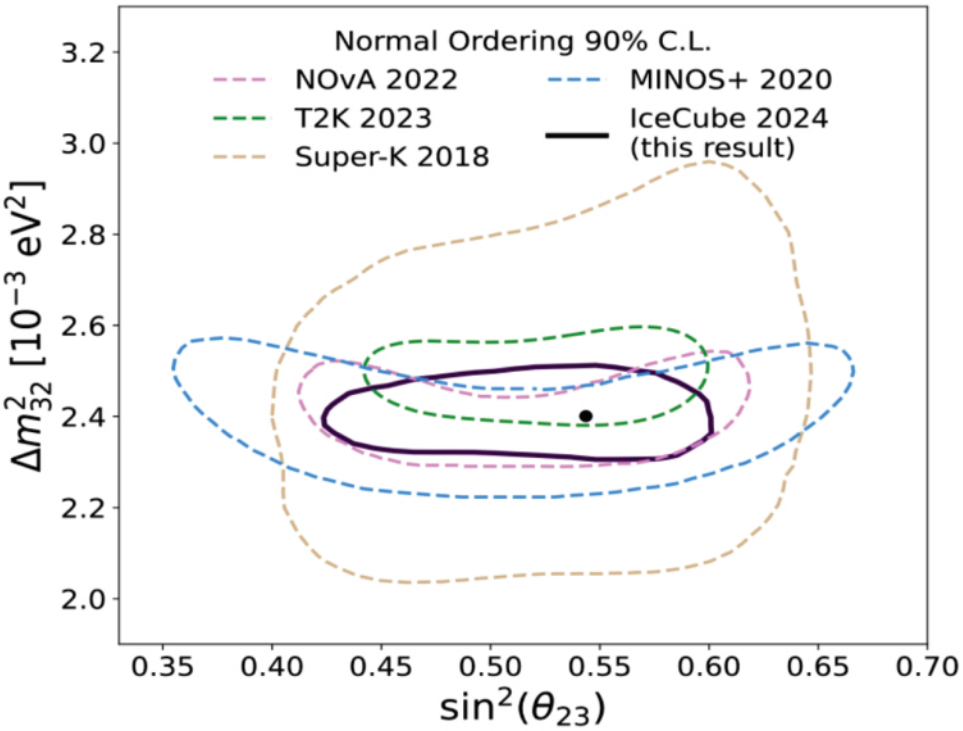
Neutrino Observatory (INO) project, which can efficiently detect the atmospheric muon-neutrino and muon-antineutrino separately in the multi-GeV energy range.

A plethora of long-range neutrino interactions probed by DUNE and T2HK:

Upcoming neutrino experiments will soon search for new neutrino interactions more thoroughly than ever before, boosting the prospects of extending the Standard Model. In anticipation of this, we have forecast the capability of two of the leading long-baseline neutrino oscillation experiments, DUNE and T2HK, to look for new flavor-dependent neutrino interactions with electrons, protons, and neutrons that could affect the transitions between different flavors. We have interpreted their sensitivity in the context of long-range neutrino interactions, mediated by a new neutral boson lighter than 10.10 eV, and sourced by the vast amount of nearby and distant matter in the Earth, Moon, Sun, Milky Way, and beyond. For the first time, we have explored the sensitivity of DUNE and T2HK to a wide variety of U(1)′ symmetries, built from combinations of lepton and baryon numbers, each of which induces new interactions that affect oscillations differently. We have found ample sensitivity: in all cases, DUNE and T2HK may constrain the existence of the new interaction even if it is supremely feeble, may discover it, and, in some cases, may identify the symmetry responsible for it.

Measurement of atmospheric neutrino oscillation parameters using convolutional neural networks with 9.3 years of data in IceCube DeepCore:

The DeepCore sub-detector of the IceCube Neutrino Observatory provides access to neutrinos with energies above approximately 5 GeV. We have utilized the data taken between 2012-2021 (3,387 days) for an atmospheric muon-neutrino disappearance analysis that studied 150,257 neutrino-candidate events with reconstructed energies between 5 to 100 GeV. An advanced reconstruction based on a convolutional neural network is applied, providing increased signal efficiency and background suppression, resulting in a measurement with both significantly increased statistics compared to previous DeepCore oscillation results and high neutrino purity (see Phys. Rev. Lett. 134 (2025) 9, 091801).



Contours showing Feldman-Cousins 90% C.L. assuming neutrino normal mass ordering of this analysis (black, 'eIceCube 2024') compared to those from NOvA, T2K, Super-Kamiokande, and MINOS+. The best-fit physics parameters are indicated with a black circle. This figure is taken from Phys.Rev.Lett. 134 (2025) 9, 091801.

Research Contribution by Prof. Debottam Das and his Group

In this (JCAP 01 (2025) 121), Prof. Das & Group we analyse the impact of dark matter density spike around the Milky Way's supermassive black hole (SMBH), in probing the Bino-dominated neutralino dark matter (DM) within the MSSM, which typically produces relatively faint signals in the conventional DM halos. Typical over-abundance of Bino DM is ameliorated with slepton and/or Wino coannihilations. The lightest neutralino, thus may be associated with a compressed supersymmetric particle spectrum, which,in general, is difficult to probe at conventional LHC searches. Similarly, for a rather tiny Hig-gsino mixing, does not offer much prospect to assess its predictions at dark matter direct detection searches. Accommodating the inclusive effects of density spike, here, we present the requisite boost factor to facilitate gamma ray searches of Bino-dominated DM in the MSSM, especially focusing on the Fermi-LAT and HESS observations.

In this (Phys.Rev.D 111 (2025) 5, 055021), A Wino-like neutralino dark matter (DM) has been considered can naturally accommodate new physics at a relatively higher scale, beyond the reach of the LHC. The constraint on the DM relic density typically implies a lightest neutralino mass two TeV. The theoretical calculations can be

improved when we compute all the one-loop electroweak (EW) corrections to the three-point ver-tices for the neutralino (Wino)-Higgs interactions, which in turn boosts the DM-nucleon scattering cross-sections through the SM-like Higgs exchange. Importantly, we include the counterterm contributions. In addition, we incorporate the other next-to-leading order (NLO) EW DM-quark, and DM-gluon interactions present in the literature to calculate the DM-nucleon cross-sections. With the improved and precise theoretical estimates, DM-nucleon scattering cross-sections may increase or decrease significantly by more than 100% compared to leading order (LO) cross-sections in different parts of the parameter space.

In this (Phys.Rev.D 111 (2025) 8, 083003), in this work, we focus on dominantly Higgsino-like and Wino-like DM. In particular, we explore large one-loop corrections to the DM-DM-Z vertex, which can significantly affect the estimation of the spin-dependent DM-nucleon scattering cross-section in the regions where such DM candidates are viable. We have used the on-shell renormalization scheme to estimate the relevant counterterm contributions. In the parameter region where DM is dominantly Higgsino-like, the radiative corrections (including the contributions from the respective counterterms) are substantial and can enhance the DM-DM-Z vertex by up to 120%. Further, for an almost pure Wino-like DM, the increment in the DM-DM-Z vertex is up to 15%. The corresponding cross-sections with the proton and the neutron can be changed by up to about 50%.

Research Contribution by Prof. Manimala Mitra and her Group

Dr. Manimala Mitra's recent research has made significant contributions to neutrino physics, dark matter, and collider phenomenology, with a strong emphasis on testable predictions at current and future experiments. In Phys. Rev. D 111 (2025) 1015005, arXiv:2408.08565, she and collaborators explore trilepton plus missing energy signals as probes of right-handed neutrinos at the HighLuminosity LHC, using an effective field theory approach to cover both sub- and super-W mass regimes. Her work on scalar leptoquarks in arXiv:2409.15992 demonstrates how single and pair production modes at a muon collider can extend the discovery reach to multi-TeV scales, particularly in top-muon final states. She also co-authored a comprehensive study of the Georgi-Machacek model with an added scalar singlet JHEP 10 (2024) 058, arXiv:2405.18332, analyzing scalar decoupling behavior and dark matter viability while satisfying electroweak and relic density constraints.

Research Contribution by Prof. Kirtiman Ghosh and his Group

In the past year, my research has focused on probing various beyond the Standard Model (BSM) scenarios through collider phenomenology, dark matter model

building, and the application of advanced analysis techniques tailored for the Large Hadron Collider (LHC). These efforts have been part of collaborative projects with researchers from multiple institutions.

In "Probing sub-TeV Higgsinos aided by a machine-learning-based top tagger in the context of trilinear R-parity violating SUSY" (with Rajneil Baruah, Arghya Choudhury, Kirtiman Ghosh, Subhadeep Mondal, and Rameswar Sahu), we studied Higgsino pair production in a trilinear R-parity violating supersymmetric scenario. This mass region (400.1000 GeV) is challenging due to low production cross-sections and near-degenerate states. By implementing a machine-learning-based top tagger for boosted top jets and using a boosted decision tree classifier, we designed a collider analysis that identifies two signal regions. Our results show that Higgsino masses up to 925 GeV can be probed at the HL-LHC.

In "Revisiting universal extra-dimension model with gravity mediated decays" (with Kirtiman Ghosh, Katri Huitu, and Rameswar Sahu), we examined the fat-brane realization of the Minimal Universal Extra Dimension (mUED) model, where Standard Model fields are confined to a small extra dimension, while gravity propagates in additional large ones. This setup leads to gravity-mediated decays of Kaluza-Klein particles, producing final states with hard photons, jets, and missing energy due to invisible gravitons. We recast recent ATLAS mono-photon, di-photon, and multijet results, and improved detection strategies by incorporating machine-learning techniques for boosted boson tagging. This led to stronger constraints and enhanced discovery prospects for such models.

The third study, "Revisiting the LHC constraints on gauge-mediated supersymmetry breaking scenarios" (with Kirtiman Ghosh, Katri Huitu, and Rameswar Sahu), involved reinterpreting ATLAS monophoton search results in the context of General Gauge Mediation (GGM). This analysis highlighted critical assumptions regarding decay widths of SUSY particles into gravitinos that significantly impact the derived limits. Our work offered a more complete and realistic treatment of GGM scenarios and presented revised constraints on the gluino.next-to-lightest SUSY particle (NLSP) mass plane.

In the area of dark matter, Prof. Ghosh contributed to "Singlet-doublet fermionic dark matter in gauge theory of baryons" (with Taramati, Rameswar Sahu, Utkarsh Patel, Kirtiman Ghosh, and Sudhanwa Patra), which proposes a minimal U(1)_B extension of the Standard Model by gauging baryon number. Anomaly cancellation is achieved by introducing exotic fermions, and the spontaneous breaking of U(1)_B leaves

behind a stabilizing Z. symmetry. He proposes a two-component dark matter scenario with singlet-doublet mixing. The model avoids direct detection constraints and provides a viable parameter space testable via collider, astrophysical, and gravitational wave experiments.

In "Multipartite dark matter in a gauge theory of leptons" (with Utkarsh Patel, Avnish, Sudhanwa Patra, and Kirtiman Ghosh), he extends the SM by gauging lepton number via a U(1) symmetry, leading to a model with both Dirac and Majorana dark matter candidates. Anomaly cancellation and symmetry breaking yield a Z. symmetry ensuring the stability of dark matter. He explored the parameter space consistent with relic density and direct detection constraints. Additionally, we investigated indirect detection prospects through gamma-ray line signatures from Majorana dark matter using experiments like FermiLAT and CTA.

Collectively, these studies contribute to the exploration of supersymmetric, extra-dimensional, and dark matter scenarios at colliders, advancing our understanding of viable BSM physics. They also demonstrate the utility of machine-learning techniques in enhancing collider analyses and improving the sensitivity of searches for new physics.

2.2. Theoretical Nuclear Physics

(P. K. Sahu & S. K. Patra)

Research Contribution by Prof. P.K. Sahu and his Group

The higher-order cumulants and their ratios for baryon number, electric charge, and strangeness are essential observables for studying the quark-hadron phase transition, the freeze-out curve, and possibly locating the critical end point (CEP). These quantities are directly related to the theoretically calculated conserved number susceptibilities. In the present work, we calculate the conserved number susceptibilities in the ideal hadron resonance gas (HRG) and interacting hadron resonance gas (iHRG) model. This interacting HRG model takes into account the presence of both attractive and repulsive interactions between the hadrons. The iHRG model introduces meson exchange interaction, formulated within the framework of relativistic mean-field (RMF) theory, in the hadron resonance gas model. We report the susceptibility ratios associated with net-baryon number, net-charge and net-strangeness as a function of temperature (T), chemical potential (μB), center of mass energies ($\sqrt{snn}$), and pT acceptance. A comparison is done between both models, and the effects of interaction on the susceptibility ratios are discussed.

We constrain the nuclear matter equation of state within the relativistic mean field model by including the isoscalar-vector and isovector-vector coupling term at a fundamental level using the Bayesian analysis. We used the nuclear saturation properties and recent astrophysical observations to constrain the dense matter equation of state. We obtained about 20000 sets of equations of states out of a sample of about 60 million sets of equations of states. All 20000 equations of state satisfy nuclear matter saturation properties at saturation densities and produce high mass neutron stars. It is found that the non-zero value of isoscalar-vector and isovector-vector coupling parameter and the negative value of the sigma meson self-coupling stiffen the equation of state. Our sets of equations of state produce neutron stars of mass larger than 2.5 $M_{\odot}$ to include the recent gravitational waves observation GW190419. We also study the Fermionic dark matter inside the neutron star, which couples to nucleons through the Higgs field via an effective Yukawa coupling. The neutron star matter consists of leptons, nucleons, and hyperons in the relativistic chiral sigma model. If the dark matter composition is increased, then the neutron star gets more compact, and hence the size and mass are reduced significantly.

The charge fluctuations have already been analysed by STAR, ALICE and CMS experiment using a robust variable known as dynamical charge fluctuations. We have proposed the higher orders of this variable for the first time using SMASH model. The higher-order fluctuations measure provides the information about the strength of higher-order correlations, which is subject to change with particle multiplicity in an ensemble. After analysing at the higher energies (200 and 62.4 GeV), the observable was analysed for lower energies (19.6, 14.5, 11.5, 9.2, and 7.7 GeV) to complete all the energies in STAR BES program. The results from all eight energies for the second, third, and fourth orders of charge fluctuations were completed. The statistical error was calculated using the Bootstrap Method using seventy samples. The values were within the marker size. The results showed the behavior of this observable at different centralities and energies. It was observed that the higher orders (third and fourth) contain higher orders of cross-correlation terms, hence they can amplify the signal in heavy ion collisions. It was also observed that, unlike the second order, the higher orders were more sensitive to detector effects.

For spherically symmetric nucleus, Wood-Saxon potential proves to be highly suitable in giving nucleons distribution within a nucleus. Incorporating shape modification in Wood-Saxon, earlier attempts were made to explain observables in the deformed nucleus collisions, such as Uranium(U). In this investigation, we checked the feasibility of an alternate approach, the Nilsson potential or Modified Harmonic

Oscillator, using one of the heavy-ion simulation models. Our study shows that the results from Nilsson potential are comparable with those of Modified WoodSaxon, within the current model formalism.

2.3. Experimental High Energy Physics (P. K. Sahu and A. K. Nayak)

Research Contribution by Prof. Aruna K. Nayak and his Group

Summary of Research Work Related to CMS experiment at LHC and GRAPES experiment at CRL, Ooty.

Physics analyses using pp collision data recorded by the CMS experiment at CERN-LHC

Prof. Nayak and his group, leading an analysis for the search of a charged Higgs boson decaying to a charm and a strange quark, where the charged Higgs originates from the decay of a top quark, using all the data recorded by the CMS experiment during LHC Run-2. The analysis sensitivity is improved using kinematic fit and machine learning methods. The ML model utilizes kinematic distributions, distributions of the b and c-tagging discriminators, as well as angular correlations of the decay products of the charged Higgs and the top quark to provide better discrimination of signal against background. Now it is being reviewed within the CMS collaboration and is expected to be submitted soon for journal publication.

He is also working on an analysis for the search of a lepto-quark decaying to a top quark and a tau lepton at CMS. The signal consists of a pair of leptoquarks, which then decay to two top quarks and two tau leptons. The final state considered in this analysis is two fully hadronic decaying top quarks leading to 6 jets of which at least two are b-tagged and two hadronic decaying tau leptons.

Phenomenological studies :

The group & Prof. Nayak is studying, using Monte-Carlo simulated data, machine learning techniques to reconstruct the invariant mass of the charged Higgs boson decaying to tau lepton and neutrino, where the charged Higgs boson is produced in association with a top quark. The final state is very complex with many jets; therefore, our studies will help improve the analysis strategies for the search of this particle at LHC to a great extent. This is an extension of our previous study for heavy gauge bosons (Z' and W'), where these heavy particles decay to final states with tau leptons.

Contributions to the development of high-level trigger and detector upgrade in the CMS experiment

The group of Prof. Nayak involved in the development of CMS high-level trigger (HLT) system for LHC Run-3, which started in 2022. We have led the STEAM group under Trigger Coordination for the last four years till August 2024. We have been consistently performing trigger rate studies for the last several years using high instantaneous luminosity data in order to validate menus and prepare trigger pre-scales for the trigger menus being developed and deployed for data taking. We have contributed to three CMS publications related to the performance of the CMS trigger system during Run-2 & Run-3. Prof. Nayak is contributing in the preparation of trigger strategies for CMS Run-3 operations as well as reviewing the performances as the Trigger Officer (an L2 position within physics coordination of CMS) since Sep 2024. We also contributed to the operation of the CMS detector during data taking.

The group of Prof. Nayak participating in the upgrade of the CMS silicon-strip tracker detector, in particular in the functional test of silicon-strip tracker detector modules, We are also assembling a multi-module functional test system using a microTCA crate and FC7-card based readout system, along with CAEN integrated HV/LV power supply to test multiple modules together during the ladder integration.

Physics Studies using GRAPES-3 Experimental Data

The group of Prof. Nayak joined the GRAPES-3 experimental collaboration, led by TIFR, Mumbai. We are studying machine learning techniques to estimate the mass composition of the primary cosmic rays using extensive air shower data recorded by the GRAPES-3 experiment. The aim is to estimate the composition of protons as well as other heavier elements in the cosmic rays and measure their energy spectrum. The studies so-far have shown promising results and have been presented in a few conferences.

2.4 Experimental Condensed Matter Physics

(K. K. Nanda, T. Som, B. R. Sekhar, D. Topwal, S. Sahoo and D. Samal)

Research Contribution by Prof. T. Som and his Group

Surfing the growth parameters in the quest for low-power, forming-free, and highly stable TiO_2 memristors for nanoscale electronics

Understanding the resistive switching (RS) behaviour of oxide-based memory devices at the nanoscale is crucial for the advancement of high-integration density in-memory computing platforms. This study explores a comprehensive growth

parameter space to address the RS behaviour of pulsed-laser-deposited substoichiometric TiO_2 thin films in search of tailored nanoscale memristors with low-power consumption and high stability. Conductive atomic force microscopy-based measurements facilitate deciphering the switching behaviour at the nanoscale, providing a direct avenue to understand the microstructure.property relationships. The present investigation reveals that rutile TiO_2 in an optimal stoichiometric configuration exhibits superior RS attributes, enabling forming-free, low-power, and highly stable memory functionalities at the nanoscale. In contrast, the expected formation of the Magneli phase within highly defective as-grown TiO_2 films hinders the occurrence of switching. Detailed analyses yield a comprehensive parametric phase diagram, providing valuable insights to predict the optimal growth parameters for fabricating on-demand TiOx-based switching devices.

Enhanced bio-synaptic plasticity behaviour through controlled defect migration in nanocolumnar WO3 memristors

In this work, we have studied a simple yet effective approach to attain superior bio-synaptic functionalities in tungsten trioxide (WO_3)-based memristors at the nanoscale by restricting the oxygen vacancy (V_O) migration through compact nano-columnar structures developed using the glancing angle deposition method. The nanostructured-WO_{3-x} memristors exhibit improved and reliable synaptic plasticity behaviour in comparison to their thin film-based counterparts when exposed to different pulse stimulations. Further, the nanostructured devices demonstrate "gexperience-dependent plasticity", where the synaptic plasticity is significantly influenced by the frequency of preceding pulses. In contrast, uncontrolled filament growth/destruction leads to a poor synaptic display in thin film-based WO_3 memristors.

A strategy for one-step optimization of metal oxide passivating contacts for Si heterojunction solar cells: The Role of growth angle

The present work demonstrates that oblique angle sputter-deposition of metal oxides, even at room temperature, can effectively modify both their bulk stoichiometry and the electronic properties at the Si hetero-interface. Especially, glancing angle deposition (80^0) facilitates the formation of stoichiometric interfacial SiO_2 along with a near-stoichiometric V_2O_{5-x} film, resulting in a high work function compared to on-axis deposition. Meanwhile, intermediate growth angle (40^0) yields stoichiometric interfacial SiO_2 along with a mixed-phase V_2O_{5-x} film, providing opportunities for enhanced charge transport. Moreover, the degree and occurrence of the interfacial

intermixing zone, resulting in the formation of a mixed-phase ternary compound, SiOx (V), as confirmed by time of flight secondary ion mass spectrometry and supported by Monte Carlo simulations, can be precisely controlled by tuning the growth angle. The findings are pivotal in simultaneously addressing the critical issues of developing passivation charge transport layers through a one-step, room temperature, easy-to-implement deposition technique, paving the way for low-cost production of Si heterojunction solar cells.

