



STUDY TOUR REPORT

27/01/23 TO 05/02/23



DESTINATIONS: AGRA-JAIPUR-DELHI

INSTITUTIONS VISITED:

-INDIAN INSTITUTE OF TECHNOLOGY(IIT),
DELHI

-INTER UNIVERSITY ACCELERATOR CENTRE(IUAC), DELHI

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PREFACE

The present report is a compilation of the events places visited and activities offer 10 days educational trip to Delhi, Agra and Jaipur under Department of Physics Marthoma College Chungathara from 27th December 2023 to 3rd January 2023 with the aim to aid ourselves to acquire basic knowledge of research mentality, to familiarise with various premier institutes through India for higher studies and to experience admirable features and diversity of the northern parts including Jaipur, Delhi and Agra. And to equip ourselves with the experience about various cultures so as to imbibe and enhance one's reach and impact in the society. In addition, as part of the BSc Physics curriculum the department also takes the opportunity collecting various information and experiences from previous institutes for higher studies – Indian Institutes of Technology, Inter University Accelerator Centre which enhance both our mind and soul. The Department of Physics Marthoma College Chungathara in collaboration with the two participating institutes the faculty personnel of their respective institutes introduced us to their institutes, facilities and opportunities available there.

First institute to be visited was the Indian Institutes of Technology Delhi. Dr, Pankajarivartava gave us information about 117 system and academics. It was a stunning session. The second institute that was visited was the IUAC (Inter University Accelerator Centre) New Delhi. The renowned professors of IUAC provided the information about the IUAC and different particle accelerators at IUAC.

The Department of Physics Marthoma College is recognised as one of the best departments in the college (affiliated under Calicut University) as it emphasises not only on the curricular syllabus but also the holistic development to the undergraduates and post graduates of the department. The academic calendar of the college has a number of activities that contribute towards self-learning and self-assertion through exposure to the various geographical regions of the country. So the department organises an educational excursion annually for the BSc physics students as a part of out of the box learning program. For the academic year 2022-2023, 33 students and two faculty members participated for the tour. The students were accompanied by the faculty members and the tour coordinators organised by the head of the department.

MEMBERS OF THE BSC PHYSICS STUDY TOUR

2022-2023

**DEPARTMENT OF
PHYSICS**

MARTHOMA COLLEGE, CHUNGATHARA



ACKNOWLEDGEMENT

On behalf of all the tour members I extend sincere thanks to our Principal Dr. Rajeev Thomas, our Head of The Department Dr. Jayaprakash for making it possible to conduct the educational trip 2022-2023. Our heartfelt gratitude to Mr. Kishan Kumar and Dr. Beena Mol for continuous care, support and valuable assistance throughout the trip, without their assistance the tour would not have been a success. Also our heartfelt gratitude to all other teaching and non-teaching staffs of the department, who co-operated and contributed towards accomplishing for the success of tour.

A TRAIN JOURNEY TO REMEMBER



We started our journey on 27th January with 33 students and 2 faculty members. Our destinations were Agra, Jaipur and Delhi. We conducted our tour under a Attar tours and travels. We reach Nilambur Railway Station at 9:30 am. All of us gathered there and by 10:00 o'clock Nilambur Shornur passenger train we reached Shornur at 12:00 o'clock pm.

We Boarded Mangala Lakshadweep SF express from Shoranur at 3:30 pm for an eventful journey to Agra. Train journey were exciting and offered different kind of experiences. We reached Agra Cantt station on 29th January at 1:00 pm. Then we went to our respective rooms and freshened up.

29TH JANUARY 2023

AGRA FORT

Our first sight-seeing place was Agra Fort. The Agra Fort is a historical Fort in the city of Agra in Uttar Pradesh. It was built by the Mughal emperor Akbar in 1565 the weather was cold it was a first different kind of experience for all of us. The opulent Agra Fort is made using red sandstone and marble and features the Mughal style of architecture. The magnificent towers, bastions and ramparts and majestic gateways symbolised the confidence and power of the 3rd Mughal emperor. The fort contains splendid palaces both in red sandstone and white marble built by 2 generations of prolific builders Akbar and later on by Jahangir and Shahjahan.

