

REPORT ON ONE-DAY INDUSTRIAL VISIT
AT VARIABLE ENERGY CYCLOTRON CENTRE (VECC),
KOLKATA

On 12/03/2025



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DEPARTMENT OF ELECTRONICS & COMMUNICATION
HALDIA INSTITUTE OF TECHNOLOGY

INTRODUCTION

The Department of Electronics and Communication organized the industrial visit to the Variable Energy Cyclotron Centre (VECC), Bidhannagar, Kolkata, under the Department of Atomic Energy, Government of India. The purpose of this visit was to provide students with practical exposure to the working principles of cyclotrons and experimental physics research. By witnessing the real-world applications of particle accelerators, students gained deeper insights into advanced nuclear research and high-energy physics. The visit also provided an opportunity to interact with leading scientists and researchers in the field, fostering curiosity and encouraging students to consider careers in scientific research and accelerator technology. This report highlights the key observations, technical aspects, and learning experiences derived from the visit.



ABSTRACT

The visit to VECC aimed to enhance students' understanding of particle accelerators and their applications in nuclear physics, material science, and medical research. The visit included a presentation on cyclotrons, their significance, and various research opportunities available at VECC. Participants had the opportunity to explore different cyclotron facilities, including the Superconducting Cyclotron (SCC), the Room Temperature Cyclotron (RTC), and the Medical Cyclotron. Through guided laboratory visits, students observed practical demonstrations of accelerator physics, nuclear reactions, and detector technologies. The visit concluded with discussions on potential career paths in nuclear and accelerator physics, offering valuable guidance for students interested in pursuing research or professional roles in these fields.

SUMMARY OF THE VISIT

At first, we entered the Cyclotron Centre, followed by a visit to one of the seminar halls. There, we were welcomed with a file, a pen, and a VECC logo cap. After a brief introduction session, a PowerPoint presentation was conducted by Dr. Chiranjib Das, providing an overview of the entire Cyclotron Centre. The presentation also included a virtual tour of the VECC campus.

Following this, we were provided with some refreshments. Afterward, the visit began. It was mainly conducted by Mr. Ananda Das. We primarily visited three key facilities:

1. The Superconducting Cyclotron
2. The Room Temperature Cyclotron
3. The Medical Cyclotron

There were strict instructions not to take any photographs inside the Cyclotron Centre, so unfortunately, we do not have any pictures from the visit.

OBJECTIVES OF THE VISIT

- To gain hands-on experience in an experimental physics research facility.
- To understand the working principles and applications of cyclotrons, including the Superconducting Cyclotron, Room Temperature Cyclotron, and Medical Cyclotron.
- To explore research opportunities in nuclear physics and particle accelerators.
- To learn about career opportunities at VECC and similar research institutions.
- To observe state-of-the-art experimental setups and learn about modern research methodologies.
- To understand the role of cyclotron facilities in medical applications, including cancer treatment through proton therapy.
- To encourage students to pursue higher studies and careers in accelerator science, nuclear physics, and related fields.

HOST INSTITUTION

VECC: VECC is a premier research and development unit under the Department of Atomic Energy, dedicated to frontier research in accelerator science, nuclear science, material science, and related areas. It operates multiple cyclotrons, including:

- **K130 Cyclotron:** Operational since 1977 and used for various experimental purposes.
- **K500 Superconducting Cyclotron (SCC):** Undergoing modifications for beam experiments and used for high-energy nuclear physics research.
- **30 MeV H- Medical Cyclotron:** Being installed for medical applications, particularly for the production of radioisotopes for medical imaging and cancer treatment.
- **Room Temperature Cyclotron (RTC):** Used for various experimental physics research applications, including radiation effects on materials.

VECC also houses a High-Performance Computing facility and a Radioactive Ion Beam (RIB) facility, which is part of the Advanced National Facility for Unstable and Rare Ion Beam (ANURIB) project. The center plays a crucial role in advancing India's research capabilities in nuclear physics and accelerator technology. Its contribution to material science, radiation biology, and medical research makes it a key institution in India's scientific progress.

VISIT SCHEDULE

- Reporting & Security Check: Participants registered at the VECC main gate, underwent identity verification, and received visitor badges.
- Welcome Session: Introduction and overview of VECC's research activities by senior scientists and officials.
- Film Show: A short film on VECC's contributions to nuclear and accelerator physics, highlighting its impact on scientific advancements and medical applications.
- Laboratory Visits: Exploration of SCC, RTC, and the Photon Multiplicity Detector (PMD) Lab, with detailed explanations by scientific officers.
- Demonstrations: Live demonstrations of cyclotron functions, data acquisition systems, and particle acceleration processes.
- Discussion on Career Opportunities: Guidance on pursuing careers in nuclear science, accelerator physics, and research positions at VECC.
- Conclusion & Departure: Participants shared feedback and experiences before concluding the visit.

OBSERVATIONS AND LEARNINGS

- Cyclotron Applications: Students learned about the role of cyclotrons in nuclear physics experiments, radiation therapy, and isotope production. The visit demonstrated how charged particles are accelerated for various research and industrial applications.
- Experimental Demonstrations: Hands-on explanations of superconducting, room temperature, and medical cyclotrons. The working of particle detectors and beam diagnostic systems was also discussed.
- Role in Medical Science: The application of medical cyclotrons in the production of radiopharmaceuticals used in PET (Positron Emission Tomography) scans and cancer treatments was highlighted.
- Career Guidance: Insights into opportunities for research and employment at VECC and other national laboratories. Students were introduced to various academic and career paths in accelerator science.
- Security & Research Ethics: Emphasis on strict safety protocols, radiation protection measures, and research confidentiality.

- Collaborations and Research Prospects: The role of VECC in international collaborations and its contribution to major global scientific projects was discussed.

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CONCLUSION

The industrial visit to VECC provided valuable exposure to real-world applications of accelerator physics and experimental research. The interaction with scientists and researchers enriched the students' knowledge and inspired many to consider careers in nuclear physics and accelerator technology. The visit reinforced the significance of cyclotrons in both scientific and medical fields, demonstrating their role in advancing knowledge and improving healthcare. Such visits play a crucial role in bridging the gap between theoretical education and practical research experience, equipping students with the necessary motivation and insights to pursue advanced studies in physics and engineering. The knowledge gained from this visit will be instrumental in shaping the students' academic and career trajectories in accelerator science and related disciplines.

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