Colour centers in diamond for energy applications

Atomic-scale defects in diamond are emerging as next-generation quantum sensors. One such defect is the nitrogen vacancy (NV) center, which possesses artificial atom-like properties, making it a strong contender for a room temperature solid state qubit. These spin defects are optically addressable by studying their optically detected magnetic resonance spectra (ODMR). The spin states can be initialized, controlled, and read out by shining a laser. The photo luminescence (PL) spectra contain information on the external magnetic field, electric field, temperature, etc. In today's world, where energy-related products are booming, the deployment of quantum sensors can expedite the development. Based on the existing works, we have made an attempt to identify the applications of color centers in diamond for energy sectors. We have highlighted our expertise in synthesizing nanocrystalline diamond films by pulsed laser deposition and microwave-based plasma reactor techniques.

Low-energy ion source for silicon surface nanostructuring

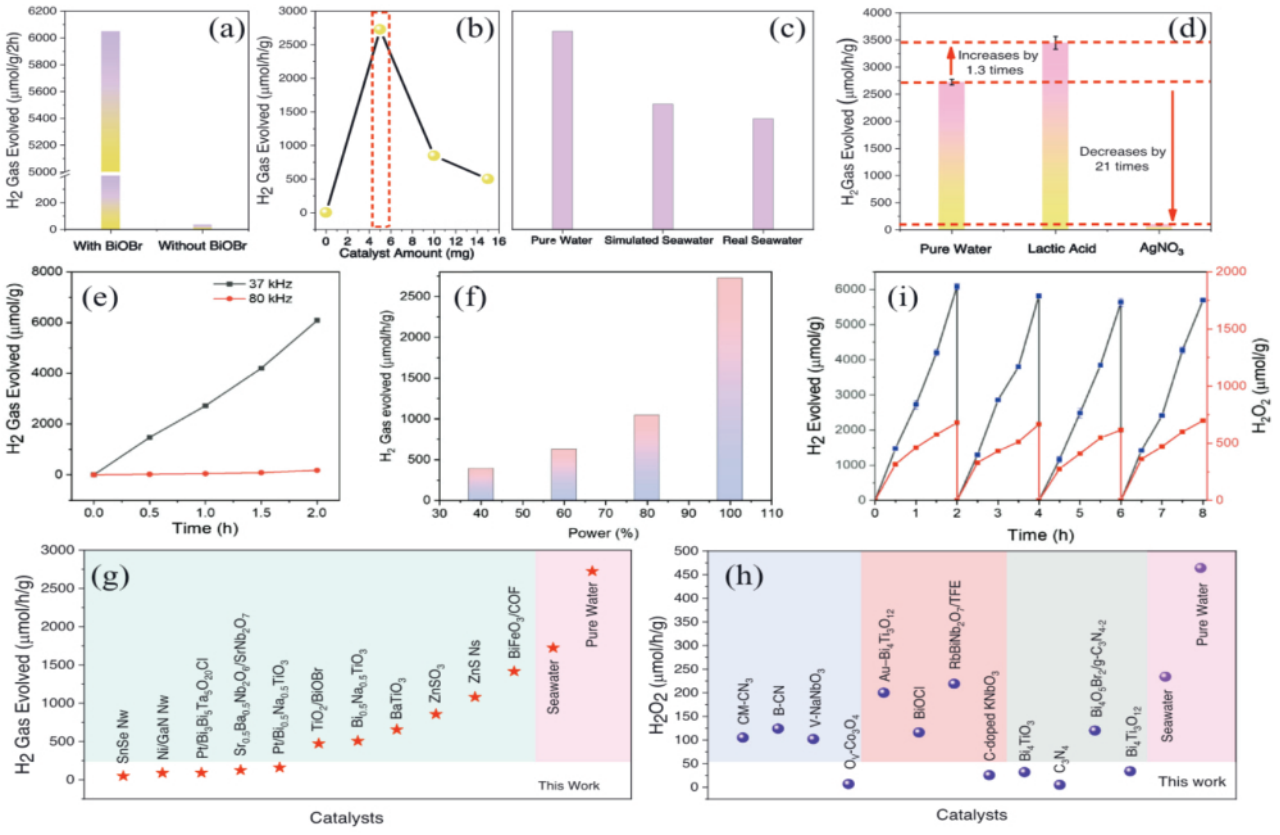
In this study, we have optimized a low-energy (50 eV-2 keV) electron cyclotron resonance-based ion source for nanostructuring of silicon surfaces. Here we have produced several patterns on silicon (100) surfaces, which are found to depend on ion current, magnetron power, gas pressure, extraction voltage, sample rotation, and ion energy.

Research Contribution by Prof. Dinesh Topwal and his Group

I am involved in interdisciplinary research spanning a wide range of innovative studies focused on the fundamental properties of condensed-matter systems. This includes a detailed examination of the electronic structure and magnetic properties of various bulk materials, thin films, nanoscale systems, and strongly correlated systems. Additionally, our research interests extend to a variety of advanced functional materials with potential technological applications. Among our contributions this year are the following.

Bi Off-Centering in Centrosymmetric BiOBr Leading to Ultrahigh Bifunctional Piezocatalytic Fuel Generation Efficiencies in Seawater

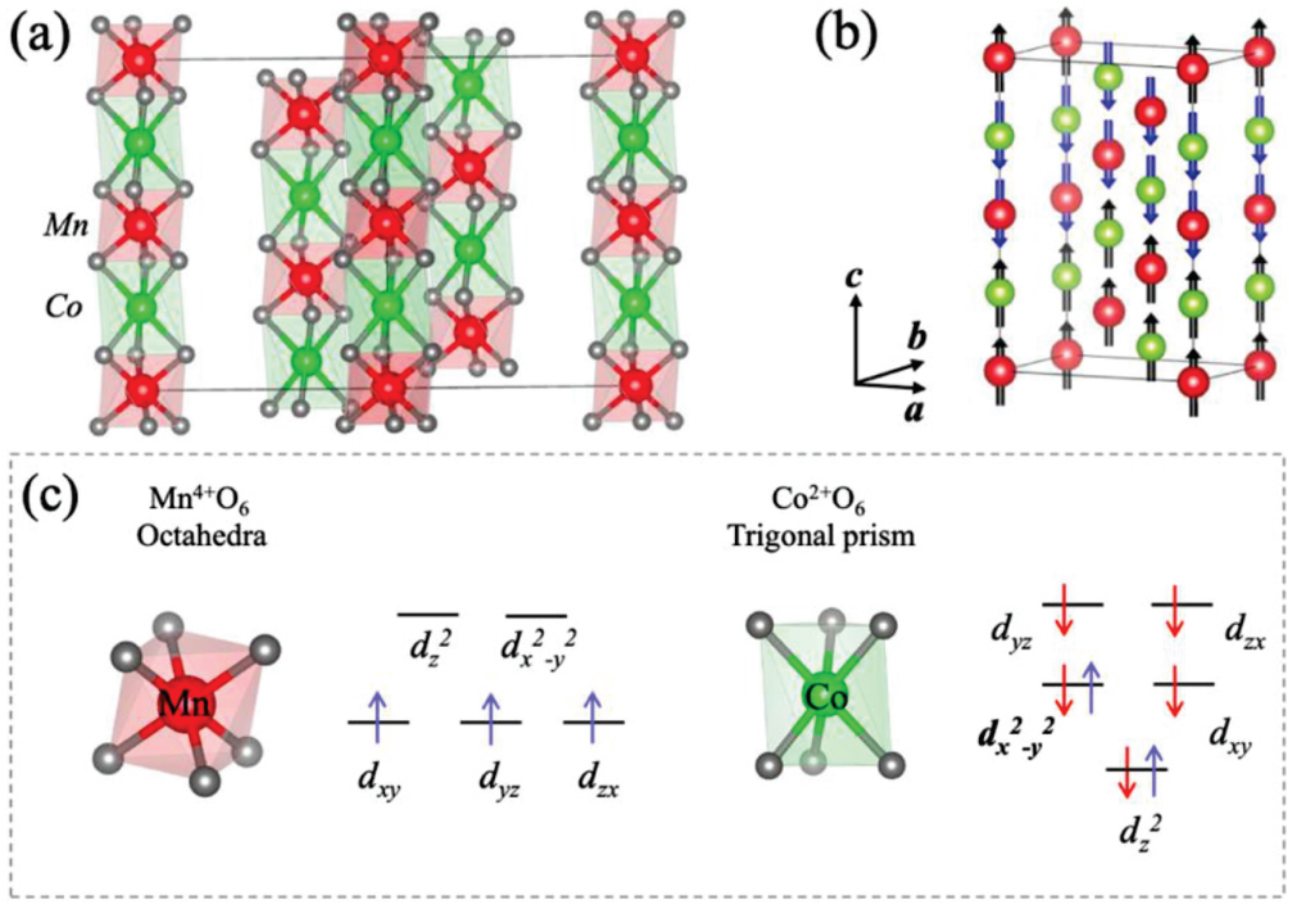
The piezocatalytic splitting of water to produce H_2 and H_2O_2 offers many advantages, but the need for polar materials restricts the choice of piezocatalysts. This study shows that centrosymmetric BiOBr with oxygen defects can efficiently generate both H_2 and H_2O_2 from pure and seawater without noble metals or scavengers. High-pressure experiments confirm no non-polar-to-polar phase transitions occur in BiOBr, though a new isostructural phase is found. Computational analysis indicates oxygen vacancies distort BiOBr, causing charge localization and polarization. Additionally, high pressure (i) lowers carrier effective masses and (ii) increases O-2p contribution at the valence band maximum, boosting catalysis and stability. The importance of oxygen vacancies is verified by varying their concentration, which directly influences H2 evolution. This work opens pathways for defect engineering to develop non-polar piezocatalysts from a wide range materials.

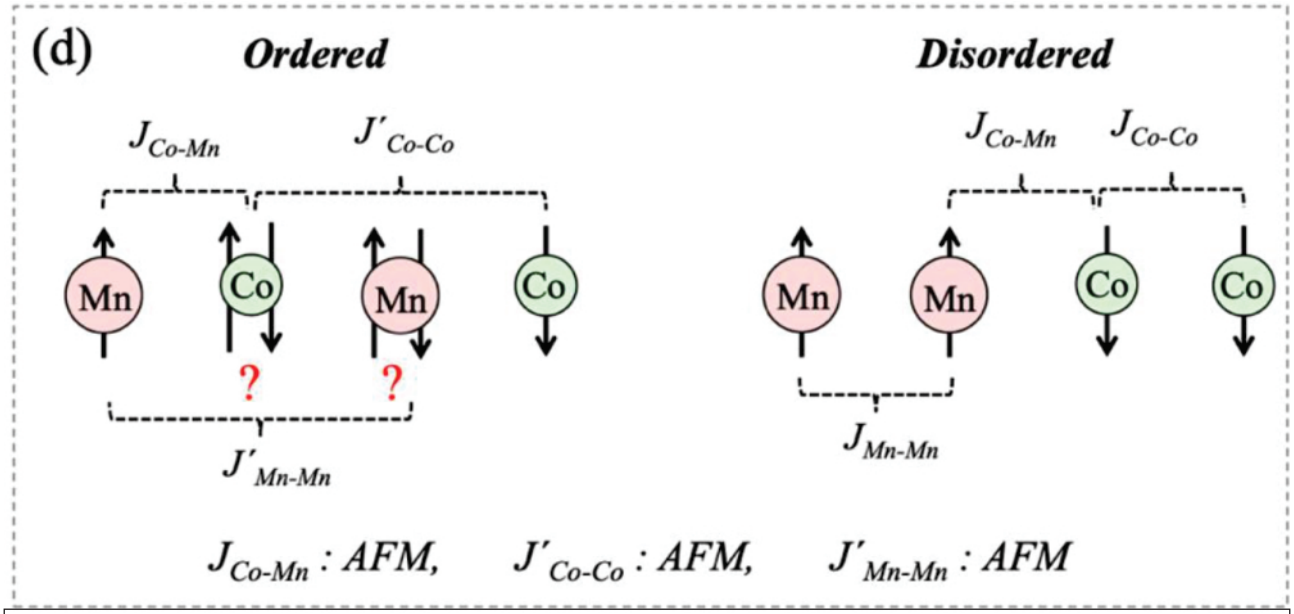


a) Ultrasound-induced H_2 production rate in the presence or absence of piezocatalysts. b) H_2 production rate in pure and seawater. c) Effect of catalyst dosage on H_2 production. d) Plot showing the effect of charge trapping agents on H_2production. e,f) Hydrogen production in different ultrasonic frequencies and power respectively. Comparison of the g) H_2production and g) H_2O_2 production performances of BiOBr with other state-of-the-art catalysts. h) Simultaneous H_2 and H_2O_2 production by BiOBr for 8 h.

Stability of the collinear ↑↑↓↓ magnetic ordering in a partial cation-disordered Ising chain magnet Ca_3CoMnO_6

$Ca_3Co_{2-x}Mn_xO_6$ is a quasi-one-dimensional Ising chain magnet characterized by a distinctive collinear up-up-down-down (↑↑↓↓) magnetic ordering that induces ferroelectricity below its Neel temperature of 13 K. This long-range magnetic order was previously thought to be stable only with Co excess (x<1.0) in non-stoichiometric Ca_3CoMnO_6, and not in the stoichiometric compound (x=1.0). Through a combination of various experiments and first-principles density-functional calculations based on x=1.0, we demonstrate that this ↑↑↓↓ magnetic order can be stabilized even in the stoichiometric Ca_3CoMnO_6 (x=1.0) by introducing optimal cationic positional disorder. This involves some Mn and Co ions occupying the trigonal-prismatic (Co-sites in the ordered case) and octahedral (Mn-sites in the ordered case) sites, respectively, which adjusts the magnetic exchange interactions. Notably, the stability of the ↑↑↓↓ magnetic order in Ca_3CoMnO_6 shows a non-monotonic dependence on the degree of cationic disorder, reaching a maximum at around 16%. Our findings offer insights into how this unique magnetic ordering, which has potential multiferroic applications, can be stabilized.





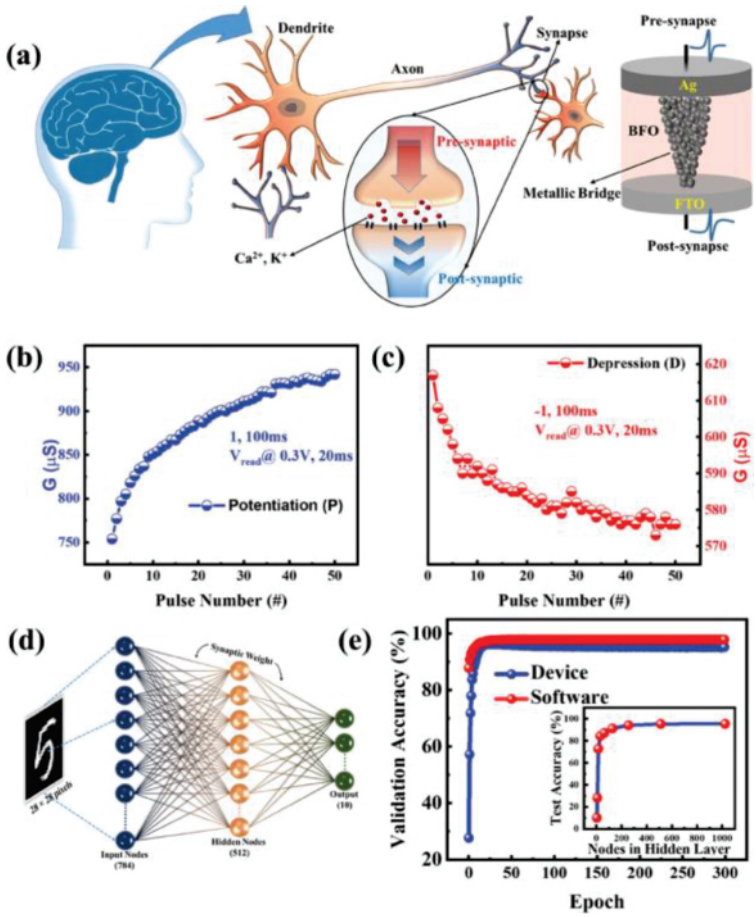
Schematic illustrations of (a) unit-cell crystal structure of Ca_3CoMnO_6. (b) Up-up-down-down (↑↑↓↓) collinear AFM ordering of Mn and Co spins in Ca_3CoMnO_6. (c) Crystal field level schemes and possible electronic configurations for $Mn^{4+}O_6$ octahedra and $Co^{2+}O_6$ trigonal prisms.(d) Schematic illustration of the possible competing ↑↓↑↓ and ↑↑↓↓ orderings in case of a cation-ordered structure, leading to short-range ordering and the stabilized long-range ↑↑↓↓ ordering in case of the disordered structure, respectively.

Research Contribution by Prof. Satyaprakash Sahoo and his Group

Analog-Digital Hybridity Switching in Ion Irradiated BiFeO3 Memristor for Synergistic Neuromorphic Functionality and Artificial Learning:

Memristors-based neuromorphic devices represent emerging computing architectures to perform complex tasks by outpacing the traditional Von-Neumann architectures in terms of speed, and energy efficiency. In this work, the resistive switching (RS) behavior of sol-gel grown and ion-irradiated BFO films is investigated under electrical stimulus. The Ag/BFO/FTO memristors emulate a combination of digital and analog RS behavior within a single device. The possible mechanism of analog digital hybridity is addressed by considering the formation of the conducting filament by oxygen vacancies, Ag+ions and Schottky barrier height modulation. The ion-irradiated BFO samples are analyzed using Raman, XRD, and XPS studies. To uphold bioinspired synaptic actions, crucial synaptic functionalities like pair-pulse facilitation and long-term potentiation/depression are effectively achieved. More intricate synaptic behaviors are also demonstrated, such as spike-time-dependent plasticity and Pavlovian classical conditioning, which represent the prominent attributes of both learning and forgetting behavior. Additionally, high pattern recognition accuracy (96.1%) is achieved in an artificial neural network simulation by using the synaptic weights of the memristors. This synergistic effect of digital and

analog RS in ion-irradiated BFO can be beneficial for the emulation of complex learning behavior as well as its incorporation into low-power neuromorphic computing.

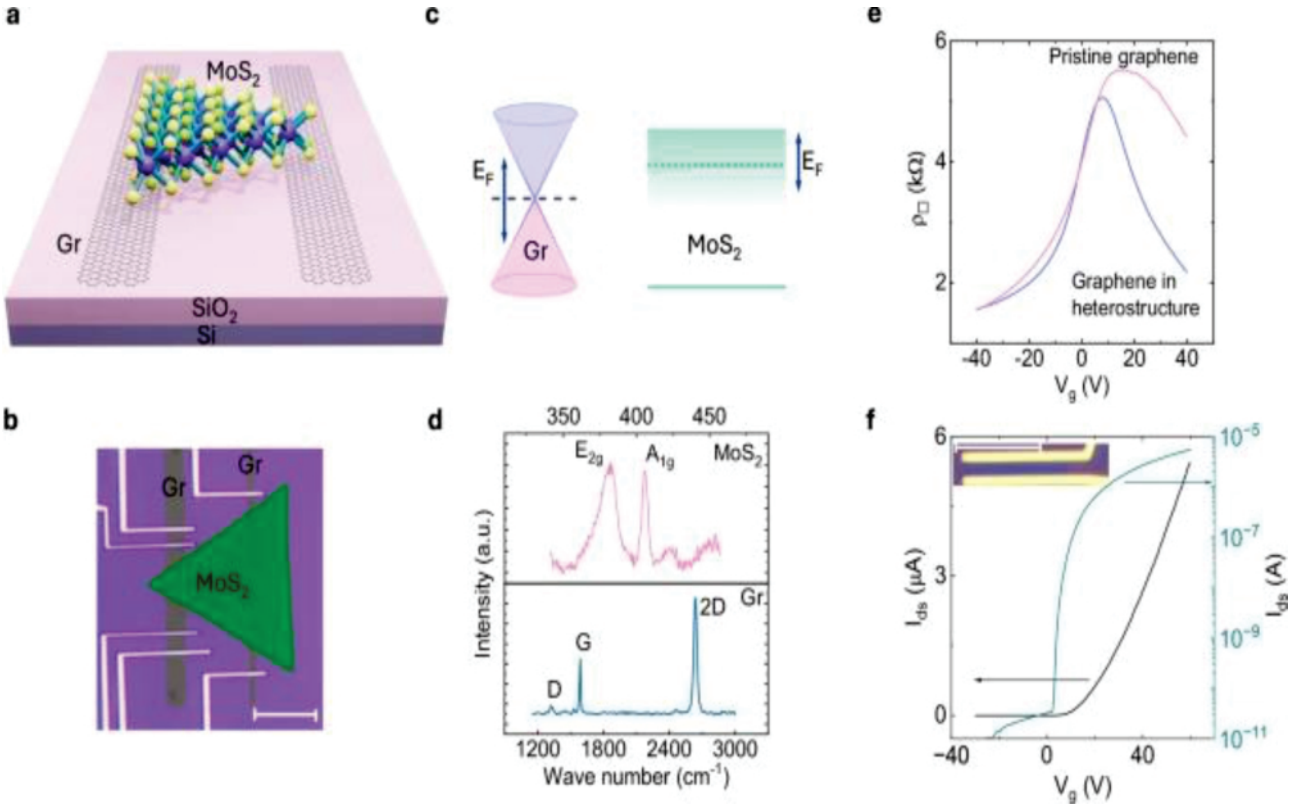


a) Depiction of the operational dynamics of a biological synapse alongside the Ag/BFO/FTO memristor, highlighting potential analogies between the two. b) Variation in conductance subsequent to iterative application of multiple pulses, where the amplitude is +1 V (100 ms) for potentiation in (b) and "1 V (100 ms) for depression in (c), observed at read voltage of 0.3 V (20 ms). d) Schematic illustration of three-layer ANN designed for MNIST image recognition. e) Training accuracy (%) versus epochs number for BFO artificial synaptic device and Software-based ideal numeric case neural network (NN) training. Inset showcasing test accuracy (%) with varying numbers of hidden nodes in the designed NN.