TAJ MAHAL

Our second spot on the same day was Taj Mahal, the heritage icon of India. An immense mausoleum of white marble built in Agra between 1631 and 1648 by order of the Mughal emperor Shah Jahan in memory of his favourite wife Mumtaz. Everyone among us was not wonder to witness one of the 7 wonders of the world. Visiting a historical monument is always an exciting experience as it cherishes the history of any nation. Every bit of this breath-taking landmark is an incredible. The majestic structures dates to 17th century. The Mahal was built in the loving memory of the emperor Shahjahan's beloved wife Mumtaz Mahal. We captured so many photos. Some of us entered to inside of Taj Mahal and visited tombs of Shahjahan and his wife. Later, we returned to the hotel. Our site seeing for the first day was an immense pleasure and a visual treat to both our eye and soul.

30TH JANUARY 2023

FATEHPUR SIKRI

On 30th January we went to Fatehpur Sikri. It is a small city in northern India, just west to Agra found by 16th century Mughal emperor. The accompanying guide gave us more information about its history. During this time, we realised how people in northern India are different from Kerala the food and climate also the dress is quite different from us. North Indian culture reflects the diversity of tradition and customs of the vast region it encompasses.

JAIPUR

After visiting Fatehpur Sikri we went to Jaipur-the capital of Rajasthan state. We were fascinated by the forming practices and buildings of Rajasthan. Jaipur holds a different climate from Agra. Jaipur is also known as “pink city” for its trademark building colours. On our journey we witnessed the beauty of Hawa Mahal in night. It was a startling view. Also, we saw the night view of Jal Mahal. Then we went back to the hotel. Jaipur tourism has something to offer to everyone. It includes a colourful mix of magnificent forts and palaces, colourful bazaars, delightfully chaotic streets brimming with activity and a collection of devout temples for those seeking solace and spiritual bliss.

31ST JANUARY 2023

ALBERT HALL MUSEUM

On 31st January we visited Albert Hall Museum. It is the oldest museum in Rajasthan. It is also known as Government Central Museum of Rajasthan. The museum has a rich collection of artifacts including paintings, jewellery, carpets, ivory, stone metal, sculptures, and work in crystal. An Egyptian mummy is the main attraction of this museum. The museum building is made of marble and stone. The building was expanded specifically with a museum in mind. The outer walls of the building are painted with scenes from ancient civilizations. The upper part of the courtyard has extracts from religious texts such as the Quran, the Bible and the Indian epics inscribed on the walls.

JANTAR MANTAR

Our next destination was Jantar Mantar. It is a collection of 19 astronomical instrument. The instruments allow the observation of astronomical position with the naked eye. Jantar Mantar literally means calculating instrument. There were instruments for measuring time, predicting eclipses, tracking location of major stars, and determining the celestial altitudes and related ephemerides. Some instruments are Chakra Yantra, Jai Prakash Yandra, Disha yantra, Dikamsha yantra etc. Jantar Mantar was an incredible experience. It features the world's largest stone sundial, and is a UNESCO World Heritage site.

CITY PALACE

Later we visited city palace. The City Palace is in the central North East part of the Jaipur city which is laid in a unique pattern with white avenues. It has preserved the history of the city and is an icon of grandeur. It is absolutely one of the highlights of city Jaipur. The palace was built by Maharaja Jai Singh II in the 17th century. The complex contains several buildings courtyards and gardens. Characteristics for this place are the unique pink walls. It also contains few museums. City palace paints the picture of the rich culture and heritage of the state.

HAWA MAHAL

Then we went to Hawa Mahal, one of the outstanding sites of Jaipur and most extraordinary building. The pink painted building contains 953 carved windows and balconies. Through this visit we could explore the culture of the people. We could experience the weather and climate of Jaipur. The cultural and architectural landscape of Jaipur attracted all of us. It is a region possessing its unique style. On the evening of 31st January, we started our journey to Delhi. At 12:00 am we reached our 3rd main destination, Delhi.