All-2D CVD-grown semiconductor field-effect transistors with van der Waals graphene contacts

Two-dimensional (2D) semiconductors and van der Waals (vdW) heterostructures with graphene have generated enormous interest for future electronic, optoelectronic,

and energy-harvesting applications. The electronic transport properties and correlations of such hybrid devices strongly depend on the quality of the materials via chemical vapor deposition (CVD) process, their interfaces and contact properties. However, detailed electronic transport and correlation properties of the 2D semiconductor field-effect transistor (FET) with vdW graphene contacts for understanding mobility limiting factors and metal-insulator transition properties are not explored. Here, we investigate electronic transport in scalable all-2D CVD-grown molybdenum disulfide (MoS_2) FET with graphene contacts. The Fermi level of graphene can be readily tuned by a gate voltage to enable a nearly perfect band alignment and, hence, a reduced and tunable Schottky barrier at the contact with good field-effect channel mobility. Detailed temperature-dependent transport measurements show dominant phonon/impurity scattering as a mobility limiting mechanisms and a gate-and bias-induced metal-insulator transition in different temperature ranges, which is explained in light of the variable-range hopping transport. These studies in such scalable all-2D semiconductor heterostructure FETs will be useful for future electronic and optoelectronic devices for a broad range of applications.



(a, b) Monolayer MoS2 with graphene contact. (d-f) Raman spectra of the device, Electrical results of MoS2 transistor with graphene contact.

Research Contribution by Prof. Debakanta Samal and his Group

Magnetic order and spin dynamics across the ferromagnetic quantum critical point in $Ni_{1-x}Mo_x$

Quantum phase transitions (QPTs) are the key to understanding the ground-state properties and the low-energy emergent collective excitations in a wide class of quantum materials, ranging from high-Tc superconductors and heavy-fermion compounds to low-dimensional systems. A QPT is driven by strong quantum fluctuations between competing ground states in the vicinity of a quantum critical point (QCP). A QCP can be attained by suppressing a second-order transition at finite temperature towards T=0 K by varying non-thermal control parameters, such as chemical doping (x), external pressure (p), and magnetic field (H).

Realizing a quantum critical point (QCP) in clean ferromagnetic (FM) metals has remained elusive due to the coupling of magnetization to the electronic soft modes that drive the transition to be of first order. However, by introducing a suitable amount of quenched disorder, one can still establish a QCP in ferromagnets. In this study, we ascertain that the itinerant ferromagnet $Ni_{1-x}Mo_x$ exhibits a FM QCP at a critical doping of $x_c \simeq 0.125$. Through magnetization and muon-spin relaxation measurements, we demonstrate that the FM ordering temperature is suppressed continuously to zero at xc, while the magnetic volume fraction remains 100% up to x_c, indicating a second-order phase transition. The QCP is accompanied by a non-Fermi liquid behavior, as evidenced by the logarithmic divergence of the specific heat and the linear temperature dependence of the low-temperature resistivity. Our findings reveal a minimal effect of disorder on the critical spin dynamics of $Ni_{1-x}Mo_x$at x_c, highlighting it as one of the rare systems to exhibit a clean FM QCP.

Reference:

H. K. Dara, S. S. Islam, A. Magar, D. Patra, H. Luetkens, T. Shiroka, R. Nath, D. Samal

Magnetic order and spin dynamics across the ferromagnetic quantum critical point in $Ni_{1-x}Mo_x$at x_c,

https://doi.org/10.48550/arXiv.2503.00484

Ligand Tunability of Emergent Non-collinear Magnetism in Cu-based Layered Hybrid Perovskites

Layered materials have gained considerable fundamental and technological importance since the discovery of high TC-superconductivity in quasi-two-dimensional (quasi-2D) cuprates. Most of the interesting electronic and magnetic

properties in layered materials arise from the confinement of electrons to 2D sheets. In the context of magnetism, Mermin-Wagner theorm forbids spontaneous symmetry breaking at finite temperature for a 2D isotropic Heisenberg system. However any deviation from the ideal isotropic 2D nature, such as the presence of weak interlayer magnetic coupling, magnetic anisotropy can introduce long range magnetic order (LRMO) at finite T and it has been a subject of extensive research. Interestingly, quasi-2D Heisenberg system undergoes a crossover from a high temperature state with 2D magnetic correlation to a 3D LRMO at lower temperature. When such a system is cooled from paramagnetic phase, first 2D magnetic correlation sets to emerge in each layer and upon further cooling the correlation length grows exponentially with 1/T and an effective 3D LRMO associated with interlayer coupling appears at lower temperature. Understanding magnetic order in quasi-2D limit is a problem of paramount interest and is closely linked with the strength of interlayer coupling and/or the underlying magnetic anisotropy. In the recent days, there has been impetus in the study of quasi-2D van der Waals magnets since it provides a basis to examine the intrinsic 2D magnetism by isolating the indivisual layer.

Transition metal based layered organic-inorganic hybrid perovskites (OIHPs) exhibit diverse magnetic phenomena, yet the atomistic origin of magnetism in this class of materials remains elusive after decades of study. We demonstrate a notable ligand tunability of magnetism in two new quasi-two-dimensional OIHPs $(C7H9NBr)_2CuX_4$ (C_7H_9NBr = 4-Bromobenzylammonium = A, X= Cl, Br). Despite being isostructural and having easy plane magnetocrystalline anisotropy (MCA), the Cl and Br analogs exhibit contrasting magnetic response. While A_2CuCl_4 shows an in-plane ferromagnetic and out-of-plane antiferromagnetic like response, A2CuBr4 follows the reverse trend. The origin of this intriguing behavior is argued to stem from Dzyaloshinskii-Moriya interaction (DMI) present in these layered systems. Based on the competition between DMI and MCA, we propose a canted and transverse conical spiral spin structure for A_2CuCl_4 and A_2CuBr_4 respectively, which captures the observed magnetic response. Our study provides an effective way of tailoring and understanding the occurrence of non-trivial spin textures in this class of OIHPs.

Reference:

P. Biswal, Sagar Sarkar, S. N. Sarangi, Subhendra D. Mahanti, G.Tripathy, Ashis Kumar Nandy, Diptikanta Swain, and D. Samal (unpublished)

Ligand tunability of emergent noncollinear magnetism in Cu-based layered hybrid perovskites

2.5 Theoretical Condensed Matter Physics
(G. Tripathy, S. Mandal, A. Saha and D. Chaudhuri)

Research Contribution by Prof. Saptarshi Mandal and his Group

Recently, the Kitaev–Heisenberg system has been used to explore various aspects of Kitaev spin liquid physics. Here, we consider a few small clusters of up to twelve sites and study them in detail to unravel many interesting findings due to the competition between all possible signs and various magnitudes of these interactions under the influence of an external magnetic field. When the Heisenberg interaction is taken anti-ferromagnetic, one obtains plateaus in correlation functions where, surprisingly, the exact ground state reduces to the eigenstate of the Heisenberg interaction as well. On the other hand, for ferromagnetic Heisenberg interaction, its competition with Kitaev interaction results in non-monotonicity in the correlation functions. Discuss, in detail, the competing effects on low-energy spectrum, flux operator, magnetization, susceptibility, and specific heat. Finally, we discuss how our findings could be helpful to explain some of the recent experimental and theoretical findings in materials with Kitaev interactions.

Prof. Mandal & group perform a systematic and exact study of Majorana fermion dynamics in the Kitaev-Heisenberg model in a few finite-size clusters increasing in size up to twelve sites. Employ exact Jordan–Wigner transformations to evaluate certain measures of Majorana fermion correlation functions, which effectively capture matter and gauge Majorana fermion dynamics in different parameter regimes. An external magnetic field is shown to produce a profound effect on gauge fermion dynamics. Depending on certain non-zero choices of other non-Kitaev interactions, it can stabilise it to its non-interacting Kitaev limit. For all the parameter regimes, gauge fermions are seen to have slower dynamics, which could help build approximate decoupling schemes for appropriate mean-field theory. The probability of Majorana fermions returning to their original starting site shows that the Kitaev model in small clusters can be used as a test bed for the quantum speed limit.

The seminal Haldane model brings up a paradigm beyond the quantum Hall effect to look for a plethora of topological phases in the honeycomb and other lattices. Here we dwell into this model considering a full parameter space in the presence of spin–orbit interaction as well as Zeeman field such that the flavour of Kane-Mele model is invoked. Adopting this extended Haldane model as an example, elucidate, in a transparent manner, a number of topological features in a pedagogical manner. First, describe various first-order topological insulator phases and their characterizations while explaining various anomalous quantum Hall effects and quantum spin Hall

effects in the extended Haldane model. Second, we demonstrate the concepts of higher-order topological insulator phases along with the topological invariants in the anisotropic limit of the extended Haldane model. At the end, we discuss various open issues involving emergent or extended symmetries that might lead to a broader understanding of various topological phases and the associated criteria behind their emergence

Research Contribution by Prof. Arijit Saha and his Group

Transport signature of Bogoliubov Fermi Surface in d-wave superconductors

In recent times, Bogoliubov Fermi surfaces (BFSs) in superconductors (SCs) have drawn significant attention due to a substantial population of Bogoliubov quasiparticles (BQPs) together with Cooper pairs (CPs) in them. The BQPs, as zero-energy excitations, give rise to captivating and intricate charge dynamics within the BFSs. In our theoretical investigation, we propose to reveal the unique signatures of the topologically protected BFSs in bulk d-wave SCs using a normal metal/time-reversal symmetry (TRS) broken d-wave SC hybrid setup, in terms of the differential conductance and Fano factor (FF). Orientation of crystal a axis with respect to junction normal, quantified by the parameter α, is crucial for transport properties in these hybrid devices. For $\alpha = 0$, an enhancement in zero-bias conductance (ZBC) can be identified as a key signature of BFSs. However, for α 8= 0, this feature does not replicate due to the presence of the localized Andreev bound state (ABS) at the interface. The interplay of ABS and BFSs gives rise to an anomalous behavior in ZBC compared to the $\alpha = 0$ case. This behavior remains qualitatively similar even at finite temperatures. Finally, Prof. Arijit Saha & group explain this anomalous behavior by analyzing the effective charge of the carriers in terms of the FF. In our second work, we investigate the thermoelectric response of topologically protected BFSs generated in a two-dimensional unconventional d-wave superconductor subjected to an external in-plane Zeeman field. Utilizing the Blonder-Tinkham-Klapwijk (BTK) formalism and considering a normal-d-wave superconductor hybrid junction, we compute the thermoelectric coefficients including thermal conductance, Seebeck coefficient, and figure of merit (zT), and examine the validation of the Widemann-Franz law in the presence of both voltage and temperature bias. Importantly, as a signature of the anisotropic nature of d-wave pairing, ABSs formed at the normal-superconductor interface play a significant role in the thermoelectric response. In the presence of ABSs, we observe a substantial enhancement in the Seebeck coefficient $(\sim 200\ \mu V/K)$ and $zT\ (\sim 3.5)$ due to the generation of the BFSs and thus making such setup a potential candidate for device applications.

Superconducting Diode Effect in Rashba nanowire and helical Shiba chain

The superconducting diode effect (SDE) refers to the non-reciprocal nature of the critical current (maximum current that a superconductor can withstand before turning into a normal metal) of a superconducting device. In our first work in this direction, we investigate SDE in helical superconductors with broken inversion and time-reversal symmetry, focusing on a prototypical Rashba nanowire device proximitized by an s-wave superconductor and subjected to external magnetic fields. Using a self-consistent Bogoliubov- de Gennes (BdG) mean-field formalism, we analyse the interplay between linear and higher-order spin-orbit coupling (SOC), bulk supercurrents, and external magnetic fields. Our results demonstrate that Rashba nanowires with only linear SOC can achieve incredibly large diode efficiency 45% through the interplay of longitudinal and transverse magnetic fields. Furthermore, higher-order SOC enables finite diode efficiency even without a longitudinal Zeeman field, which can be utilized to reveal its presence and strength in nanowires. In our second work, we propose a theoretical framework for the realization of Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) pairing in a helical Shiba chain subjected to an out-of-plane Zeeman field, analysed through a self-consistent BdG mean-field formalism approach. Our study reveals the crucial role of finite momentum pairing of Cooper pairs in the form of an FFLO state, which also supports topological Majorana zero modes (MZMs) at the ends of the chain. Interestingly, we demonstrate that FFLO pairing facilitates nonreciprocal charge transport, giving rise to a SDE in our system where both time-reversal and inversion symmetries are broken. Such a diode effect stems directly from the presence of finite Cooper pair momentum of the FFLO ground state.

Research Contribution by Prof. Debasish Chaudhuri and his Group

Active matter systems—composed of energy-consuming elements that generate motion—are key to both biological organization and synthetic collective behavior. The group recent research spans scales from intracellular dynamics to macroscale self-organization, offering insights into emergent phenomena far from equilibrium. Below is an overview of our main achievements:

FtsZ and Cell Division: A theoretical model of FtsZ, a tubulin-like protein essential for bacterial cytokinesis, elucidates how lateral filament interactions and mechanical properties stabilize the Z-ring. Molecular dynamics simulations reveal treadmilling-driven spooling as the mechanism behind contractile force generation and morphological transitions (rings, helices, globules). These results align with experimental data from transgenic yeast and are published in the prestigious journal PRX-Life [PRX Life 3, 013009 (2025)].

UNC-104 Motor Proteins: A combined experimental-theoretical study in C. elegans neurons demonstrates that ubiquitin-like modifications enhance cooperative cargo binding by UNC-104 motors without altering their processivity or diffusivity, ensuring robust intracellular transport [Phys Rev E 111, 064404 (2025) (**Editors' choice)].**

Precision of Cilia Oscillations: A "rower" model shows that cilia-like oscillations result from energy-driven potential switching in a Brownian system. The precision, quantified by the quality factor, is optimized at intermediate amplitudes and explained using first-passage time theory. The energy budget conforms with thermodynamic uncertainty relations, advancing our understanding of the physical limits of biological oscillators [arXiv:2504.07681 (2025)].

Motility-Chemical Feedback: A minimal agent-based model reveals that agents depositing and responding to chemical gradients can self-organize into fractal or networked structures. The resulting phase diagram captures transitions between uniform, networked, and phase-separated states, encompassing behaviors observed in chemotaxis and tissue remodeling [arXiv:2504.16539 (2025)].

Non-Affine Deformation in Active Solids: Scaling theory shows that non-affinity in active solids scales quadratically with activity and inversely with density. Increased activity drives defect proliferation, leading to phase transitions (solid → hexatic → fluid). Local activity modulation offers control over mechanical responses [arXiv:2504.06914 (2025)].

Trapped Active Particles: Active particles with fluctuating speeds (modeled by Ornstein-Uhlenbeck processes) exhibit metastable mean-squared displacement plateaus and diverse steady-state distributions. Exact Fokker-Planck analysis produces phase diagrams capturing transitions and re-entrant behavior governed by excess kurtosis [Phys Rev Research 7, 013126 (2025)].

Inertial Effects in Active Polymers: Semi-flexible active polymers exhibit re-entrant transitions between open chains and spinning spirals. At low activity, torque-driven spiral formation is inertia-independent; high activity destabilizes spirals due to inertia. Shape analysis using Kullback-Leibler divergence identifies peak nonequilibrium states at compact spirals [Soft Matter 20, 6221 (2024)].

Chiral Active Brownian Particles: Our exact solution of Fokker-Planck equations via Laplace transform reveals oscillatory, non-Gaussian displacement behavior in chiral active Brownian particles. Excess kurtosis analysis highlights intermediate-time

deviations from equilibrium, driven by persistence and chirality [New Journal of Physics 26, 083024 (2024)].

Inertial Active Brownian Motion in Harmonic Traps: Inertial effects alter diffusivity and kinetic temperature in trapped active particles. Analytical expressions for position and velocity moments yield kurtosis-based phase diagrams, revealing complex time-scale competition and re-entrant steady-state distributions [New Journal of Physics 26, 073048 (2024)].

Tracer Dynamics in Active Chains: A study of a tracer in a 1D active harmonic chain identifies ballistic, diffusive, and single-file diffusion regimes. Simulations validate theoretical predictions, showing that interactions and persistence dictate long-time behavior and correlations [Soft Matter 20, 8638 (2024)].

Active Nematic Phase Transitions: In dry, apolar active nematics with Lebwohl-Lasher-type alignment, simulations and mean-field theory reveal transitions between isotropic, nematic, and coexistence phases. The system exhibits fluctuation-dominated phase ordering, first-order transitions, and distinctive coarsening dynamics [Soft Matter 20, 8078-8088 (2024); Soft Matter 20, 788-795 (2024)].

The groups work advances understanding of how biological and synthetic active systems produce complex, non-intuitive behaviors. From motor protein transport and cytoskeletal dynamics to emergent phenomena in active materials, our integrated theoretical, numerical, and experimental approaches inform both biological insight and the design of next-generation active materials and programmable robotic systems.

2.6. Research Contribution from Prestigious Fellows

Research Contribution by Dr. Mrutunjaya Bhuyan

Nuclear incompressibility and its enduring impact on fusion cross sections: The present study reveals that a decrease in the nuclear matter incompressibility significantly influences the interaction dynamics between colliding nuclei. Specifically, a reduction in incompressibility leads to a noticeable decrease in the fusion barrier height, which in turn results in an enhancement of the fusion cross section. This implies that nuclear systems with lower incompressibility values are more likely to overcome the Coulomb barrier and undergo fusion. Furthermore, it is observed that the barrier height diminishes not only with decreasing incompressibility but also with lower symmetry energy values. These combined effects point toward a softer equation of state (EoS), where the nuclear matter is less

resistant to compression. Such an EoS, characterized by reduced incompressibility, has important implications for both nuclear structure and reaction studies, as well as for understanding astrophysical phenomena such as supernova dynamics and neutron star properties. Phys. Rev. C 109 044613 (2024)

Bubble structure in Superheavy Island: This work identifies enhanced stability at neutron numbers N=172 and N=184 across the isotopic chains of elements with proton numbers Z=125 and Z=126. A distinct shape evolution is observed along the mass number, characterized by a transition from prolate to spherical shapes and then back to prolate configurations. No evidence of superdeformed or hyperdeformed structures is found throughout the isotopic chains under study. In addition, the investigation is extended to explore the presence of central density depletion, commonly referred to as bubble structures. The analysis reveals the existence of bubble or semi-bubble configurations in the charge density distributions of several neutron-rich isotopes, indicating the emergence of exotic nuclear shapes in this superheavy region. J. Phys. G: Nucl. Part. Phys. 51, 095104 (2024)

Exploring the effect of positive Q-value neutron transfer on fusion reaction: This investigation examines the influence of neutron transfer degrees of freedom on the fusion cross section in heavy-ion fusion reactions, employing the relativistic mean-field (RMF) formalism within the coupled-channels framework using the CCFULL code. The results clearly demonstrate that incorporating vibrational and/or rotational intrinsic excitations enhances the fusion cross section at sub-barrier energies. Nonetheless, a degree of fusion hindrance remains in this low-energy region. To further explore this phenomenon, two-neutron (2n) transfer channels were included in the coupled-channels calculations. A comparative analysis between the traditional Woods-Saxon (WS) potential and the relativistic R3Y nucleon-nucleon (NN) interaction reveals that the R3Y potential, when combined with intrinsic degrees of freedom, provides a superior description of the fusion process—particularly at energies below the Coulomb barrier. This enhanced performance is attributed to the higher barrier heights and lower fusion cross sections predicted by the WS potential, in contrast to the more realistic barrier profiles and improved fusion probabilities yielded by the R3Y NN interaction for the studied reaction systems. Phys. Rev. C 109, 064619 (2024)

Effect of nuclear deformation and orientation of target in heavy-ion fusion dynamics: The present study highlights that the inclusion of nuclear shape degrees of freedom and orientation effects leads to significant modifications in the characteristics of the fusion barrier, which in turn markedly influences the fusion cross section. These

effects become increasingly pronounced in reactions that result in the formation of heavier compound nuclei. This trend suggests a strong sensitivity of the fusion process to the intrinsic structural properties of the interacting nuclei as the system's mass increases.