1ST FEBRUARY 2023

ACADEMIC VISIT

**INDIAN INSTITUTE OF
TECHNOLOGY(IIT), DELHI**

We reached Indian Institute of Technology Delhi on 1st February at 9:00 am. We were seated at the conference hall of Department of Physics. Head of Department Dr.Pankaj Srivastava gave us information about IIT system and academics. It was a stunning session. After that we were grouped into 2. Our group firstly went to nanotechnology lab. We saw so many instruments which emerged a curiosity among us. Dr.Uday Kankhaje, faculty member of department explained each instrument in detail. The instruments we met there are given below.





NANOSCALE RESEARCH FACILITY LAB



The nano scale research facility lab in IIT Delhi mainly aims with the research and innovations of nanotechnology. Centre for nano scale research facility have mainly 2 labs (i)characterization labs and (ii)fabrication labs. Nanotechnology deals with synthesis and fabrication of materials in the nanoscale in the range of 1 to 100 nm.



The following instruments we familiarised in nanoscale research facility were;

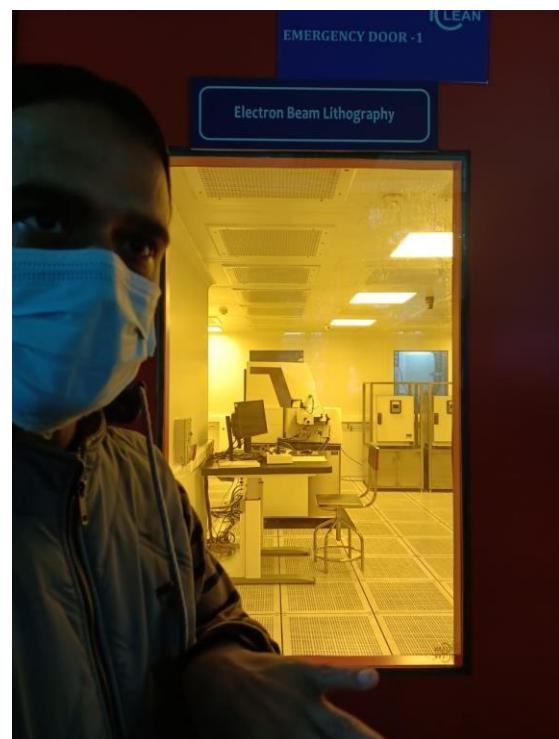
1.LITHOGRAPHY

Lithography is a growing field of techniques within nanotechnology dealing with engineering (patterning example etching, depositing, writing, pointing, etc.) of nanometre scale structures on various materials. The term reflects on a design of structures built in the range of 10^{-19} to 10^{-6} materials i.e; nanometer scale. Using lithography IC, diode etc can be fabricated. The lithography lab should be ultra-clean. The temperature should be 22^0 Celsius for proper working. To prevent polymer growth, the lab is using yellow light.



a) ELECTRON BEAM LITHOGRAPHY

Electron Beam Lithography (EBL) is the process of transferring a pattern on to the surface of a substrate by first scanning a thin layer of organic film on the surface by a tightly focused and precisely controlled electron beam and then selectively removing the exposed or non-exposed regions of the result in a solvent. The porous allows patterning of very small feature. The advantage of electron beam lithography stems from the shorter wavelength of accelerated electron compared to the