In particular, nuclear deformations—such as quadrupole and hexadecapole components—along with the orientation of deformed nuclei relative to the beam axis, play a vital role in altering the barrier height, width, and curvature. These changes can either enhance or suppress the probability of fusion, especially at sub-barrier energies, where quantum tunneling dominates the reaction dynamics. The deformation can lower the effective fusion barrier for certain orientations, leading to barrier distribution effects that significantly affect the fusion excitation function. Phys. Rev. C 110, 024601 (2024)

Elucidating shell/subshell closure and the critical impact of isospin-asymmetry: This study provides strong evidence that the bulk nuclear properties identify N=82 as a prominent neutron shell closure on the neutron-rich side of the barium (Ba) isotopic chain. A comprehensive analysis of isospin-dependent observables, including the nuclear symmetry energy and its volume and surface components, along the entire isotopic chain of barium nuclei. By breaking down the symmetry energy into its volume and surface components, this work provides a deeper understanding of how the symmetry energy behaves in different regions of the isotopic chain and its role in driving shell effects. The detailed examination of these isospin-dependent properties allows for a more accurate description of the nuclear structure in neutron-rich nuclei, providing valuable insights into the evolution of nuclear shell structure in exotic regions of the nuclear chart. This is especially relevant for astrophysical processes, such as nucleosynthesis in neutron star mergers or supernovae, where neutron-rich isotopes play a key role. Nucl. Phys. A 1053, 122975 (2025)

Influence of effective interactions and nuclear densities on the dynamics of heavy-ion fusion: This study aims to investigate the underlying mechanisms of heavy-ion fusion by employing various effective nucleon-nucleon (NN) interactions in conjunction with nuclear density distributions. The nuclear interaction potentials are constructed by folding the relativistic effective NN interaction—specifically, the R3Y potential—with nuclear densities obtained from the relativistic mean-field (RMF) formalism. The resulting relativistic potentials are systematically compared with the well-established non-relativistic M3Y-type NN interactions, including the Reid and Paris parametrizations, along with their respective density-dependent extensions. The analysis reveals that the relativistic R3Y and its density-dependent counterpart,

DDR3Y, generally predict higher fusion cross sections compared to those obtained from the Reid and Paris versions of the M3Y NN potential. This indicates a stronger attractive component in the relativistic interactions, making them more favorable for describing fusion processes, particularly at sub-barrier energies. Furthermore, the inclusion of in-medium effects—manifested as density dependence in both relativistic and non-relativistic NN interactions—introduces a repulsive component to the nuclear potential. This repulsion leads to an increase in the fusion barrier height, thereby suppressing the fusion cross section. These findings underscore the importance of properly accounting for medium modifications in the effective NN interactions to accurately describe nuclear fusion dynamics, especially in the context of microscopic models aiming to explore reactions involving heavy and superheavy systems. Phys. Rev. C 111, 054621 (2025)

Research Contribution by Dr. Pinaki Baner

The primary focus of my research is broadly in the field of theoretical high-energy physics. Currently, he is focusing on understanding the mathematical structures of scattering amplitudes using modern on-shell methods. This exploration involves both particle and string scattering. More specifically, with my collaborators, at present, I am trying to formulate a framework for perturbative renormalization to recently introduced 'curve integral formula' for particle scattering at all loops and arbitrary multiplicity by Arkani-Hamed et al.

He also interested in several related research directions in conformal field theory and holography. Particularly using amplitudes methods we are trying to understand the criteria to have holographic dual of boundary conformal field theories.

Research Contribution by scientific officer Dr. S. N. Sarangi

Dr. Sarangi report, a facile approach has been employed to synthesize NiOH nanoporous film via a hydrothermal process on an ITO substrate, which subsequently serves as the sensing electrode for the electrochemical detection of H_2O_2. To analyze the morphology, structure, and optical properties of the resultant nanoporous film, various techniques were employed, including scanning electron microscopy, X-ray diffraction, Raman spectroscopy, and absorption spectroscopy. The electrochemical measurements demonstrate that the biosensor utilizing the NiOH nanoporous film results in rapid amperometric sensing, a low detection limit, and a broad response range for non-enzyme H2O2 detection. This performance highlights the strong synergistic effect resulting from the high electrocatalytic activity of the NiOH nanoporous film, combined with its outstanding conductivity and large surface area.

CHAPTER 03

PUBLICATIONS

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भौ सं
IOP
ATOMS IN THE SERVICE OF THE NATION

3.1. Papers Published in Refereed Journal

Condensed Matter Physics (Experiment)

1. **Comprehensive insights into hydrolysis-mediated hydrogen production using high-entropy quintuple alloy-grafted carbon black**,
G. Raj, R. Nandan, S. Midya, K. Kumar, A.K. Singh, K.K. Nanda, Journal of Materials Chemistry A 13, 5765-5776 (2025).

2. **A novel electrochemical high-performance non-enzymatic glucose sensing based on face-centred cubic FeCoNiMnCr high entropy nano alloys encapsulated in NCNTs,**
G. Raj, R. Nandan, P. Gakhad, K. Kumar, A.K. Singh, K.K. Nanda Chemical Engineering Journal 503, 158041 (2025).

3. **Green Synthesis of Magnesium Single Atom Catalyst from Spinacia oleracea-Chlorophyll Extracts for Sustainable Electrocatalytic Nitrate Reduction to Ammonia,**
K. Kumar, P. Tripathi, G. Raj, D. Kalyan, D.B. Gorle, N.G. Mohan, S.K. Makineni, K. Ramanujam, A.K. Singh, K.K. Nanda, Green Chemistry 26, 7931 – 7943 (2024).

4 **Bioinspired Carbonized Polymer Microspheres for Full-Color Whispering Gallery Mode Emission for White Light Emission, Unclonable Anticounterfeiting, and Chemical Sensing Applications,**
B.K. Barman, D. Hernández-Pinilla, T.D. Dao, K. Deguchi, S. Ohki, K. Hashi, A. Goto, T. Miyazaki, K.K. Nanda, and T. Nagao, ACS Applied & Materials Interface 16, 22312 - 22325 (2024).

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9. **Oxygen-mediated tunability in physicochemical properties of RF sputtered Vanadium pentoxide thin films towards energy harvesting**
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D. Hasina, A. Mandal, S.K. Srivastava, A. Mitra, and T. Som, Small, 21, 2408369 (2025).

11. **Low-Energy Ion-Implanted Nanometer-Thick Metal Oxide Memristor for Random Number Generation at the Nanoscale,**
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T. Basu, A. Patra, M.Murali, M. Saini, A. Banerjee, T. Som, ACS Omega, 10, 2372–2392 (2025).

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14. **Internal and external magnetic-field engineering of negative magnetization and ex-change bias in La1"xPrxCrO3**
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40. **Floquet second-order topological Ander-son insulator hosting corner localized modes,**
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41. **Corner modes in non-Hermitian next-nearest neighbor hopping model,**
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44. **Mechanistic insights into Z-ring formation and stability: A Langevin dynamics approach to FtsZ self-assembly,**
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High Energy Physics (Experiment)

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Theoretical Nuclear Physics

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75. **Relativistic Mean-Field Study of Alpha Decay in Superheavy Isotopes with $100 \leq Z \leq 120$,** N. Jain, M. Bhuyan and R. Kumar, Physics of Particles and Nuclei Letters 21, 852(2024).

76. **Exploring the effect of positive Q-value neutron transfer in coupled-channels calculations using microscopic nuclear potentials,** N. Jain, M. Bhuyan, P. Mohr, and Raj Kumar Physical Review C 109, 064619 (2024).

77. **Effect of nuclear deformation and orientation about the symmetry axis of the target nucleus on heavyion fusion dynamics,** S. Rana, M. Bhuyan, R. Kumar, and B. V. Carlson Physical Review C 110, 024601 (2024).

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80. **Elucidate the non-relativistic and relativeistic energy density functional from momentum space to coordinate space within local density approximation,** J.A. Pattnaik, M. Bhuyan, R.N. Panda, S.K. Patra, International

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82. **Influence of effective interactions and n clear densities on the dynamics of heavyion fusion,**
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CMS Collaboration :

85. IOP is a part of CMS Collaboration (Dr. A. K. Nayak) has published about 92 papers during this period. We listed only those ones where we have made direct contributions. However, all the publications include us as author due to our many indirect contributions

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ALICE Collaborations

88. IOP is a part of ALICE collaboration (Prof. P.K. Sahu) and total number of publications for the year 2024-2025 are 43.

Publication by other Members

1. **Internal and external magnetic-field engineering of negative magnetiza-tion and ex-change bias in La_{1-X} Pr_X CrO_3 ($0.8 \leq x \leq 0.9$),**
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S.K. Agarwalla, M. Bustamante, M. Singh, P. Swain, Conference proceedings for the 25th International Workshop on Neutrinos from Accelerators (NuFact 2024).

3. **Constraints on flavor-dependent long-range interactions of high-energy astro-physical neutrinos,**
S.K. Agarwalla, M. Bustamante, S. Das, A. Narang, Conference proceedings for the 25th International Workshop on Neutrinos from Accelerators (NuFact 2024).

4. **Flavor-Dependent Long-Range Neutrino Interactions in DUNE and T2HK: Synergy Breeds Power,**
M. Singh, M. Bustamante, Sanjib Kumar Agarwalla, Conference proceedings for the 25th International Workshop on Neutrinos from Accelerators (NuFact 2024).

5. **Exploring constraints on the core radius and density jumps inside Earth using atmospheric neutrino oscillations,**
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6. **Probing non-unitary neutrino mixing using atmospheric neutrinos at INO-ICAL,**
S. Sahoo, S. Das, A. Kumar, S.K. Agarwalla, Contribution to the 25th DAE-BRNS High Energy Physics Symposium (Springer Proc.Phys. 304 290-293). (2024).

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S.K. Agarwalla, S. Das, A. Giarnetti, D. Meloni, Contribution to the 25th DAE-BRNS High Energy Physics Symposium (Springer Proc.Phys. 304 719-721) (2024).

11. **Neutrino Oscillation Parameters: Pre-sent and Future,**
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12. **Run3 CMS High Level Trigger Perfor-mance,**
S. Varghese [on behalf of CMS collaboration] Proceedings of 25th DAE-BRNS High Energy Physics Symposium, Mohali, India; Springer Proc. Phys. 304 (2024) 961-964.

13. **Jet and Missing Transverse Energy Performance at CMS High Level Trigger,**
D. Vats and A. Nayak, Proceedings of 25th DAE-BRNS High Energy Physics Symposium, Mohali, India; Springer Proc. Phys. 304 (2024) 771-773.

14. **Phenomenology of Scalar Lep toquarks: Neutrino Mass, g-2, and B- Anomalies,**
S. Parashar, P. Bandyopadhyay, A. Karan, R. Mandal, A. (Avnish) et al., in Springer Proceedings in Physics, 304, 919–921 (2024).

15. **Singlet-Doublet Fermionic Dark Matter in Gauge Theory of Baryons,**
Taramati, U. Patel, R. Sahu, S. Patra, and K. Ghosh, J. High Energ. Phys. 2025, 1-40 (2025).

16. **Role of different NN potentials and densities in the description of heavyion fusion,**
S. Rana, R. Kumar, and M. Bhuyan,

Proceedings of the DAE Symp. on Nucl. Phys. 68 (2024) 539.

17. **f-mode universal relation of dark matter admixed quarkyonic stars,** D. Dey, J.A. Pattnaik, R.N. Panda, M. Bhuyan, S.K. Patra Proceedings of DAE Symposium On High Energy Physics, Springer Nature, (2025) (**in press**).

18. **Study of surface properties of neutron stars using coherent density fluctuation model,** P. K. Yadav, Raj Kumar, and M. Bhuyan Proceedings of the DAE Symp. on Nucl. Phys. 68 (2024) 89.

19. **Influence of Dark Matter on Neutron Star Curvature within the Quarkyonic Model: A Relativistic Mean Field Approach,** J. A. Pattnaik, D. Dey, R. N. Panda, M. Bhuyan J Proceedings of DAE Symposium on Nuclear Physics 68, (2024) 763.

20. **Dark Matter Effects on f-mode Oscillations in Quarkyonic Stars,** D. Dey, J. A. Pattnaik, R. N. Panda, M. Bhuyan, S. K. Patra, Proceedings of DAE Symposium On Nuclear Physics 68 (2024) 765.

21. **Effect of microscopic nuclear potential on sub-barrier fusion cross-section for $^{30}S_i$+$^{140}C_e$ reaction,** N. Jain, M. Bhuyan, and R. Kumar Proceedings of the DAE Symp. on Nucl. Phys. 68 (2024) 609.

3.3. Book Published/Book Chapter Published:

1. **Title of the Chapter:** Symmetry Energy of Finite Nuclei Using Relativistic Mean Field Densities within Coherent Density Fluctuation Model
Title of the Book: Multifragmentation in Heavy-Ion Reactions
Author(s): M. Kaur, A. Kumar, A. Quddus, **M. Bhuyan**, and S. K. Patra
Year: 2024
Publisher's Name: Jenny Stanford Publishing, New York, USA
ISBN No.: ISBN: 978-1-003-38513-4

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CHAPTER 04

OTHER ACTIVITIES

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4.1. Golden Jubilee Year & 50th Foundation Day Celebration:

Institute of Physics, Bhubaneswar, celebrated a momentous milestone as it marked its Golden Jubilee Year and 50th Foundation Day on September 4th, 2024. The event was held on the Institute's premises, featuring a series of notable activities to honor its rich legacy and contributions to the field of physics. Distinguished Scientist Padma Vibhushan, Dr. R. Chidambaram, Former Chairman of the AEC & Secretary of the DAE, Former Principal Scientific Advisor to the Government of India, and Chairman of the School of Advanced Studies in Nuclear Science & Technology at BARC, Mumbai, graciously served as the Chief Guest. Dr. Chidambaram's profound expertise and valuable insights enriched the proceedings as he delivered the highly anticipated Foundation Day Talk.

The session was chaired by Prof. K. K. Nanda, Director of the Institute of Physics, Bhubaneswar, in the presence of Prof. T. Som, Chairman of the Foundation Day Celebration Committee, and Lt. Col. B. Pattanaik, Registrar, at the Institute's Auditorium. Following the session, a vibrant cultural program took place, showcasing the diverse talents and artistic expressions of the Institute. Members of the press and media were invited to witness the celebration of the Institute of Physics, Bhubaneswar's remarkable 50-year journey. The media event was successfully coordinated by Dr. B. Mohanty, In-charge of PAMID, IOP.

4.2. IOP, Bhubaneswar Commemorated 40 Years with DAE through Special Open Day Event:

Institute of Physics (IOP), Bhubaneswar, invited students, educators, and science enthusiasts to its Open Day event held on 25 March 2025. This special occasion marked **40 years of IOP's association with the Department of Atomic Energy (DAE), Government of India**.

Established in 1972 with initial funding from the Government of Odisha, the Institute of Physics became an aided autonomous institution under DAE in 1985. Over the years, IOP has been at the forefront of cutting-edge research in physics, fostering scientific excellence and innovation.

The Open Day showcased IOP's diverse experimental and theoretical research facilities through interactive demonstrations and live experiments. Designed to engage students, teachers, and science enthusiasts, the event provided a unique opportunity to explore the exciting world of physics. While it encouraged participation from schools, colleges, and universities, the event was also open to the general public, inviting everyone with a curiosity for science.

The inaugural ceremony took place at 9:30 AM, led by Prof. Karuna Kar Nanda, Director, IOP, in the presence of Prof. T. Som, Chairman of Open Day, and Lt. Col. B. Pattanaik, Registrar, IOP. Members of the press and media joined the occasion, making the Open Day a memorable, educational, and inspiring experience.

4.3. Outreach Programme:

The Institute of Physics (IoP), Bhubaneswar has always been enthusiastic to promoting scientific awareness and nurturing young minds. As part of our outreach initiatives, IOP organized large number of Science Outreach Programme specifically designed for students at various stages of their academic journey, including 10th standard, +2 Science, B. Sc., and M. Sc. students.

The programme intended to spark curiosity, foster critical thinking, and provide a platform for students to engage with cutting-edge scientific research and concepts. Through interactive sessions, lectures, and hands-on activities, fun science experiments, IOP's endeavor was to inspire and motivate the next generation of scientists, researchers, and thinkers.

This volume has not only imparted knowledge but also instilled a sense of wonder, awe, and passion for science among the readers. IOP is grateful to all the participants, resource persons, and organizers who have contributed to the success of above programmes. The outreach activities conducted both inside and outside institute during 2024-25 are listed below:

4.3.1. List of Exposure visit of students of different Schools/ Colleges/ Universities to the Institute during 2024-2025

Sl. No.	List of Exposure visit of different Schools/Colleges and Universities	Date of visit	No. of Students
1	Students of nearby Colleges of Nimapara, Puri	30.04.2024	50
2	Freedom International School, Bhatapada, Cuttack	14.05.2024	35
3	Bhadrak Autonomous College, Bhadrak	24.05.2024	45
4	PM Shri Jawahar Navodaya Vidyalaya, Khurda	08.10.2024	80
5	PM Shri Jawahar Navodaya Vidyalaya, Mundali, Cuttack	08.10.2024	50
6	PIMIT Residential Higher Secondary School, Odagaon, Nayagarh	13.11.2024	90
7	Regional Science Congress team of Bhopal Region of Navodaya Vidyalayas under the patronage of PM Shri JNV, Cuttack	15.11.2024	65
8	PM Shri Jawahar Navodaya Vidyalaya, Puri (at Konark)	19.11.2024	80
9	PM Shri Jawahar Navodaya Vidyalaya, Sarang, Dhenkanal	02.12.2024	45
10	PM Shri Kendriya Vidyalaya, Sector-1, CDA, Bidanasi, Cuttack	03-04.12.2024	312
11	Odisha Adarsh Vidyalaya, Digdhar, Thakurmunda, Mayurbhanj	12.12.2024	82
12	PM Shri Kendriya Vidyalaya, Kendrapara	18.12.2024	108
13	Tara Tarini College, Purusottampur, Ganjam	21.01.2025	50
14	Government College, Nayagarh	24.01.2025	50
15	Talcher Autonomous College, Talcher	28.01.2025	60
16	Sai International School, Chandrasekharpur, Bhubaneswar	05.02.2025	60

4.3.2 List of Outreach programmes conducted by the Institute during 2024-2025

Sl.No.	Venue of Outreach Programmes	Date
1	Vigyan International College, Koraput	06.04.2024
2	Brundaban Subudhi College, Daspalla, Nayagarh	10.08.2024
3	Talcher Autonomous College, Talcher, Dist. Angul	14.09.2024
4	Maa Bhuasuni Bidyapitha, Bhuasuni-patna, At/Po. Dingara, Begunia, Khordha	20.09.2024
5	Silicon Institute of Technology, Silicon West, Sason, Sambalpur-768200	04.07.2024
6	Jawahar Navodaya Vidyalaya, Mundali, Cuttack.	09.11.2024
7	Panchayat Degree College, Kantamal, Boudh-762017	06.12.2024 to 07.12.2024
8	Kabi Samrat Upendra Bhanja College, Bhanjanagar, Ganjam-761126 and Uniitech Degree College, Nayagarh (KSUB)	18.01.2025 & 19.01.2025 (UDC)
9	Tara Tarini Degree College, Purusottampur, Ganjam	31.01.2025

4.4. Implementation of the Official Language Policy

Implementation of the Official Language Policy of the Government of India has always been the priority of the Institute of Physics, Bhubaneswar. The Hindi Section in the Institute implements the Official Language Policy.

4.4.1 Official Language Implementation Committee

Official Language Implementation Committee (OLIC) has been constituted in the Institute under the Chairmanship of Director, Institute of Physics, Bhubaneswar. Official Language Implementation Committee held four meetings in the year (April 2024- March 2025) to review the implementation of Official Language Policy in the Institute. In these meetings, quarterly Hindi progress reports regarding progressive use of Hindi in government work were reviewed and ways to encourage the use of Hindi were suggested.

In compliance with the provisions of Section 3 (3) of the Official Languages Act 1963 (as amended 1967), all the documents falling under this section are being issued in bilingual form.