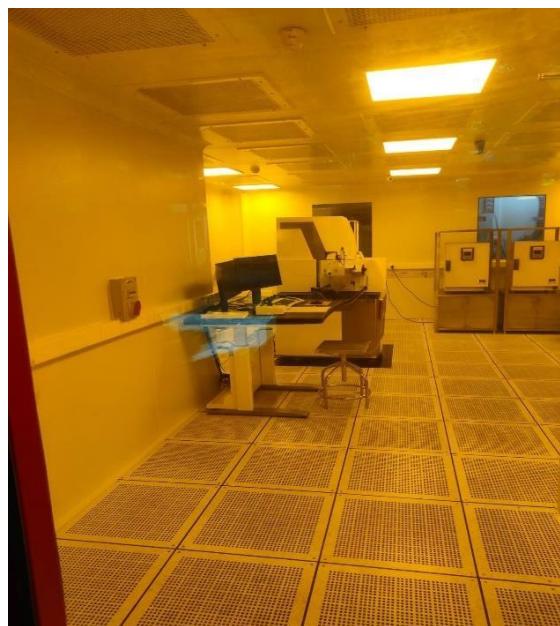


wavelength of ultraviolet electron beam lithography has high resolution compared to the other techniques.



b) MASKLESS LITHOGRAPHY

Maskless Lithography (MPL) photomask-less photolithography-like technology used to project or focal-spot write the image pattern onto a chemical resist coated substrate by means of UV radiation or electron beam. Maskless Lithography the pattern is exposed directly on to the substrate surface with the help of spatial light modulator, or SLM, which serves a dynamic photo mask. A Mask Less Lithography equipment proposes a better resolution and larger depth of focus than a mask alignment system. It can change lithography patterns from one run to the next, without incurring the cost of generating a new photo mask.



c) OPTICAL LITHOGRAPHY

Optical Lithography (photolithography or UV lithography) is of photon-based technique compressed of projecting an image into a photo-sensitive emulsion coated onto a substrate such as silicon wafer. It is used for manufacturing of nano electronics by the semiconductor industry. This type of lithography can create patterns with extremely small features- down to a few tens of nanometers - while also enabling incredibly precise control over feature geometry. Optical lithography or photolithography is also comparatively fast capable of creating patterns over an entire silicon wafer with relatively low cost.

2) SEMICONDUCTOR CHARACTERISATION SYSTEMS



It is an integrated system for I-V characterization of semiconductor devices and materials. It performs current-voltage, capacitance-voltage and ultra-fast pulsed I-V measurements. The system is equipped with 38 MUs capable of doing 2, 3, and 4 terminal measurements. Also, the PMU model is capable of generating voltage pulses of width in nanoseconds.

2) STYLUS SURFACE PROFILE



Stylus profiler meters use a probe to detect the surface physically moving a probe along the surface in order to acquire the surface height. It is used to measure surface profiler, roughness, waviness, and other finished parameters. They are similar to form gases, SP section tools that are also used to measure surface profiles roughness rtc. It is a methodology instrument for topographical characterization of a product's uppermost layers. It is a multipoint form of measurement that considers a materials primary form and the sub-micicontextural variation of its surface.

3) X-RAY DIFFRACTION SYSTEM



It is used for the primary characterization of material properties like crystal structure, crystallite size and stain. It is primary tool for probing structures of nanomaterials. Typically XRD provides information regarding the crystalline structure, nature of phase, lattice parameter and crystalline gain size. It is based on the constructive interference of monochromatic X-rays and crystalline sample. XRD relies on the dual wave or particle nature of X-rays to obtain information about the structure of crystalline materials.

4) WET CHEMICAL LAB

A wet chemical lab is used for all the chemical handling and etching of the materials. After the photo resist has been produced, then pattern can be transferred into thin film. This requires specific combination of chemicals to etch specific materials.

5) PLASMA ENHANCED CHEMICAL VAPOUR DEPOSITION SYSTEM

Plasma enhanced chemical vapour deposition is a process used to deposit a thin film from a gas stage to a solid state on a substrate. Chemical reactions are involved in the process which occur after creation of plasma of reacting gases. The working principle of this system is the capacitive coupling between the electrodes excites the reaction gases into plasma which a chemical reaction and results. The plasma is generally created by radio frequency or direct current discharge between 2 electrodes the space between which is filled with reacting gases.



6) INDUCTIVELY COUPLED PLASMA REACTIVE ION ETCHING (ICPRIE)



Inductively coupled plasma reactive ion etching can combine both chemical reactions and ion-induced etching. The independent control of ion flux enables high process flexibility. The ICPRIE tool uses an inductively coupled plasma source meaning that plasma is generated with an RF powered magnetic field. Actively coupled plasma source to a standard RIE system very high plasma density can be achieved. ICPRIE systems typically run at low pressures and use 2-2 independent RF sources.

7) MASK ALIGNER

It is a system that produces integrated circuits using the photography process. It holds the photo mask over the silicon wafer. While a bright light is shown through the mask and on to the photo resist. To generate this pattern a substrate is then introduced into mask aligner and mask with the desired pattern is placed above substrate. A high intensity UV light is shined over the mask. The light only transmits through the opening in the pattern allowing the pattern to evaporate corresponding areas of the photoresist layer of the substrate silicon wafers are common substrate and their commonly used result is polymethyl methacrylate. Mask aligner are widely used to generate integrated electronic circuits. Specialty photonics materials and microfluid channels.



8) ELECTRON BEAM EVAPORATION SYSTEM

In electron beam evaporation, the evaporation material can be placed directly in a water-cooled copper hearth or into a crucible and heated by a focused electron beam. The heat from the electron beam vaporizes the material, which then deposits on the substrate to form the required thin film.



9) ELECTRICAL PROBE STATION



10) ALTERNATING GRADIENT MAGNETOMETER(AGM)



The alternating gradient force magnetometer (AGFM, or simply AGM) is the direct descendant of the Faraday balance, a very early technique for characterizing magnetic materials by measuring the force exerted on a magnetic sample by an externally applied magnetic field.

11) TABLE TOP SCANNING ELECTRON MICROSCOPE(SEM)



12) THIN FILM STRESS MEASUREMENT SYSTEMS

Thin film stress is calculated by measuring the change in radius of curvature of a substrate caused by the deposition of a thin film on the substrate. The thin film must only be on one side of the sample (front), because if it is on both, it will balance the stress.



SCANNING ELECTRON MICROSCOPE (SEM)

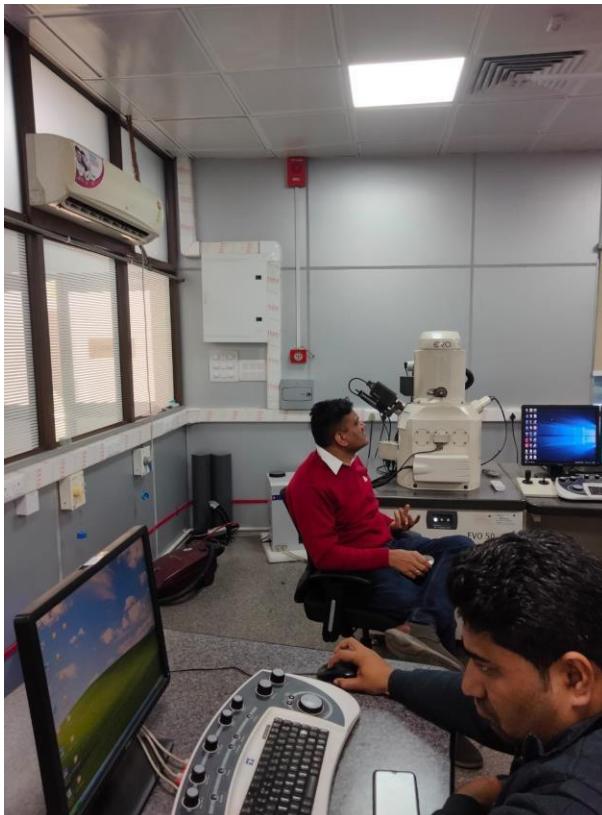


We were offered a great guidance by the principal technical officer Dr. Bhupindal Singh who was a humble teacher to hear and clarify all our doubts regarding the session. We loved to see how SEM works and he along with other assistants explain us all the works of the instruments and process.