4.4.2 Special measures to increase the use of Hindi

Cash awards and incentive schemes are being implemented in the Institute for officers and employees to do their work in Hindi. Under these schemes, cash awards are given to officers for noting and drafting in Hindi.

Organization of Hindi Day and Hindi Fortnight-2024 On the occasion of Hindi Day on 14th September, 2024, the message of the Hon'ble Home Minister, Government of India and the message of Chairman, Atomic Energy Commission and

Present during the prize distribution ceremony were Lt. Col. Bibekananda Pattanaik, Registrar, Prof. K.K. Nanda, Director and Prof. S.K. Patra, Chairman, IOPEWS

Secretary, Department of Atomic Energy, Government of India were broadcast among all the officers and employees of the Institute, in which it was said that the use of Hindi should be increased in government work. Hindi Fortnight was celebrated in the Institute from 14th to 28th September 2024. During this fortnight, competitions like Hindi essay writing, Hindi noting and drafting, Hindi translation, Hindi poetry recitation etc. were organized. Based on the results of the competition, the participants were declared prize winners. The prize distribution ceremony was held on 14.11.2024.

4.4.3 Workshop Organized : Official Language

Hindi workshops have been organized for the employees of the institute during the year 2024-2025. In these workshops, the participants were given new information related to the use of Hindi while working on computers. The result has come in the form of increasing use of Hindi in government work in the institute.

Shri Achleshwar Singh, Director (Official Language), DAE, Prof. Karuna Kar Nanda, Director and Lt. Col. Bibekananda Pattanaik, Registrar were on dais

A) WORLD HINDI DAY-2025

As per the decision of the Department of Atomic Energy, Government of India, World Hindi Day was organized at IREL (India) Limited, OSCOM, Chhatrapur, Odisha on 01 January 2025. Its objective is to create awareness among the people of the world for the international recognition of Hindi language at the global level and to create a favorable environment abroad. This program was jointly organized by the Institute of Physics, Bhubaneswar and IREL (India) Limited, OSCOM, Chhatrapur. 20 officials of

IREL (India) Limited, OSCOM, Chhatrapur and 19 officials of the Institute of Physics, Bhubaneswar participated in this program.

Guests seated on the stage during the inaugural ceremony of World Hindi Day-2025

Shri Sarada Bhushan Mohanty, Chairman cum Managing Director, IREL (India) Ltd., Prof. Karunakar Nanda, Director, IOP, Lt. Col. Bibekananda Patnaik, Registrar, IOP, Shri CVR Murthy, General Manager cum Chief, MM Division, OSCOM, Shri Achleshwar Singh, Director (Official Language), DAE and Shri K.K. Patra, General Manager & Head, REEP, OSCOM were Present during the inaugural function.

B) Public Awareness Programme through Hindi Language

Institute of Physics, Bhubaneswar has been organizing seminars and other public awareness and outreach programmes from time to time with the aim to create awareness about the activities of Department of Atomic Energy among students, teachers, public representatives, Government officials and general public.

Guests at the observation of World Hindi Day-2025

A Public Awareness Programme for the students of AECS was organized on 30.01.2025 at Atomic Energy Central School, OSCOM, Chhatrapur jointly by Department of Atomic Energy, IREL (India) Limited, OSCOM, Institute of Physics, Bhubaneswar and National Institute of Science Education & Research, Bhubaneswar and Atomic Energy Central School, OSCOM, Chhatrapur. IREL (India) Limited, OSCOM, Institute of Physics, Bhubaneswar, National Institute of Science Education and Research, Bhubaneswar and Department of Atomic Energy jointly organized a Public Awareness Programme for their students on 3-4 February 2025 at Kalinga Institute of Social Sciences, Bhubaneswar Campus.


Participants during the public awareness programme

Department of Atomic Energy, Government of India, IREL (India) Limited, OSCOM, Institute of Physics, Bhubaneswar and National Institute of Science Education and Research, Bhubaneswar jointly organized a Public Awareness Programme on 31.01.2025 at Kendriya Vidyalaya, Chhatrapur.

A joint effort of DAE and Institute of Physics, Bhubaneswar organized a Public Awareness Programme for the students of Talcher Autonomous College, Talcher, Dist.-Anugul, Odisha, students and staff of Institute of Physics on 28.01.2025.

Guests seated on the dais during the inaugural programme at Kendriya Vidyalaya, Chhatrapur, Ganjam, Odisha

4.5. Van Mahotsav Celebration at IOP:

Van Mahotsav function was inaugurated by Prof. Karuna Kar Nanda, Director of IoP on July 7, 2024. The event saw enthusiastic participation from our IoP members, who joined in the tree-planting activities. The presence of IoP authorities added significance to the occasion, highlighting the Institute's dedication to fostering a green and sustainable environment. The IoP's celebration of Van Mahotsav reflects its broader commitment to environmental stewardship and community engagement.

A) Swachhata Initiatives

This year, we took our Swachhata initiatives to new heights by actively involving villagers, students, and the public in various activities. From cleaning toilets and maintaining hygiene to restoring the cleanliness of water bodies, our collective efforts have made a significant impact. These events not only fostered a sense of community but also emphasized the importance of cleanliness and sustainability, inspiring everyone to contribute towards a cleaner, healthier environment.

B) Mass Swachhata Pledge Ceremony

The inauguration ceremony started with the Swachhata pledge on February 16, 2025. Prof. K. K. Nanda Director, IOP briefed the audience about the importance of Swachhata pakhwada. The event was attended by IOP staff members and School students at IOP.

4.6. Sports and Cultural Activities

Along with the research activities, the sports and cultural activities have been promoted through different sports and cultural programs to keep all the members physically fit. To carry out different sports and cultural activities a committee was formed. Institute of Physics Employees Welfare Society (IOPEWS) supports the committee in organizing different events throughout the year. Followings are the different activities conducted during the year 2024-25:

1. A football match was organized by IOPEWS and it was held on 15th August, 2024. It was a friendly football match played between Team A (Faculty and Doctoral Scholars) and Team B (Staff of the Institute). This match was won by Team A. Around 110 spectators were present there to enjoy this football match.
2. A friendly Cricket match was also conducted on the occasion of 26th January, 2025. This match was played between Team A (Faculties and Doctoral scholars) and Team B (Staffs of the Institute). It was a very interesting match. Team A won the match. Around 80-viewers joined and made the event successful.
3. During this period IOPEWS organized various types of competitions among the employees of the organization and their family members. These included painting competition (on a given theme), 100 meter race among children. Song, Musical-Chair and Jhoti competition among women of the colony (family members of employees). Bridge, Chess, Badminton, Slow Cycle Race, Tug of War competition among the employees of the Institute. IOPEWS also organized Volleyball match and Kabaddi match during the session. These competitions were organized in three categories according to age. i.e. children of employees were divided into three categories: 0-5 age group, 5-14 years age group, 14 years and above. Various competitions for employees and students of the Institute like playing Carrom board (double and single), Chess competition, Badminton competition, Song competition, Brisk walking competition, successful candidates of children, women and various competitions were felicitated on the eve of Foundation Day.
4. In the year 24-25, many members of IoP were selected to play in various events of Zonal Selection Matches of XXXIX Annual DAE Sports and Cultural Meet. Among them IOP Drama Group was selected for DAE Cultural Final Meet completion, which was held from 17-24 March, 2025 at Tarapur Atomic Power Station, Tarapur, Mumbai. A troupe of 10 members led by Dr. S. N. Sarangi participated in the Drama Competition where Mr. Brundaban Mohanty, Mrs. Ajita Kujur, Mr. Rajesh Mohapatra, Mr. Pramod K. Senapati, Mr. Bijay K. Das, Mr. Samarendra Das, Mr. Keshaba Ch. Dakua, Mr. Ramesh Ch. Patnaik, Mr. Dhoba Naik and Mr. Rajan Biswal performed various roles in the play titled “Bichara Bigidi Gala”. The play was nominated for the Final Round and stood in the Runners Up category. Shri Brundaban Mohanty awarded as best supporting actor in the competition.

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CHAPTER 05

FACILITIES

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5.1 MAJOR EXPERIMENTAL FACILITIES

ION BEAM FACILITIES

The Ion Beam Laboratory houses the NEC 3 MV tandem Pelletron Accelerator which is one of the major facilities used by researchers from all over the country. The accelerator provides ion beams of energies typically 1-15 MeV starting from protons and alphas to heavy ions. Commonly used ion beams are that of H, He, C, N, Si, Mn, Ag and Au. Multiple charge states are possible for the MeV energy positive ion beams. Argon is used as the stripper gas to produce positive ions. The most probable charge state for heavy ions (carbon or above) is 3+ for terminal potentials above 2 MV.

The beam hall has six beam lines. The beam line at -45° is used for Rutherford Backscattering (RBS), Elastic Recoil Detection Analysis (ERDA), Proton induced X-ray Emission (PIXE), Ultra high vacuum (UHV) and ion channeling. A general purpose scattering chamber suitable for PIXE experiments is available in the 0° line. This beam line also has the potential to perform external PIXE experiments in atmosphere. The 15° beam line is equipped with a raster scanner and is being used for ion implantation. There is a UHV chamber for surface science experiments in the 30° beam line. The 45° beam line houses the micro-beam facility.

The electron cyclotron resonance (ECR) ion source for ion implantation, nanoscale patterning, ion-beam induced epitaxial crystallization, ion beam mixing, ion-beam shaping and synthesis of embedded nanostructures and so on. At Surface Nano structuring and Growth (SUNAG) Laboratory, we have facilitated a low energy (50eV-2 keV), broad beam (I in. diameter) electron cyclotron resonance (ECR) source based ion beam etching facility for creating self-organized surface nanostructures.

MICROSCOPY FACILITIES

The High Resolution Transmission Electron Microscope (HRTEM) facility consists of two components: Jeol 2010 (UHR) TEM and Associated Specimen Preparation system. High-Resolution Transmission Electron Microscopy (HRTEM) with an ultra-high resolution pole-piece

(URP22) working at 200 keV electrons from LaB6 filament assures a high quality lattice imaging with a point-point to resolution of 0.19 nm.

ARUPS FACILITIES

The Angle Resolved Ultraviolet Photoelectron Spectrometer (ARUPS) is equipped with facilities for doing both angle integrated valence band measurements as well as angle resolved valence band measurements. The angle resolved studies are possible on single crystals.

PULSED LASER DEPOSITION (PLD) SYSTEM

PLD system helps growing epitaxial thin films of various materials albeit the most preferred materials are oxides. The newly installed system was developed in a piece-wise manner by procuring several modules from different sources. We are depositing epitaxial bi- and multi-layer thin films of superconducting (viz. YBCO) and colossal magneto-resistance (viz. LSMO) on suitable substrates.

MAGNETIC PROPERTY MEASUREMENT FACILITY

The SQUID-VSM lab consists of the Quantum Design MPMS SQUID-VSM EVERCOOL system. The magnetic property measurement system (MPMS) is a family of analytical instruments configured to study the magnetic properties of samples over a broad range of temperatures and magnetic fields. Extremely sensitive magnetic measurements are performed with superconducting pickup coils and a Superconducting Quantum Interference Device (SQUID).

OPTICAL PROPERTY MEASUREMENT FACILITY

The Micro Raman facility is operated in backscattering geometry. Confocal mapping capabilities with sub-micron spatial resolution are possible. A wide range of excitation wavelengths, using laser, is possible allowing control of the penetration depth into the material, and thus, control of the volume sampled.

5.2. COMPUTER CENTRE

The computer centre facilitates the scientific community dedicatedly in terms of scientific computation and In-House IT facilities. The centre is responsible for managing information and communication technology infrastructure in the Institute. The centres activity ranges from administration (server, network, etc.), and hosting various services to laptop/desktop & user support. The Centre provides support in a hybrid environment consisting of different operating systems such as Unix-based (Cent OS, Redhat, Fedora, Ubuntu), MS Windows and MAC OS. Our Data centre activities have a state-of-the-art mechanism to handle system administration which includes mail services, a centralized storage solution with a backup facility and in-house development of web and intranet and gigabit network connectivity. To accomplish our Data centre activities, we have installed high-end servers, core, distribution, access layer network switches, Firewall (UTM) and load balancer. Wireless network is available across all the buildings on campus.

The centre manages over 200 Desktops, Laptops, Software and licenses (Mathematica, Matlab, Origin etc.), and Closed Circuit Television (CCTV) based surveillance systems installed at several offices and laboratories. Several heavy-duty printers are installed at different locations of academic buildings for general printing over LAN using a terminal and through the Web using online printing facilities.

The institute has leased line Internet connectivity from one Internet Service Provider (ISPs) of 100 Mbps and 1 Gbps network connectivity by the National Knowledge Network (NKN). The Institute operates over its own IP addresses from the Indian Registry for Internet Names and Numbers (IRINN). The Institute is a part of the EDUROAM facility.

The centre provides technical support for administrative work, such as accounting, personnel management, and store management. Several software packages such as MSOffice, Wings 200 Net, Tally and multilingual software are in use.

5.3. SAMKHYA : High Performance Computing Facility

SAMKHYA – High-Performance Computing (HPC) Facility at the Institute is a hybrid environment that consists of Sixty (60) Compute Nodes, two (2) Master Nodes, Four (4) I/O nodes (OSS & MDS) and 50 TB of object storage, QDR Infiniband interconnect and 1 Gbps Local Area Network. The infrastructure consists of two (2) precision ACs (10 tons of refrigeration each) and uninterrupted supply through three (3) 40KVA & one (1) 60 KVA UPS to facilitate the system. The facility consists of 1440 CPU cores, 40 NVIDIA Tesla K80 cards and 40 Intel Xeon Phi 7120P.

This facility has been ranked in the list of top supercomputers in India by CDAC, Bengaluru (January 2018 report at http://topsc.in). The facility is acknowledged in various publications by the user community.

5.4. ANUNET FACILITY

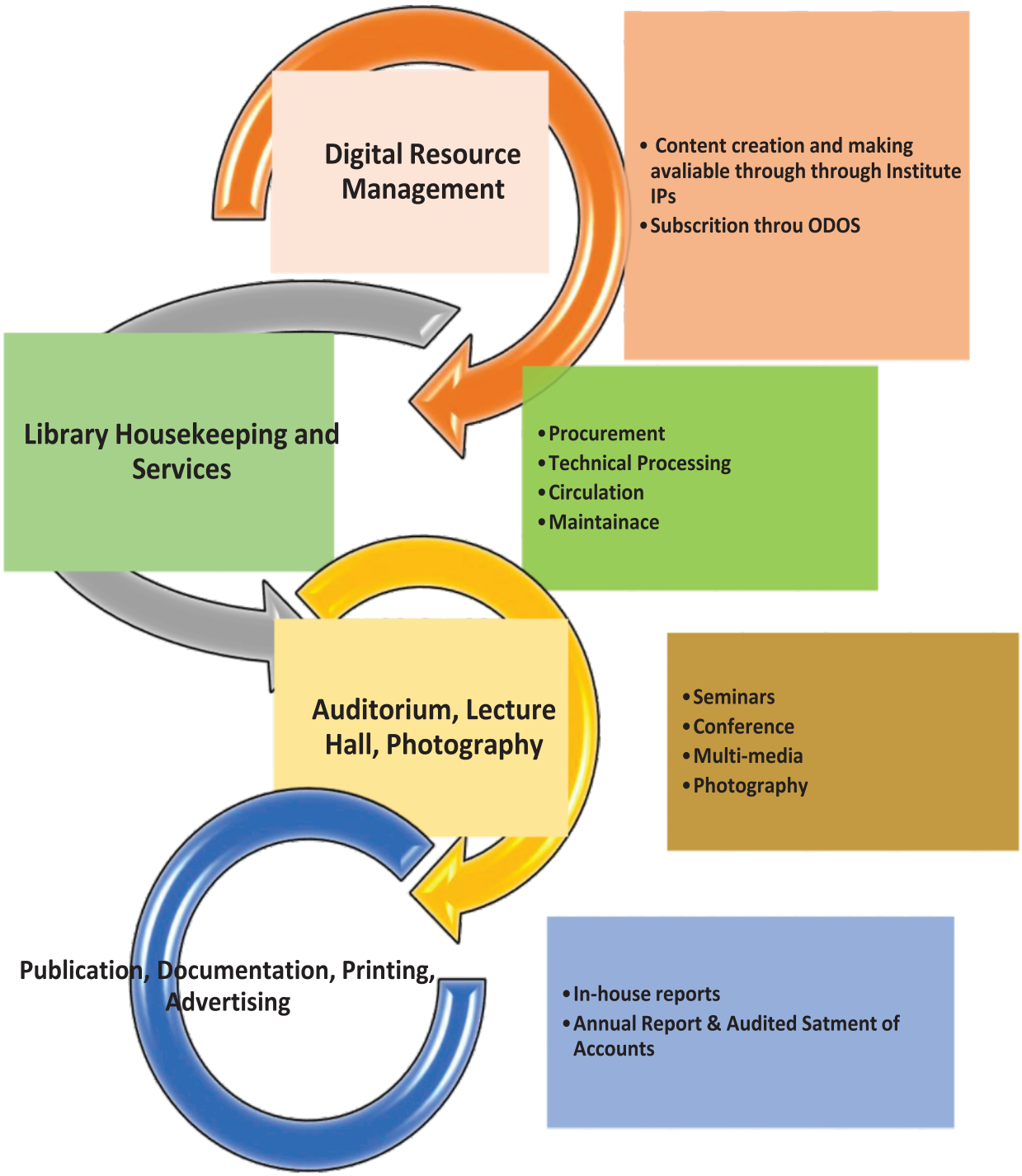
Institute of Physics is a node on ANUNET with the provision to connect other units of DAE directly by VSAT link for voice and data communication. Seismic monitoring equipment has been installed in the Institute and seismic data is being continuously transmitted to Bhabha Atomic Research Centre (BARC) for analysis using ANUNET. The link is also used to connect with DAE and another institute on ANUNET through a video conferencing setup.

The center conducts training, workshops and awareness programs in relevant areas from time to time. In addition to members of the Institute, the computer facility is also being used by Researchers from several other universities and colleges in Odisha for their academic work.

5.5. LIBRARY

The **IOP Library and Resource Center** serves as a vital academic support unit, dedicated to the acquisition, organization, and dissemination of scientific and technical resources in both print and digital formats. Its primary objective is to support the research and academic activities of the Institute's scholars, staff, and visiting researchers. In addition, the **General Library** caters to the broader IOP

community, promoting general reading and a culture of lifelong learning. Beyond conventional library services, the IOP Library also provides a suite of support functions, including reprography, printing, publishing, advertising, photography, videography, and auditorium coordination. It plays an active role in outreach initiatives, regularly hosting seminars, conferences, and academic training programs. A schematic overview of the library's operations is provided in the accompanying visual representation.



The Library facility is open to both members of the Institute and individuals from other academic institutions, particularly DAE members and those affiliated with the Department of Higher Education of the Government of Odisha. For a comprehensive overview of the Library's holdings, users can visit the Library Portal at http://www.iopb.res.in/~library.

Collections and Resources:

- The Library holds a rich and diverse collection comprising:
- Over 17,620+ print books
- More than 10,500 e-books
- 23,643 bound volumes of journals

As a participating member of national and institutional consortia namely, **ONOS (One Nation One Subscription)** and **ODOS (One DAE One Subscription)**, the Library provides access to 13,000+ peer-reviewed full-text journals from 30 international publishers, covering a broad spectrum of disciplines including science, engineering, medicine, social sciences, and the humanities. In addition to consortia resources, the Library continues to renew subscriptions for 35+ e-journals (non-ONOS/ODOS) along with selected **print journals, magazines**, and **newspapers**. Perpetual access rights have been acquired for archival content from leading publishers such as IOP (UK), John Wiley, Springer Nature (Physics and Astronomy), Scientific American, World Scientific, and Annual Reviews (OJA). Further, the Library provides enduring access to titles in the Lecture Notes in Mathematics and Physics series.

Digital Tools and Services:

To support academic writing and uphold research integrity, the Library subscribes to:

- **iThenticate** – An anti-plagiarism tool accessible within the IOP IP range via the IOP Library at http://www.iopb.res.in/~library/plagiarism.php
- **Grammarly Premium** – A cloud-based writing enhancement and citation audit tool

As part of its resource-sharing initiative, the Library facilitates access to research articles through Digital Inter-Library Loan (ILL) services. Notably, the IOP Library was the first library in Odisha to be automated using the Integrated Library Management System (ILMS) namely LibSys. It has then migrated to an **RFID-based Smart Library Solution** powered by the KOHA (a widely used Open-source ILMS) in the year 2018. This system supports various library housekeeping activities, including acquisition, cataloguing, circulation, and

serial control, with automated check-in and check-out functionalities. To search for books and journals, users can utilize the Library's WEB-OPAC, accessible at https://www.iopb.res.in/~library/ or http://10.0.1.16/.

Other Activities and Outreach:

The Library also oversees the Publication, Printing, and Advertisement (PRD) division of the Institute and provides comprehensive reprographic services. To promote effective use of digital resources and enhance user proficiency, regular training-cum-demonstration sessions are organized for the research community.