The electron gun produces a beam of electron which is positive Potential, attracts them and they get accelerated down wards. The magnetic lens focuses the beam in to smaller region. The scanning coil deflects them so that it strikes at different point in the sample. When the electron strikes the sample, it produces

- a) Back scattered electron
- b) Secondary electron
- c) X- rays

By analysing the properties of them. We can determine the topography, morphology, elemental composition, etc. The specimen of environmental scanning electron microscope (ESEM) produces image of sufficient quantity and resolution with the sample being wet or ion tainted in low vacuum can be imaged. Sem is used for imaging sample like ceramics, Fibre etc. It is to be noted that sample must be conducting. If it is non-conducting gold coating is necessary to take imaging without sample changing and the surface is scanned with a beam of electron. The resolution is about 2nm and the magnification is 2lack. Specimens are observed in the vacuum. The alpha rays are emitted from deeper part of the samples. The electron gun produces electron sources which is maintained at potential 30kv and the secondary electrons are captured by secondary detector. The SEM has applications in analysing biological samples also After their informative session. Headed to the Nano scale research facility lab.



TRANSMISSION ELECTRON MICROSCOPE (TEM)

The SEM is back scattered while TEM is transmitted through the sample. TEM typically uses high energy electron beam transmitted through very thin samples in order to analyse the microstructure of materials. The TEM facilities at IIT Delhi consist of 200kv TEM. With high brightness field emission gun source which provide detailed information of size, shape, morphological details of material.

FOURIER - TRANSFER INFRARED SPECTROSCOPY (FTIR)



FTIR is a technique used to obtain infra-red spectrum of absorption or emission of a solid, liquid or gas. A Fourier - transform infrared spectroscopy spectrometer simultaneously collects high-resolution spectral data over a wide spectral range. This confers significant

advantages over dispersive spectrometer. Which measure intensity over a narrow range of wavelengths at a time. The term Fourier - Transform infra-red spectroscopy originates from the fact that a Fourier-Transform is required to convert the raw data into the actual spectrum.



SPUTTER COATER

When a glow discharge is formed between a Cathode and Anode using a suitable gas (typically Argon), and Cathode target material (commonly Gold) the bombardment of the target with gas ions will erode this target material, this process being termed 'Sputtering'. Sputter coating can be an effective technique for obtaining high-quality SEM images when working with challenging samples such as beam-sensitive and non-conductive materials.



THE QUTAB MINAR AND THE INDIA GATE

It stands as a memorial to 8400 soldiers of the British Indian army who died in first world war and third Afghan war, The gates evolve the architectural style of the memorial. arch such as the arch of the Constantine in Rome After exploring the heritage then we headed back to our After a spending some quality time in IIT Delhi. We had our lunch. After that we headed to see a historical monument. The Qutab Minar also spelled. Qutub Minar is a minaret and victory tower that forms part of the Qutab complex founded by the Tomar Rajput's Qutab Uddin Aibak it was built in 1192. It reaches 73m height from thus we went to see India gate. India gate is a war memorial. located near Kartarya path on the eastern edge of the 'ceremonial axis' of New Delhi rooms.

2ND FEBRUARY 2023

ACADEMIC VISIT

INTER UNIVERSITY ACCELERATOR

CENTER(IUAC), DELHI



○○○
Samsung Triple Camera
Shot with my Galaxy F41

On 2nd February we reached IUAC Delhi campus at 9:00am interuniversity accelerator centre is one of the important centres for accelerator based research facilities. It provides world class facility for accelerator and for the studies in material science in nuclear physics, atomic physics etc.. It was established in 1934 An introductory session about the IUAC had done by Dr. Golda. The session is very helpful in understanding the facilities provided there.



INDIAN NATIONAL GAMMA ARRAY (INGA) AND GAMMA DETECTOR ARRAYS (OIDA).

It is used for nucleus spectral studies. It is a 4π multidetector gamma ray spectrometer. It is a powerful tempt scope for the study of atomic nuclei are prepared in exited. States using energetic beams from the heavy ions accelerator the fast rotating decays to ground States emitting gamma rays that are measured by INGIA detector. It has high resolution about 2 Mevat 1Mev photoenergy. The Photo peak efficiency for gamma ray of 1MeVis about 5%.



NATIONAL ARRAY OF NEUTRON DETECTORS.