The Library further extends its support through study tours, internship opportunities for Library and Information Science (LIS) students, and guidance for project and dissertation work, playing a pivotal role in the academic development of future professionals.

5.6. AUDITORIUM

The Institute houses a state-of-the-art auditorium, designed to host a variety of events including colloquia, seminars, workshops, conferences, cultural programs, and social functions. This modern facility, with a seating capacity of over 320, is fully equipped with advanced audiovisual and presentation systems, ensuring a high-quality experience for both organizers and participants.

CHAPTER 06

PERSONNEL

राष्ट्र की सेवा में परमाणु
भौ सं
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PERSONNEL

Prof. Karuna Kar Nanda, Director
Institute of Physics

6.1. List of Faculty members and their research specialization

1. **Prof. Biju Raja Sekhar**
Professor
Condensed Matter Physics
(Experiment)

2. **Prof. Sudipta Mukherji**
Professor
High Energy Physics (Theory)

3. **Prof. Suresh Kumar Patra**
Professor **(Up to 30.04.2024)**
Nuclear Physics (Theory)

4. **Prof. Tapobrata Som**
Professor
Condensed Matter Physics
(Experiment)

5. **Prof. Goutam Tripathy**
Associate Professor
Condensed Matter Physics
(Theory)

6. **Prof. Pradip Kumar Sahu**
Professor
Nuclear **Physic**s (Theory)

7. **Prof. Dinesh Topwal**
Associate Professpr
Condensed Matter Physics
(Experiment)

8. **Prof. Sanjib Kumar Agarwalla**
Associate Professor
High Energy Physics (Theory)

9. **Prof. Arijit Saha**
Associate Professor
Condensed Matter Physics
(Theory)

10. **Prof. Saptarshi Mandal**
Associate Professor
Condensed Matter Physics
(Theory)

11. **Prof. Satyaprakash Sahoo**
Associate Professor
Condensed Matter Physics
(Experiment)

12. **Prof. Aruna Kumar Nayak**
Associate Professor
High Energy Physics (Experiment)

13. **Prof. Debashis Chaudhuri**
Associate Professor
Condensed Matter Physics
(Theory)

14. **Prof. Debakanta Samal**
Associate Professor
Condensed Matter Physics
(Experiment)

15. **Dr. Debottam Das**
Associate Professor
High Energy Physics (Theory)

16. **Dr. Manimala Mitra**
Associate Professor
High Energy Physics (Theory)

17. **Dr. Kirtiman Ghosh**
Associate Professor
High Energy Physics (Theory)

6.2. Inspire/Visiting Faculty:

6.2.1. Inspire Faculty

1. Dr. Aparajita Mandal

6.2.2. Ramanujan Fellow

1. Dr. Pinaki Banerjee
2. Dr. Mrutunjay Bhuyan

6.3. POST-DOCTORAL FELLOWS (INSTITUTE)

1. Dr. Deepak Kumar
2. Dr. Hemanta Kumar Sharma
3. Dr. Joy Mukherjee
4. Dr. Rasmita Sahoo
5. Dr. Abhijit Kumar Saha
6. Dr. Koushik Naskar
7. Dr. Sagarika Swain

POST-DOCTORAL FELLOWS (PROJECT)

1. Dr. Abhishek Das
2. Dr. Arindam Lala
3. Dr. Arvind Bhaskar
4. Dr. Ashish
5. Dr. Harisamkar S
6. Dr. Jit Satra
7. Dr. Lalit Kumar Saini
8. Dr. Md. Ishquae Khan
[(P) CEFIPRA]
9. Dr. Mohammad Asif Bhat
10. Dr. Mrinal Kanti Sikdar
11. Dr. Nilakshi Das
12. Dr. Paswa Nath
13. Dr. Pavan Kumar Yerra
14. Dr. Pooja Saini
15. Dr. Purusottam Ghosh
16. Dr. R. Thiru Senthil
17. Dr. Rajneesh Kumar
18. Dr. Ramita Sarkar
19. Dr. Smrutirekha Swain
20. Dr. Songshaptak De
21. Dr. Sreelakshmi
22. Dr. Subhadeep Datta
23. Dr. Subhashree Sahoo
24. Dr. Sudeshna Maity
25. Dr. Sudipta Moshat
26. Dr. Sukanta Kumar Jena

6.4. Doctoral Scholar

1. Mr. Rupam Mandal *(upto 24.12.2024)*
2. Mr. Abhishek Roy *(upto 29.10.2024)*
3. Ms. Aisha Khatun
4. Mr. Arpan Sinha *(upto 22.01.2025)*
5. Mr. Chitrak Karan *(upto 06.12.2024)*
6. Mr. Mousam Ch Sahu *(upto 04.06.24)*
7. Mr. Pragyanprasu Swain
8. Mr. Pritam Chatterjee *(upto 10.08.24)*
9. Mr. Ritam Kundu
10. Mr. Sameer K. Mallik *(upto 10.08.24)*
11. Mr. Siddharth P. Maharathy *(upto 03.10.24)*

12. Mr. Sudipta Das *(upto 23.10.2024)*
13. Mr. Sandhyarani Sahoo *(upto 04.10.24)*
14. Mr. Ithineni Sairam
15. Mr. Rameswar Sahu
16. Mr. Sanu Varghese
17. Mr. Sk. Moonsun Pervez
18. Mr. Subhadip Bisal
19. Mr. Debasish Mondal
20. Mr. Dipak Maity
21. Mr. Digbijaya Palai
22. Mr. Suman Roy
23. Ms. Sharmistha Chattopadhyay
24. Mr. Manish Patel
25. Mr. Aswin Kumar Burma
26. Ms. Pujalin Biswal
27. Mr. Kamalesh Bera
28. Mr. Amartya Pal
29. Mr. Alok Kumar
30. Ms. Sayari Ghatak
31. Mr. Ashish Kumar Panigrahi
32. Mr. Rahul Puri
33. Mr. Sayak Bhowmik
34. Mr. Debabrata Dey
35. Mr. Nevin Noble
36. Ms. Subhalaxmi Rout
37. Mr. Subhransu Sekhar Mishra
38. Mr. Aditya Mehta
39. Ms. Ruma Khatun
40. Mr. Debabrata Sahoo
41. Mr. Subham Saha
42. Mr. Tarakeswar Mondal
43. Mr. Raj Rajiv Upadhyay
44. Ms. Ankita Ghosh
45. Ms. Minakshi Subhadarshini
46. Mr. Smruti Ranjan Senapaty
47. Mr. Abhishek Hota
48. Mr. Shanu Bandyopadhyay
49. Mr. Ohidul Alam
50. Ms. Nutan Das *(upto 19.07.2024)*
51. Mr. Subhankar Gope *(upto 10.01.2025)*
52. Mr. Jayanta Kumar Panigrahi
53. Mr. Debidatta Mohanty
54. Mr. Babulu Pradhan

6.5. Pre-Doctoral Scholar

1. Mr. Bibhubhusan Swain
2. Mr. Dhananjaya Sahoo
3. Mr. Rohit Kumar Pandey
4. Ms. Gargi Rath
5. Mr. Sandeepan Sahoo
6. Mr. Sameer Kumar Sahoo
7. Mr. Sashibhusan Sahoo
8. Mr. Ranjan Sharma (upto 16.12.2024)

6.6. PROJECT ASSOCIATE & SCIENTIST

1. Dr. Dibyendu Nanda
2. Ms. Antara Dey
3. Dr. Shyamapada Patra

6.7. ADMINISTRATIVE PERSONNEL

Dr. S. N. Sarangi, Registrar
(from 01.08.2023 to 01.09.2024)
Lt. Col. B. Pattanaik, Registrar
(from 02.09.2024)

(i) Director's Office:

1. Bira Kishore Mishra (Consultant)
2. Saubhagyalaxmi Das
3. Lipika Sahoo
4. Purabi Paramita
5. Samarendra Das

(ii) Registrar's Office

1. Ms. Titili Amrit *(from 03.01.2024)*

2. Mr. Dhoba Nayak
(from 01.06.2023)

(iii) Establishment

1. M.V. Vanjeeswaran
(upto 28.02.2024)
2. Bhagaban Behera
(Hindi Cell)
3. Baula Tudu
4. Pramod Kumar Senapati
5. Rajesh Mohapatra
6. Abhishek Mahraik
7. Shubharam Rout
(from 01.04.2024)
8. Sudhakar Pradhan

(iv) Stores & Transport

1. Keshab Chandra Dakua
2. Sarat Chandra Pradhan
3. Jahangir Khan

(v) EPABX

1. Arakhita Sahoo

(vi) Accounts

1. Debendranath Sahoo
2. Priyabrata Patra
3. Purabi Paramita
4. Prativa Choudhury
5. Basalaxmi Tudu
(from 01.04.2024)
6. Bijaya Kumar Swain

(vii) Maintenance (Electrical)

1. Arun Kanta Dash
2. Debaraj Bhuyan
(upto 30.04.2024)
3. Brundaban Mohanty
4. Deba Prasad Nanda
5. Naba Kishore Jhankar
6. Martin Pradhan
7. Chandra Mohan Hansdah
8. Pradip Kumar Naik
9. Santosh Moharana (Civil)
(from 04.07.2024)
10. Ranjit Das *(from 09.07.2024)*
11. Jivan Jyoti Prusti
(from 27.08.2024)
12. Shivram Chaurasiya
(07.10.2024 – 13.02.2025)

(viii) Estate Management

1. Saroj Kumar Jena.
2. Tikan Kumar Parida
(upto 31.01.2025)
3. Bijaya Kumar Das
5. Sanatan Pradhan
(upto 31.03.2025)
6. Bhaskara Mallick
7. Pitabas Barik
(upto 31.05.2024)
9. Kapila Pradhan
10. Charan Bhoi
(upto 31.12.2024)
11. Jatindra Nath Bastia
12. Basanta Kumar Naik
(upto 08.07.2024)
13. Ramakanta Nayak
(upto 31.12.2024)
14. Ramesh Kumar Patnaik

(ix) Library

1. Dr. Basudev Mohanty
2. Ajita Kumari Kujur
3. Kisan Kumar Sahoo
4. Daitari Das

(x) Computer Centre

1. Makrand Siddhabhatti
2. Nageswari Majhi
3. Jyoti Ranjan Behera

(xi) Laboratory

1. Sanjib Kumar Sahu
2. Dr. Sachindra Nath Sarangi
3. Khirod Chandra Patra
4. Madhusudan Majhi
5. Ramarani Dash
6. Santosh Kumar Choudhury
7. Dr. Biswajit Mallick
8. Pratap Kumar Biswal
9. Bala Krushna Dash
10. Soumya Ranjan Mohanty
11. Mamali Behera
    (from 05.07.2024)
12. Jothi Manikandan S.V
    (from 30.09.2024)
13. Arkapravo Bera
    (from 04.10.2024)
14. Purna Chandra Marndi
15. Srikanta Mishra
16. Ranjan Kumar Sahoo

(xii) Workshop

1. Subhabrata Tripathy
2. Ratikanta Majhi
   (from 03.07.2024)

(xii) Purchase Section

1. Dr. Khirod Ch. Patra
   (Scientific Officer in Charge, Purchase Cell)
2. Aviram Sahoo
3. Shubharam Rout
   (from 20.08.2024)
4. Aakash Verma
   (from 10.06.2024)

6.8 List of Retired Members

Prof. S. K. Patra
Post Held : Senior Professor
Date of Joining : 07.08.2001
Date of Retirement : 30.04.2024

Mr. Debraj Bhuyan
Post Held : Tradesman-C
Date of Joining : 24.11.1992
Date of Retirement : 30.04.2024

Mr. Pitabas Barik
Post Held : MTS-C
Date of Joining : 24.11.1992
Date of Retirement : 31.05.2023

Mr. Charana Bhoi
Post Held : MTS-C
Date of Joining : 16.08.2011
Date of Retirement : 31.12.2024

Mr. Tikan Kumar Pradhan
Post Held : MTS-C
Date of Joining : 03.07.1990
Date of Retirement : 31.01.2025

Mr. M. V. Vanjeeswaran
Post Held : Administrative Officer
Date of Joining : 21.03.2005
Date of Retirement : 28.02.2025

Mr. Sanatan Pradhan
Post Held : MTS-C
Date of Joining : 10.07.1992
Date of Retirement : 31.03.2025

6.9 List of New Members

Lt. Col. B. Pattanaik
Joined as Registrar on 02.09.2024

Ms. Basalaxmi Tudu
Joined as LDC on 01.04.2024

Mr. Shubharam Raot
Joined as LDC on 01.04.2024

Mr. Aakash Verma
Joined as LDC on 10.06.2024

Ms. Mamali Behera
Joined as Scientific Assistant-B
on 05.07.2024

Mr. Ratikanta Majhi
Joined as Tradesman - A (Machinist)
on 03.07.2024

Mr. Santosh Maharana
Joined as Tradesman - A (Carpenter)
on 04.07.2024

Mr. Ranjit Das
Joined as Tradesman - A (Electrician)
on 09.07.2024

Mr. Jivanjyoti Prusty
Joined as Tradesman - A (Electrician)
on 27.08.2024

Mr. Jothi Manikandan S. V.
Joined as Scientific Assistant-B
on 30.09.2024

Mr. Arkapravo Bera
Joined as Scientific Assistant - B
on 04.10.2024

Mr. Shivam Chaurasiya
Joined as Tradesman - A (Plumber)
for the period 07.10.2024 to 13.02.2025

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2024-25

भौतिकी संस्थान
INSTITUTE OF PHYSICS
भुवनेश्वर, ओडिशा
BHUBANESWAR, ODISHA

जीआरसी एंड एसोसिएट्स / Satapathy & Associates
सनदी लेखाकार / Chartered Accountants
प्लॉट नं. -461/1494, प्राची विहार/ Plot No-461/1494, Prachi Vihar,
पोस्ट ऑफिस: जीजीपी कॉलोनी / PO: GGP Colony
भुवनेश्वर-751025/ Bhubaneswar-751025

SATAPATHY & ASSOCIATES
Chartered Accountants

CA INDIA

Head Office
Plot no. 461/1494,Prachi Vihar
(Back side of Mayur Plaza Apartment
Po- GGP Colony, Palasuni, BBSR- 751025
Mob.: 9861561653,8249130108,94371 83035
E-mail : pksatapathybbsr@gmail.com

INDEPENDENT AUDITORS' REPORT

To

The Director,

Institute of Physics,

Bhubaneswar-751005.

Report on the audit of the financial statements

We have audited the accompanying financial statements of **INSTITUTE OF PHYSICS** ("the Society"), which comprise the balance sheet as at March 31, 2025, and the Statement of Income and Expenditure for the year ended as on that date.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation of the financial statements that give a true and fair view of the financial position, financial performance of the Society in accordance with the applicable Accounting Standards and Societies Registration Act 1860. This responsibility includes the design, implementation and maintenance of the internal control relevant to the preparation of the financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's responsibility

Our responsibility is to express an opinion on these financial statements based on audit. We conducted our audit in accordance with the standards on auditing issued by the Institute of Chartered Accountants of India. Those standards require that we comply with ethical requirements and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing producing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risk of material misstatement of the financial statements, whether due to fraud or error. In making preparation and fair representation of the financial statements in order to design audit procedures that are appropriate in the circumstances. An audit also includes evaluating the appropriateness of accounting polices used and the reasonableness of the accounting estimates made by the management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

SATAPATHY & ASSOCIATES
Chartered Accountants

Head Office
Plot no. 461/1494,Prachi Viha
(Back side of Mayur Plaza Apartmen
Po- GGP Colony, Palasuni, BBSR- 751025
Mob.: 9861561653,8249130108,94371 8303
E-mail : pksatapathybbsr@gmail.com

Qualified opinion

Basis of Qualification:

1.

a) The Society has not followed IAS 10 for accounting of fixed assets and AS 6 for provision of depreciation. The society has not maintained fixed assets register to verify the individual asset residual value. Depreciation has been charged on gross block at the end of the year on SLM method irrespective of the fact that individual old assets may have been depreciated in full. The depreciation on assets purchased during the year was also charged for the whole year instead of proportionate basis from date to use.

b) The Fixed Assets of the Society were not physically verified in full during the year under audit.

c) None of the Fixed Assets of the Society were tested for impairment in accordance with IAS 28 and no provision has been made for impairment if any.

2. IAS 12 on accounting of Government grants has not been followed. The grants have been recognized on realization basis. Unspent Capital grants have been recognized as capital fund and shown as Liability.

3. The Capital Fund of the Institute is decreased to the tune of Rs.97.03 lakhs to due recognition of unutilised Government grant as current liabilities at the end of the year.

Emphasis of Matter:

Attention of the management is also drawn on the following matter:

1. Balances of advances and liabilities to/from third parties are subjects to confirmation.

Based on the above, in our opinion and to the best of our information and according to the explanations given to us, the financial statement read with the Accounting policies and note on accounts gives the information required by the Act in the manner so required and give a True and Fairview in conformity with the Accounting Principles Generally Accepted in India.

a. In the case of Balance sheet of the state of affairs of the Society as at March 31 2025
b. In the case of the statement of income and expenditure, of the deficit of the institute for the year ended on that date.

SATAPATHY & ASSOCIATES
Chartered Accountants

Head Office
Plot no. 461/1494,Prachi Vihar
(Back side of Mayur Plaza Apartment
Po- GGP Colony, Palasuni, BBSR- 751025
Mob.: 9861561653,8249130108,94371 83035
E-mail : pksatapathybbsr@gmail.com

Report on other legal and regulatory requirements

(a) We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit and have found them to be satisfactory.

(b) In our opinion proper books of account as required by law have been kept by the Institute, so far as it appears from our examination of those books.

(c) The Balance Sheet, the Statement of income and Expenditure and Receipts and payment dealt with by this report are in agreement with the books of accounts.

For Satapathy & Associates
Chartered Accountants
Firm Registration No.324904E

CA P. K. Satapathy/FCA,DISA
Partner
MembershipNo.059161
UDIN: 25059161BMHXNV2331

Place: Bhubaneswar
Date: 30.08.2025

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005
Balance Sheet as at 31st March 2025

(Amount in Rs.)

Sl.	Particulars	Note	As on '31 March 2025	As on '31 March 2024
I	**Sources of Funds**			
1	**NPO Funds**	3	50,12,28,870	48,33,54,953
(a)	Unrestricted Funds			
(b)	Restricted Funds			
(c)	EARMARKED/ENDOWMENT FUNDS	3(a)	85,45,805	79,74,860
			50,97,74,676	49,13,29,813
2	**Non-current liabilities**			
(a)	Long-term borrowings	4	-	-
(b)	Other long-term liabilities	5	-	-
(c)	Long-term provisions	6	16,55,96,963	16,17,37,179
			16,55,96,963	16,17,37,179
3	**Current liabilities**			
(a)	Short-term borrowings	4	-	-
(b)	Payables	7		
(c)	Other current liabilities	8	3,37,66,146	3,36,07,480
(d)	Short-term provisions	6	21,20,539	38,59,784
			3,58,86,685	3,74,67,264
	Total		71,12,58,324	69,05,34,256
II	**Application of Funds**			
1	**Non-current assets**			
(a)	Property, Plant and Equipment and Intangible assets	9		
(i)	Property, Plant and Equipment		67,30,37,375	65,61,73,226
(ii)	Intangible assets			
(iii)	Capital work in progress			
(iv)	Intangible asset under development			
(b)	Non-current investments	10	-	-
(c)	Long Term Loans and Advances	11	-	-
(d)	Other non-current assets (specify nature)	12	-	-
			67,30,37,375	65,61,73,226
2	**Current assets**			
(a)	Current investments	10	-	-
(b)	Inventories	22	23,70,540	23,20,363
(c)	Receivables	13	-	-
(d)	Cash and bank balances	14	3,25,80,007	2,89,78,213
(e)	Short Term Loans and Advances	11	32,70,402	30,62,454
(f)	Other current assets	15	-	-
			3,82,20,949	3,43,61,030
	Total		71,12,58,324	69,05,34,256
	Brief about the Entity	1		
	Summary of significant accounting policies	2		
	The accompanying notes are an integral part of the financial Statements			

As per our attached report of even date

For and on behalf of
Satapathy & Associates
Chartered Accountants
FRN-324904E

CA P K Satapathy
Partner
M.No. 059161
UDIN: 25059161BMHXNV2331
Place: Bhubaneswar
Date: The 30th Day of August 2025

For and on behalf of
Institute of Physics, Bubaneswar

A Sahoo
(A.Sahoo)
Jr. Accounts Officer
कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

(Lt. Col. B. Pattanaik)
REGISTRAR
रेजिस्ट्रार/REGISTRAR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

(Prof. K.K. Nanda)
DIRECTOR
निदेशक/DIRECTOR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005
Income and Expenditure for the year ended 31st March 2025

(Amount in Rs.)

	Particulars	Note	As on '31 March 2025			As on '31 March 2024		
			Unrestricted fund	Restricted funds	Total	Unrestricted funds	Restricted funds	Total
I	Income	23			38,49,70,583			38,81,78,035
(a)	Donations and Grants				38,49,70,583			38,81,78,035
(b)	Fees from Rendering of Services							
(c)	Sale of Goods							
II	Other Income	16			11,62,472		-	14,49,236
III	Total Income (I+II)				38,61,33,055		-	38,96,27,270
IV	Expenses:							
(a)	Material consumed/distributed	17					-	-
(b)	Donations/contributions paid							
(c)	Employee benefits expense	18			28,45,34,230		-	27,78,56,214
(d)	Finance Cost	19			-		-	-
(e)	Depreciation and amortization expense	20			6,70,41,377			7,61,31,977
(f)	Other expenses	21			9,80,38,217		-	9,58,95,486
(g)	Religion/charitable expenses							
(h)	Other Expenses (specify nature)							
	Total expenses				44,96,13,824		-	44,98,83,678
V	Excess of Income overExpenditure for the year before exceptional and extraordinary items (III- IV)				-6,34,80,769		-	-6,02,56,407
VI	Exceptional items (specify nature & provide note/delete if none)						-	-
VII	Excess of Income over Expenditure for the year before extraordinary items (V-VI)				-6,34,80,769		-	-6,02,56,407
VIII	Extraordinary Items (specify nature & provide note/delete if none)						-	-
IX	Excess of Income over Expenditure for the year (VII-VIII)				-6,34,80,769		-	-6,02,56,407
	Appropriations Transfer to funds, e.g., Building fund							
	Transfer from funds							
	Balance tansferred to General Fund							
	The accompanying notes are an integral part of the financial Statements							

As per our attached report of even date

For and on behalf of
Satapathy & Associates
Chartered Accountants
FRN-324904E

CA P K Satapathy
Partner
M.No. 059161
UDIN: 25059161BMHXNV2331
Place: Bhubaneswar
Date: The 30th Day of August 2025

SATAPATHY & ASSOCIATES Bhubaneswar M. No. 059161 FRN-324904E Chartered Accountants

(Mr.A.Sahoo)
Jr. Accounts Officer
कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

For and on behalf of
Institute of Physics, Bubaneswar

(Lt. Col. B. Patnaik)
REGISTRAR
रेजिस्ट्रार/REGISTRAR
भौतिकी संस्थान/INSTITUTE OF PHYSICS
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भुवनेश्वर/BHUBANESWAR

INSTITUTE OF PHYSICS, SASCHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended, 31st March, 2025

Note - 3 NPOs Funds

(Amount in Rs.)

Sr. No.	Particulars	As at 1st April 2024(Opening Balance)	Funds transferred/received during the year	Funds Utilised during the year	As at 31st March 2025 (Closing Balance)
(A)	**Unrestricted Funds**	**48,33,54,953**			**48,33,54,953**
	Balances as at the beginning of the year		-		-
	Add : Contributions towards Corpus/Capital Fund	-		8,13,54,686	-
	Add/(Deduct) : Balance of Income/(Expenditure) transferred from Income & expenditure Account	-	-	-6,34,80,769	1,78,73,917
(B)	**Restricted Funds**				-
			-	**1,78,73,917**	**50,12,28,870**
Previous Year (PY)			-	-	**48,33,54,953**

SATAPATHY & ASSOCIATES Chartered Accountants

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
भौतिकी संस्थान/INSTITUTE OF PHYSICS
भुवनेश्वर/BHUBANESWAR

रजिस्ट्रार/REGISTRAR
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निदेशक/DIRECTOR
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भुवनेश्वर/BHUBANESWAR

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005
Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular	Long Term		Short Term	
4	Borrowings	As on '31 March 2025	As on '31 March 2024	As on '31 March 2025	As on '31 March 2024
	Secured				
(a)	Term loans				
(i)	from banks	-	-	-	-
(ii)	from other parties	-	-	-	-
(b)	**Loans repayable on demand**				
(i)	from banks	NA	NA	-	-
(ii)	from other parties	NA	NA	-	-
(c)	Deferred payment liabilities	-	-	-	-
(d)	Loans and advances from related parties	-	-	-	-
(e)	Long term/current maturitites of finance lease obligation	-	-		
(f)	Other loans advances (specify nature)	-	-	-	-
	Total (A)	-	-	-	-
	Unsecured				
(a)	**Term loans**				
(i)	from banks	-	-	-	-
(ii)	from other parties	-	-	-	-
(b)	**Loans repayable on demand**				
(i)	from banks	NA	NA	-	-
(ii)	from other parties	NA	NA	-	-
(c)	Deferred payment liabilities	-	-	-	-
(d)	Loans and advances from related parties	-	-	-	-
(e)	Long term/current maturitites of finance lease obligation	-	-	-	-
(f)	Other loans advances (specify nature)	-	-	-	-
	Total (B)	-	-	-	-
	Total (A) + (B)	-	-	-	-
	Foot Note:				
(i)	Nature of the Security to be specified separately.				
(ii)	Terms of repayment of terms loans and other loans may be stated.				
(iii)	Where loans guranteed by partners/proprietors/owners aggregate of such amount under each head may be disclosed.				

S.N.RAPATHY & ASSOCIATES Chartered Accountants FRN-324904E

A Sahoo
कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
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Vanda
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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular	(Amount in Rs.)	
5	**Other long-term liabilities**	As on '31 March 2025	31 March 2024
(a)	Advance from customers	-	-
(b)	Others (please specify)	-	-
	Total Other long-term liabilities	-	-

6	**Provisions**	Long term		Short term	
		As on '31 March 2025	31 March 2024	As on '31 March 2025	31 March 2024
(a)	**Provision for employee benefits**				
(i)	Provision for gratuity	8,36,34,338	8,00,64,547	58,706	35,69,791
(ii)	Provision for leave Encashment	8,19,62,625	8,16,72,632	20,61,833	2,89,993
(b)	**Other provisions**	-	-	-	-
	(Please Specify - eg/- Provision for warranties / Provision for Sales Return)	-	-	-	-
	Other (specify nature)	-	-	-	-
	Total Provisions	**16,55,96,963**	**16,17,37,179**	**21,20,539**	**38,59,784**

7	**Payables**	As on '31 March 2025	31 March 2024
(a)	Total outstanding dues of micro, small and medium enterprises	-	-
(b)	Total outstanding dues of creditors other than micro, small and medium enterprises	-	-
	Total payables	-	-
	Disclosure relating to suppliers registered under MSMED Act based on the information available with the entity Company:		

SATPATHY & ASSOCIATES Chartered Accountants

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular		(Amount in Rs.)
	Particulars	As on '31 March 2025	31 March 2024
	(a) Amount remaining unpaid to any supplier at the end of each accounting year:		
	Principal	-	-
	Interest	-	-
	Total	-	-
	(b) The amount of interest paid by the buyer in terms of section 16 of the MSMED Act, along with the amount of the payment made to the supplier beyond the appointed day during each accounting year.	-	-
	(c) The amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under the MSMED Act.	-	-
	(d) The amount of interest accrued and remaining unpaid at the end of each accounting year.	-	-
	(e) The amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues above are actually paid to the small enterprise, for the purpose of disallowance of a deductible expenditure under section 23 of the MSMED Act.	-	-

8	Other current liabilities	As on '31 March 2025	31 March 2024
(a)	Current maturities of finance lease obligations	-	-
(b)	Interest accrued but not due on borrowings	-	-
(c)	Interest accrued and due on borrowings	-	-
(d)	Income received in advance	-	-
(e)	Unearned revenue	-	-
(f)	Goods and Service tax payable	-	-
(g)	TDS payable	-	-
(h)	**Other payables (specify nature)**	-	-
I	GST Recovery Payable	6,075.00	-
II	GSLI Premium Payable	50.00	
III	TCS Payable	398.00	
IV	Labour Cess Payable	21,978.00	
V	Earnest money Deposit	1,47,820	1,20,210

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
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भुवनेश्वर/BHUBANESWAR

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular		(Amount in Rs.)
VI	Caution money from Scholars	22,200	20,600
VII	Audit Fee Payable	59,000	59,000
VIII	Project Grant Payable	1,47,778	5,18,999
IX	Provision for Expenses	2,21,30,861	2,07,29,135
X	Payable to NALCO Project	68,701	68,701
XI	Pension Payable	13,500	-
XII	Gratuity Payable	2,81,213	5,67,993
XIII	Security Deposit - contractors	11,40,650	4,92,453
XIV	Transferable Receipt	21,922	17,422
XV	Unspent Grant	97,03,000	97,03,000
XVI	Incometax Payable	1,000	1,45,130
XVII	GSLI Claim Payable	-	10,205
XVIII	Interest Payable to DAE (NP)	-	1,25,543
XIX	Interest Payable to DAE (Plan)	-	10,29,089
	Total Other current liabilities	**3,37,66,146**	**3,36,07,480**

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Property, Plant and Equipment and Intangible Assets (owned assets)

(Amount in Rs.)

Particulars /Assets	TANGIBLE ASSETS														
	Leasehold land	Buildings(Leasehold land)	Plant and Equipment	Computer/Peripherals	Road	Office equipment	Electric installations	Library Books	Furniture & Fixtures	Vehicles	Capital Work-in-Progress	Advance for capital Goods	Online Journal Subscription	Total	Previous Year Total
Gross Block															
At 1 April 2024	50,00,000.00	21,09,86,379.00	96,72,86,902.00	15,17,03,736.00	65,48,158.00	13,11,21,856.00	5,11,79,788.00	46,58,23,758.00	2,40,31,887.00	28,70,817.00	12,23,57,573.35	2,28,702.00	3,87,34,642.00	2,17,78,74,199.00	2,14,91,85,663.00
Additions			9,41,82,120.00	9,643.00		5,52,495.00		44,638.00	1,65,019.00		74,19,215.00		41,18,671.00	10,64,91,801.65	8,42,84,122.60
Deductions/Adjustments											2,23,57,574.00	2,28,702.00		2,25,86,276.65	5,55,95,586.88
At 1 April 20X0															
Additions															
Deductions/Adjustments															
At 31 March 2025	50,00,000.00	21,09,86,379.00	1,06,14,69,022.00	15,17,13,379.00	65,48,158.00	13,16,74,351.00	5,11,79,788.00	46,58,68,396.00	2,41,96,906.00	28,70,817.00	10,74,19,214	-	4,28,53,313	2,26,17,79,724.00	2,17,78,74,198.37
At 31 March 2024															
Depreciation/Adjustments															
At 1 April 2024		6,74,36,925.00	64,92,81,572.00	14,25,30,409.00	62,20,750.00	12,31,40,487.00	2,78,88,719.00	44,14,62,242.00	2,22,54,905.00	27,50,321.00	-		3,87,34,642.00	1,52,17,00,972.65	1,44,55,68,996.00
Additions		34,39,078.00	5,60,45,564.00	1,563.00	1,24,415.00	52,487.00	32,39,681.00	4,241.00	15,677.00	-	-		41,18,671.00	6,70,41,377.00	7,61,31,977.00
Deductions/Adjustments															
At 1 April 2025															
Additions															
Deductions/Adjustments															
At 31 March 2025	-	7,08,76,003.00	70,53,27,136.00	14,25,31,972.00	63,45,165.00	12,31,92,974.00	3,11,28,400.00	44,14,66,483.00	2,22,70,582.00	27,50,321.00	-	-	4,28,53,313.00	1,58,87,42,349.65	1,52,17,00,973.00
At 31 March 2024															
Net Block															
At 31 March 2024															
At 31 March 2025	50,00,000.00	14,01,10,376.00	35,61,41,886.00	91,81,407.00	2,02,993.00	84,81,377.00	2,00,51,388.00	2,44,01,913.00	19,26,324.00	1,20,496.00	10,74,19,214.35	-	-	67,30,37,375.00	65,61,73,126.00

(Amount in Rs.)

Particulars /Assets	INTANGIBLE ASSETS					
	Goodwill	Computer Software	Copyrights/patents	Liscense and franchise	Others (specify nature)	Total
Gross Block						
At 1 April 20X1						
Additions						
Deductions/Adjustments						
At 1 April 20X0						
Additions						
Deductions/Adjustments						
At 31 March 20X2						
At 31 March 20X1						
Amortization/Adjustment						
At 1 April 20X1						
Additions						
Deductions/Adjustments						
At 1 April 20X0						
Additions						
Deductions/Adjustments						
At 31 March 20X2						
At 31 March 20X1						
Net Block						
At 31 March 20X1						
At 31 March 20X2						

Assets under lease to be separately specified under each class of asset.

Capital Work in Progress	31 March 2025	31 March 2024
Opening Balance	-	-
Add: Additions during the year	-	-
Less: Capitalized during the year	-	-
Closing Balance (B)	-	-

Intangible assets under development	31 March 2025	31 March 2024
Opening Balance	-	-
Add: Additions during the year	-	-
Less: Capitalized during the year	-	-
Closing Balance (B)	-	-

SATAPATHY & ASSOCIATES Chartered Accountants FRN-324900

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular					(Amount in Rs.)
10	Investments - Non Current and Current	As at 31 March 2025			As at 31 March 2024	
	(valued at historical cost unless stated otherwise)	Face Value	Numbers/ Units/ Shares	Book Value	Numbers/ Units/ Shares	Book Value
	Trade Investments -Quoted					
(a)	Investments in Other Entities					
	Less: Provision for diminution in value of investments			-		-
(b)	Investments in partnership firm (Refer footnote 1)			-		-
	Other Investments					
(c)	Investments in preference shares			-		-
(d)	Investments in equity instruments			-		-
(e)	Investments in government or trust securities			-		-
(f)	Investments in debentures or bonds			-		-
(g)	Investments in mutual funds			-		-
(h)	Investments property			-		-
(i)	Other non-current investments (specify nature)			-		-
	Total Investments			-		-
	Trade Investments - Unquoted					
(a)	Investments in Other Entities			-		-
	Less: Provision for diminution in value of investments			-		-
(b)	Investments in partnership firm (Refer footnote 1)			-		-
	Other Investments					
(c)	Investments in preference shares			-		-
(d)	Investments in equity instruments			-		-
(e)	Investments in government or trust securities			-		-
(f)	Investments in debentures or bonds			-		-
(g)	Investments in mutual funds			-		-
(h)	Other non-current investments (specify nature)			-		-
(i)	Investments property			-		-
	Total Investments			-		-
	Aggregate market value as at the end of the year:					
	Aggregate amount of quoted investments and market value thereof.			-		-

SATAPATHY & ASSOCIATES Chartered Accountants FRN 324...

कनिष्ठ लेखा अधिकारी/JUNIOR ACCOUNTS OFFICER
भौतिकी संस्थान/INSTITUTE OF PHYSICS
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भुवनेश्वर/BHUBANESWAR

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular					(Amount in Rs.)
	Aggregate amount of Un-quoted investments.			-		-
	Aggreagte Provision for diminution in value of investments.					
	Footnote 1: Details of investment in partnership firm			31 March 2025		31 March 2024
	Name of partner with % share in profits of such firm					
	ABC			-		-
	XYZ			-		-
	Mr. A			-		-
	Total capital of the firm (Amount in Rs.)			-		-
	Current Investments		As at 31 March 2025		As at 31 March 2024	
		Face Value	Numbers/ Units/ Shares	Book Value	Numbers/ Units/ Shares	Book Value
	Trade (valued at lower of cost or market value) - Quoted					
(a)	Current maturities of long-term investments			-		-
(b)	Investments in equity instruments			-		-
(c)	Investments in preference shares			-		-
(d)	Investments in government or trust securities			-		-
(e)	Investments in debentures or bonds			-		-
(f)	Investments in mutual funds			-		-
(g)	Other Short-term investments (specify nature)			-		-
	Net current investments			-		-
	Trade (valued at lower of cost or market value) - Unquoted					
(a)	Current maturities of long-term investments					
(b)	Investments in equity instruments			-		-
(c)	Investments in preference shares			-		-
(d)	Investments in government or trust securities			-		-
(e)	Investments in debentures or bonds			-		-
(f)	Investments in mutual funds			-		-
(g)	Other Short-term investments (specify nature)			-		-
	Net current investments			-		-
	Grand Total			-		-
	Aggregate value of quoted investments and market value thereof.			-		-

SATAPATHY & ASSOCIATES Chartered Accountants

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular					(Amount in Rs.)
	Aggregate value of quoted investments.		-	-		-
	Aggregate Provision for diminution in value of investments.		-	-		-

			Long Term		Short Term	
11	Loans and advances		31 March 2025	31 March 2024	31 March 2025	31 March 2024
A	(Secured)					
(a)	Capital advances					
(i)	Considered good		-	-	-	-
(ii)	Doubtful		-	-	-	-
	Less: Provision for doubtful advances		-	-	-	-
		(a)	-	-	-	-
(b)	Loans advances to partners or relative of partners		-	-	-	-
(c)	Other loans and advances (specify nature)		-	-	-	-
(i)	Prepaid expenses		-	-	-	-
(ii)	CENVAT credit receivable					
(iii)	VAT credit receivable					
(iv)	Service tax credit receivable					
(v)	GST input credit receivable					
(v)	Security Deposits					
(vi)	Balance with government authorities					
		(b)	-	-	-	-
	Total (a)+(b) (A)		-	-	-	-

			Long Term		Short Term	
B	Loans and advances		31 March 2025	31 March 2024	31 March 2025	31 March 2024
	(Unsecured)					
(a)	Capital advances					
(i)	Considered good		-	-	-	-
(ii)	Doubtful		-	-	-	-
	Less: Provision for doubtful advances		-	-	-	-
		(a)	-	-	-	-
(b)	Loans advances to partners or relative of partners		-	-	-	-
(c)	Other loans and advances (specify nature)		-	-	-	-
(i)	Computer Advance		-	-	-	48,000

SATAPATHY & ASSOCIATES Chartered Accountants

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular				(Amount in Rs.)
(ii)	Staff Advance			4,40,636	1,15,334
(iii)	Travel Advance			15,000	1,47,100
(iv)	Contingency Advance(ALICE)				50,000
(v)	TDS (IT) Receivable			32,372	19,626
(v)	Security deposit With CESCO			26,21,944	26,21,944
(vi)	Security Deposit with BSNL			2,000	2,000
(vii)	Security Deposit for GAS			20,950	20,950
(viii)	AKRUTI Fund Receivable			37,500	37,500
(ix)	Advance JEST			1,00,000	
	(b)	-	-	32,70,402	30,62,454
	Total (a)+(b) (B)	-	-	32,70,402	30,62,454
	Total (A + B)	-	-	32,70,402	30,62,454

12	Other non-current assets	31 March 2025	31 March 2024
(a)	Security Deposits	-	-
(b)	Prepaid expenses	-	-
(c)	Others (Specify nature)	-	-
	Total other non-current other assets	-	-

13	Receivables	31 March 2025	31 March 2024
(a)	Donations/grants receivable	-	-
(b)	Others (specify nature)	-	-
		-	-
	Outstanding for a period exceeding 6 months from the date they are due for receipt		
(a)	Secured Considered good	-	-
(b)	Unsecured Considered good	-	-
(c)	Doubtful	-	-
	Less: Provision for doubtful receivables	-	-
		-	-
	Total	-	-

14	Cash and Bank Balances	31 March 2025	31 March 2024
A	Cash and cash equivalents		
(a)	On current accounts SBI	7,66,225	8,04,714.30
(b)	Cash credit account (Debit balance)	-	-

SATAPATHY & ASSOCIATES Chartered Accountants

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note	Particular			(Amount in Rs.)
(c)	**Fixed Deposits**			
	Deposits with original maturity of less than three months		-	-
(d)	Cheques, drafts on hand		-	-
(e)	Cash on hand		-	-
	Total	(I)	7,66,225	8,04,714
B	**Other bank balances**			
(a)	Bank Deposits			
(i)	Earmarked Bank Deposits		-	-
(ii)	Deposits with original maturity for more than 3 months but less than 12 months from reporting date		-	-
(iii)	Margin money or deposits under lien		-	-
(iv)	Others (specify nature)		-	-
	Savings accounts			-
	i) IOB CS Pur (SB-10917)		23,03,597	39,96,370
	ii) IOB CS Pur (SB-16916)		1,61,24,077	1,07,41,583
	iii) IOP Corpus Fund (SB-19339)		48,40,301	54,60,685
	iv) Project Bank Account (Sch.3)		85,45,805	79,74,860
	Total other bank balances	(II)	3,18,13,782	2,81,73,499
	Total Cash and bank balances	(I+II)	**3,25,80,007**	**2,89,78,213**
15	**Other current assets**		31 March 2025	31 March 2024
	(Specify nature)			
	(This is an all-inclusive heading, which incorporates current assets that do not fit into any other asset categories)			
(a)	Interest accrued but not due on deposits		-	-
(b)	Interest accrued and due on deposits		-	-
	Total		-	-

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular		(Amount in Rs.)
16	**Other income**	31 March 2025	31 March 2024
(a)	Interest income	11,207	3,72,236
(b)	Dividend income	-	-
(c)	Net gain on sale of investments	-	-
(d)	Other non-operating income (Please specify)	-	-
(e)	Miscellaneous Income		
(i)	Profit on sale of Asset	33,750	
(ii)	RTI Fee	480	1,526
(iii)	Miscellaneous Income	1,50,832	25,000
(f)	Rent		1,215
(i)	Bank Premises Rent	3,30,000	3,60,000
(ii)	Guest House Rent	6,04,450	5,53,630
(iii)	Hostel Room Rent	31,753	1,32,929
(g)	Sale of Tender paper		2,700
	Total other income	**11,62,472.00**	**14,49,235.68**
17	**Cost of goods sold (Delete whatever is not applicable)**	31 March 2025	31 March 2024
(A)	**Materials consumed/distributed**		
	Raw material consumed/distributed		
(i)	Inventory at the beginning of the year	-	-
(ii)	Add : Purchases during the year	-	-
(iii)	Less: Inventory at the end of the year	-	-
	Cost of raw material consumed (I)	-	-
	Other materials (purchased intermediates and components)		
(i)	Inventory at the beginning of the year	-	-
(ii)	Add : Purchases during the year	-	-

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular			(Amount in Rs.)
(iii)	Less: Inventory at the end of the year		-	-
	Cost of other material distributes	(II)	-	-
	Total raw material consumed/distributed (A)	(I+II)	-	-
B	Purchases of stock-in-trade		31 March 2025	31 March 2024
(i)	...		-	-
(ii)	...		-	-
(iii)	...		-	-
	Total (B)		-	-
C	Changes in inventories of finished goods, work in progress and stock-in trade		31 March 2025	31 March 2024
	Inventories at the beginning of the year:			
(i)	Stock-in-trade		-	-
(ii)	Work in progress		-	-
(iii)	Finished goods		-	-
		(I)	-	-
	Inventories at the end of the year:			
(i)	Stock-in-trade		-	-
(ii)	Work in progress		-	-
(iii)	Finished goods		-	-
		(II)	-	-
	(Increase)/decrease in inventories of finished goods, work-in-progress and stock-in-trade (C)		-	-
	Total (A+B+C)		-	-

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular		(Amount in Rs.)
18	**Employee benefits expense**	31 March 2025	31 March 2024
	(Including contract labour)		
(a)	Salaries, wages, bonus and other allowances	-	-
	Staff Salary	13,02,50,221	12,37,06,252
	NPS Contribution	79,05,309	61,33,770
	Honorarium	30,23,010	9,29,178
	Fellowship	2,25,72,574	2,84,07,339
	Remuneration to Medical Officer	7,32,917	6,71,828
(b)	Allowances and Bonus	-	-
	PRIS	1,01,21,260	1,13,14,621
	Update Allowance	18,28,135	19,61,608
	Uniform Allowance	1,06,240	1,25,000
(c)	Gratuity expenses	94,97,026	1,23,00,975
(d)	Staff welfare expenses	-	-
	Reimbursement of Medical Expenses	1,06,27,815	78,10,748
	Canteen Expense	21,76,232	10,48,625
	Recreation & Welfare Expenses	12,80,924	6,56,236
	Children Education Allowance	11,41,895	12,15,000
	Medical Aid Centre Expenses	15,850	1,520
€	Retirement and Terminal Benefits		
	Leave salary	1,00,74,318	99,90,635
	Pension	7,20,07,382	6,95,07,637
(f)	Others		
	Contigency Grant to Scholars	11,73,122	20,75,242
	Total Employee benefits expense	28,45,34,230	27,78,56,214

19	**Finance cost**	31 March 2025	31 March 2024
(a)	Interest expense		

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular		(Amount in Rs.)
(i)	On bank loan	-	-
(ii)	On assets on finance lease		
(b)	Other borrowing costs		
(c)	Loss on foreign exchange transactions and translations considered as finance cost (net)	-	-
	Total Finance cost	-	-
20	**Depreciation and amortization expense**	**31 March 2025**	**31 March 2024**
(a)	on tangible assets (Refer note 9)	6,70,41,377	7,61,31,977
(b)	on intangible assets (Refer note 9)	-	-
	Total Depreciation and amortization expense	**6,70,41,377**	**7,61,31,977**
21	**Other Expenses**	**31 March 2025**	**31 March 2024**
(a)	Religious/charitable		
(b)	Other Expenses		
	Water Charges		1,53,526.00
	Conference & Symposia	5,92,819.00	3,46,273.00
	Science Outreach Activities	1,70,852.00	7,16,793.00
	Postage & Telegram	37,638.00	48,358.00
	Telephone & Telex	4,32,091.00	5,35,528.00
(i)	Consumption of stores and spare parts	-	-
(ii)	Power and fuel	1,39,52,002	1,70,73,520.68
(iii)	Rent	-	-
(iv)	Repairs and maintenance - Buildings	-	-
	Civil	1,08,55,558	1,24,57,792
	Vehicle	4,10,365	4,25,639

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular		(Amount in Rs.)
	Workshop	72,854	7,230
	Electrical	28,73,996	9,17,489
	Garden	2,49,747	3,96,299
	Telephone	3,86,052	2,75,832
	Office Equipment	12,205	2,34,160
(v)	Repairs and maintenance - Machinery	-	-
	Laboratory	33,69,448	28,31,085
	AC Plant	39,67,130	41,89,405
	Library	8,75,545	7,23,638
	Furniture	2,42,393	14,050
	Computer	10,15,505	6,06,177
(vi)	Insurance	-	-
(vii)	Rent, Rates and taxes, excluding, taxes on income	-	-
(viii)	Labour charges	-	-
(ix)	Travelling expenses	-	-
	Conference TA	2,17,991	88,915
	Visiting scientist TA	8,694	77,893
	Domestic Travel	9,07,118	8,75,733
	Leave Travel concession	9,63,693	2,33,076
	Hire Charge	79,896	32,753
(x)	Auditor's remuneration	59,000	59,000
(xi)	Printing and stationery	8,63,952	7,31,570
(xii)	Security Charges	76,50,007	64,07,596
(xiii)	Legal and professional charges	2,88,280	1,54,455
(xiv)	Advertisement and publicity	-	-
(xv)	Project Revenue Expenses	-	-
	ALICE Utilisation and CBM Participation	14,30,955	20,33,434
	Investigating Spin Structure		58,903

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.	Particular		(Amount in Rs.)
	CMS_Revenue Expenses	23,87,246	12,89,258
	Supporting Scientific Infr. (RIO 4003)	54,25,279	1,56,07,220
	Theoretical and Experimental Physics	3,68,28,757	2,50,75,356
	Advertisement and Publicity	6,19,748	
(xvi)	Commission	-	2,78,954
(xvii)	Entertainment Expenses	6,09,499	5,40,960
(i)	Loss on sale of Property, Plant and Equipment	-	-
(ii)	Loss on foreign exchange transactions (net)	-	-
(iii)	Loss on cancellation of forward contracts	-	-
(iv)	Loss on sale of investments (net)	-	-
(v)	Provision for diminution in value of investments	-	--
(vi)	Provision for doubtful debts	-	-
(vii)	Miscellaneous expenses	1,81,902	3,97,616
	Total	**9,80,38,217**	**9,58,95,486**

SATAPATHY & ASSOCIATES Chartered Accountants

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005

Notes forming part of the Financial Statements for the year ended 31st March, 2025

Note.23- GRANTS/ SUBSIDIES

Particulars		Current Year (2024-25) (Amount in Rupees)	Previous Year (2023-24) (Amount in Rupees)
1 DAE - Government of India		38,49,70,583	38,81,78,035
a)	Revenue (Salary)	27,89,98,631	27,26,45,338.00
b)	Revenue (General)	5,98,99,715	7,15,27,429.00
c)	Creation of Capital Assets	4,22,54,036	4,06,82,575.66
d)	GIA-ALICE	14,30,955	20,33,434.00
e)	GIA-CMS	23,87,246	12,89,258.00
2 Government Of Orissa (Non-Plan Revenue)		-	-
TOTAL		**38,49,70,583**	**38,81,78,035**

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INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2025

Note-3(a) - EARMARKED/ENDOWMENT FUNDS

(Amount in Rupees)

S. No.	Particulars	Current Year (2024-25)				Previous Year (2023-24)
		OB	Receipt	Payment	CB	
1	L.K.Panda Memorial Fellowship SB A/C No.10164207776	1,26,937.82	3,401.00	5,000.00	1,25,338.82	1,26,937.82
2	TPSC Account SB A/C No. 450502010004886	1,13,849.34	3,175.00	-	1,17,024.34	1,13,849.34
3	JC Bose of Prof. A.M.Jayannavar SB A/C No.15987	57,239.01	1,595.00	-	58,834.01	57,239.01
4	INSA PROF. J MOHARANA SB A/C No.18532	47,558.00			47,558.00	47,558.00
5	BI-IFCC Grant of Dr. P.K. Sahu SB A/C No.18597	4,83,769.03	9,346.00	2,60,138.00	2,32,977.03	4,83,769.03
6	Inspire Grant of Dr. Manimala Mitra SB A/C No.18695	1,30,129.00	3,625.00	-	1,33,754.00	1,30,129.00
7	MAX PLANCK GROUP DR. DEBAKANTA SAMAL SB A/C No. 18738	17,03,674.22	46,472.00	14,04,060.00	3,46,086.22	17,03,674.22
8	INSA YOUNG SCIENTIST SCHEME BY DR. SK AGRAWAL SB A/C No. 18952	3,284.00	92.00	47.20	3,328.80	3,284.00
9	NALCO Project - Prof. P.V. Satyam SB A/C No.19051	2,75,698.50	7,559.00	2,41,224.00	42,033.50	2,75,698.50
10	DST PROJECT OF PROF PANKAJ AGRAWAL SB A/C No. 19123	3,69,929.00	9,727.00	-	3,79,656.00	3,69,929.00
11	PMFS SB A/C No.19143	79,566.00	1,90,43,166.00	1,89,34,024.00	1,88,708.00	79,566.00
12	DST PJ TO DR. K BHATTACHARJEE,IIST SB A/C No. 19182	967.00	-	967.00	-	967.00
13	IOP PROJECT PRENMM&CE-SERB DR.K. GHOSH SB A/C No. 19314	97,658.00	2,721.00	-	1,00,379.00	97,658.00
14	SERB PROJECT OF DR. DEBAKANTA SAMAL SB A/C No.19348	19,45,646.00	43,896.00	18,49,723.00	1,39,819.00	19,45,646.00
15	IOP INSPIRE FACULTY FELLOWSHIP OF A MANDAL SB A/C No. 19497	20,749.80	-	20,750.00	-0.20	20,749.80
16	IOP SERB PROJECT OF DR. DINESH TOPWAL SB A/C No.19498	1,25,936.00	1,878.00	1,16,870.00	10,944.00	1,25,936.00
17	SERB PROJECT OF DR. SATYAPRAKASH SAHOO SB A/C No.19506	1,43,372.00	3,994.00	-	1,47,366.00	1,43,372.00
18	IOP-SERB-LBSMPNE PROJECT OF DR. SK AGARWALLA SB A/C No.19539	15,15,451.00	15,40,397.00	17,13,499.00	13,42,349.00	15,15,451.00
19	CEFIPRA PROJECT OF DR. MANIMALA MITRA SB A/C No. 19540	4,72,180.00	7,354.00	3,69,229.00	1,10,305.00	4,72,180.00
20	IOP-PJ-EMHMBOMEST-SAPTARSHI MANDAL SB A/C No.202360	47,083.00	442.00	42,808.00	4,717.00	47,083.00
21	IOP-PJ-RRF-BINAYA KUMAR PANIGRAHI SB A/C No.20361	1,56,495.28	2,780.00	1,17,076.44	42,198.84	1,56,495.28
22	IOP-PJ-CRS-D-TOPWAL SB A/C No.20780	12,747.00	4,78,818.00	1,86,000.00	3,05,565.00	12,747.00
23	IOP-PJ-CRS-K.BHATTACHARJEE SB A/C No.20923	44,941.00	1,238.00	-	46,179.00	44,941.00
24	IOP-PJ-CRG-S.SAHOO SB A/C No.21432	-	38,57,554.00	3,86,061.00	34,71,493.00	-
25	IOP-PJ-ENMRUEDS-K.GHOSH SB A/C.NO.20793	-	2,25,946.00	1,56,667.00	69,279.00	-
26	RAMANUJAN FELLOWSHIP MRUTUNJAYA BHUYAN SB A/C.22229	-	18,77,385.00	12,72,447.00	6,04,938.00	-
27	RAMANUJAN FELLOWSHIP PINAKI BANERJEE SB A/C.22230	-	18,37,526.00	13,62,551.00	4,74,975.00	-
TOTAL		79,74,860.00	2,90,10,087.00	2,84,39,141.64	85,45,805.36	79,74,860.00

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SATAPATHY & ASSOCIATES Chartered Accountants

INSTITUTE OF PHYSICS, SACHIVALAYA MARG, BHUBANESWAR-751005
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2025

NOTE- 22 : CURRENT ASSETS: INVENTORIES.

(Amount in Rupees)

Particulars	Current Year (2024-25)		Previous Year (2023-24)	
CURRENT ASSETS:				
Inventories:		23,70,540		23,20,363
a) Electrical Fittings Stock	9,96,836		9,91,769	
b) Office Stationery	4,45,922		2,54,384	
c) Computer Stationery	6,59,454		6,75,907	
d) Diesel Stock	95,512		1,34,654	
e) Carpentry Material Stock	20,338		34,200	
f) Workshop Spares	90,146		1,63,000	
g) PH Material Stock	6,222		21,985	
h) Cleaning Material stock	56,110		44,464	
		23,70,540		**23,20,363**

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INSTITUTE OF PHYSICS
BHUBANESWAR-751005

NOTES FORMING PART OF THE ACCOUNTS

FOR THE YEAR ENDED ON 31.03.2025

Note.1. Brief about the entity:

The Institute of Physics (IOP), Bhubaneswar is an autonomous, DAE-funded institution established by the Government of Odisha in 1972 and taken over by the Department of Atomic Energy (DAE) in 1985. It conducts both theoretical and experimental research in condensed matter, high energy, nuclear physics, and interdisciplinary fields like nano-materials, material science and biological physics. IOP offers pre-doctoral program and Ph.D. opportunities, supports international collaborations, and features world-class experimental facilities.

Key Features & Mission

Research Focus:
IOP conducts research across theoretical and experimental domains, including condensed matter physics, nuclear physics, high energy physics, and emerging areas like nano-materials, complex systems, and biological physic.

Facilities:

The institute houses world-class experimental facilities for its research programs.

Collaborations:

IOP actively participates in international collaborations with institutions such as CERN (ALICE) and others in the USA and Germany.

Academic Programs:

Pre-doctoral Program:
IOP offers a one-year pre-doctoral program, which is a mandatory precursor to a Ph.D. program.

Ph.D. Program:
The institute provides opportunities for students to pursue their Ph.D. research in various branches of physics.

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BHUBANESWAR-751005

NOTES FORMING PART OF THE ACCOUNTS

FOR THE YEAR ENDED ON 31.03.2025

NOTE.2 - SIGNIFICANT ACCOUNTING POLICIES

1. **ACCOUNTING CONVENTION**

The financial statements have been prepared under accrual basis under historical cost convention with Generally Accepted Accounting Principles in India except for Government Grants.

2 **PROPERTY, PLANT & EQUIPMENTS**

2.1 Freehold: Property, Plant & Equipment are stated at Historical cost less accumulated Depreciation. The cost of acquisition includes the cost of Carriage Inward, duties & taxes and other incidental direct expenses incurred in relation to such particular fixed assets.

2.2 Leasehold: Out of acquired leasehold land of Ac. 56.130 dec., the institute is in possession of title of land of Ac.6.130 dec. The Lease rent has been paid on A6.130 dec land up to 31.03.2025. Rest of the land is in the name of Higher Education Department, Govt. of Odisha, alienated in favour of the Institute and hence for this part, no rent is due to the State Government.

3. **INVESTMENT**

Noncurrent Investments are carried individually at cost less Provision for diminution. Current Investments are carried at lower of Cost of fair value.

However, the Institute has no long-term Investment of any nature. Moreover, there are short-term investments in shape of STDR with bank.

4. **VALUATION OF INVENTORIES**

Stock of Office Stationery, Computer Stationery, Cleaning Material Stock, Hardware and Electrical items etc. are valued at cost.

5. **BANK BALANCE**

Earmarked/ Endowment Fund (As per Note-3(a)) Bank balances of ` 0.80 Crore shown under the total Bank balances.

6. **DEPRECIATION**

6.1 Depreciation is provided on straight-line method at the rates specified in the Company Act, 1956. However, the amendment of 2013 has not been taken into account. Depreciation has been charged on those assets whose WDV are exceeding the residual value of 5% of Gross Block as per the fixed assets schedule. However incase of addition of Fixed Assets, depreciation has not been calculated on the basis of number days put to use.

6.2 Assets costing Rs. 5000/- or less are fully provided.

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7. GOVERNMENT GRANTS / SUBSIDIES

The grants are accounted for on realisation basis.

7.1. Plan grants to be utilised for capital expenditure is treated as Capital Fund otherwise has been taken into Income & Expenditure A/c.

7.2. Non-Plan grants to be utilised for revenue expenditure has been taken into Income & Expenditure A/c.

7.3. The Grants received, unutilized at the yearend has been considered as current Liability.

8. FOREIGN CURRENCY TRANSACTIONS

Transactions involving foreign currency are accounted at the exchange rate prevailing on the date of the transactions.

9. RETIREMENT BENEFITS

9.1 Liability in respect of Gratuity on retirement payable as on 31.03.2025 has been provided in accounts on actual basis. Provision for liability towards accumulated leave encashment benefit to the employees as on 31.03.2025 has been provided for in accounts on actual valuation.

9.2 Provision for liability payable towards Pension to the employees has been provided in the Accounts.

9.3 No Pension fund has been created by the Institute.

9.4 Contribution to newly defined pension scheme has been made regularly by the Institute for those employees who have joined the Institute after 01-01-2004.

9.5 The Institute has its own Provident Fund Trust which manages the Provident Fund of the employees who have joined the Institute on or before 31.12.2003. The Accounts of the Trust for the year ending 31.03.2025 has been audited by a firm of Chartered Accountants.

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Chartered Accountants

ACTION TAKEN REPORT ON THE COMMENTS OF STATUTORY AUDITORS ON THE ANNUAL ACCOUNTS OF INSTITUTE OF PHYSICS, BHUBANESWAR
FOR THE FINANCIAL YEAR 2024-25

Sl. No.	AUDITOR'S OBSERVATION	INSTITUTE'S REPLY	STATUTORY AUDITOR'S REPLY
Qualified opinion			
Basis of qualification			
1	a) The Society has not followed IAS 10 for accounting of Fixed Assets and AS 6 for provision of depreciation. The society has not maintained fixed assets register to verify the individual asset residual value. Depreciation has been charged on gross block at the end of the year on SLM method irrespective of the fact that individual old assets may have been depreciated in full. The depreciation on assets purchased during the year was also charged for the whole year instead of proportionate basis from date to use.	The Institute has engaged M/s. Laldash & Co., CAs vide W.O. No1315 dt.05.12.2024 for preparation of Asset Register from FY 2021-22 to 2024-25. They have submitted their report on 04.07.2025 vide letter No.LD/94/2025-26 dt.04.07.2025 at Annexure-A.	We have duly Considered the Fixed asset Register Prepared by Laldash & Co Submitted on 04.07.2025 in our Audit Report dated 30.08.2025
	b) The Fixed Assets of the Society were not physically verified in full during the year under audit.	The assignment of physical verification as on 31.03.2025 was done by M/s. Laldash & Co., CAs. They have submitted the report vide letter No. LD/94/2025-26 dt.04.07.2025 at Annexure-A.	We have duly considered the Physical Verification of Fixed asset reported by by Laldash & Co Submitted on 04.07.2025 in our Audit Report dated 30.08.2025
	c) None of the Fixed Assets of the Society were tested for impairment in accordance with IAS 28 and no provision has been made for impairment if any.	Point has been noted for future compliance.	No Comments.
2	IAS 12 on accounting of Government grants has not been followed. The grants have been recognized on realization basis. Capital grants have been recognized as capital fund and shown as Liability.	The Institute has been receiving full grant from DAE (Govt. of India) under GIA (General) and GIA (Creation of Capital Assets) which is treated as Capital Fund as per the provision of Accounting Standard 12.	No Comments.
3	The Capital Fund of the Institute is decreased to the tune of Rs.97.03 lakhs to due recognition of unutilised Government grant as current liabilities at the end of the year.	No comments	No comments
Matter of emphasis			
1	Balances of advances and liabilities to/from third parties are subjects to confirmation.	Point has been noted for future compliance.	No comments

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