It is a array large array of neutron detector. The detector array Consist of 100 Liquid Scintillators, photo multiplier tube. coupled to a certain each cell having 5"x5" Cylindrical size.

They are all mounted at a fixed fight distance of 175 cm. from the target position. Now we move to the control room of various accelerator and their discussed about Salty measures and other things.



The 15 UD Pelletron is a tandem electrostatic accelerator capable of accelerating ion beams of all essentially stable nuclei with energies up to 200 MeV depending on the ion species. The ion source for this machine is Multi cathode caesium sputter negative ion source. The negative ions are produced and pre-accelerated up to ~ 300 keV in Ion Source. The desired ion beams are selected and also bent from the horizontal plane to the vertical plane using an Injector magnet. These ions are injected into the 15 UD pelletron for acceleration. The electrostatic accelerator is installed in vertical configuration inside a tank filled with SF₆ insulating gas. The tandem accelerator has both ends at the ground with high -voltage terminal at the middle. The terminal is connected to the tank vertically through accelerating tubes. These tubes maintained a potential gradient from the tank top to the terminal as well as from the terminal to the tank bottom. Two metal pellet charging chains are used for the generation of high voltage at the terminal. This terminal can be charged to a high potential that can be varied from 4 to 15 MV. The principle involved in generating high voltage at the terminal is the Van de Graaff generator.



The acceleration is due to the electrostatic attraction between the negative ions and the high positive potential terminal. The terminal is equipped with a gas stripper differentially pumped by two turbopumps. It also has a foil stripper assembly. On reaching the terminal they pass through a stripper which removes electrons away, thereby converting them into positive ions. These ions are again accelerated to ground potential to the tank bottom. In this case, the acceleration is due to electrostatic repulsion between the high terminal potential and the resulting positive ions. Hence, the ions emerging out of the accelerator have energy gain $E = V(q+1)$, V = terminal potential, q = charge state of the positive charge after stripping. These

high-energy ions are then analysed to the required energy with an analyser magnet. The ions are bent into a horizontal plane by this magnet. The ions are directed to a desired experimental area with a multiport switching magnet that can deflect the ion beam into any of the six established beamlines. In addition to the DC beam (continuous beam), it can deliver a pulsed beam of 1.2ns to 2 ns width separated by 250ns to 2us could be delivered with multiharmonic buncher in the low energy section. The entire machine is computer-controlled and is operated from the control room. After a wonderful session Spent well at IUAC we headed to the lotus temple.



PELLETION ACCELERATOR

Pelletron Accelerator RBS-AMS Systems (PARAS)

Rutherford Backscattering Spectrometry (RBS) facility with 1.7 million Volt Pelletron accelerator has been installed at IUAC. The facility is equipped with:

- Alphatross ion source for producing negatively charged He and H ions.
- 1.7MV 5SDH-2 Pelletron accelerator
- Charles Evans and Associate make 4 – axis goniometer (model name RBS-400)

Surface barrier detector measure the number and energy of ions backscattered after colliding with atoms of the sample enabling us to determine atomic mass and elemental concentration versus depth below the surface.



Usage

The facility is extensively used by users to carry out backscattering, Channelling measurements, resonance backscattering and ERDA (Elastic recoil detection analysis) for

hydrogen in the samples. RBS is most suitable method to get accurate thickness and composition of the thin film samples of different categories like nuclear targets, thin or multi layered films on substrates like Si, SiO₂, Ge, GaAs etc.

The RBS Channelling of epitaxial layers on single crystals and low energy ion implanted and processed samples are analysed for quality of epitaxial growth or ion implanted damage estimation. Resonance scattering $^{16}\text{O}(\alpha, \alpha)^{16}\text{O}$ at 3.045 MeV, $^{14}\text{N}(\alpha, \alpha)^{14}\text{N}$ at 3.69 MeV commonly referred Resonance RBS as has been used for oxygen and Nitrogen depth profiling in various thin oxide films, implanted and processed materials respectively. More than 15000 measurements have been performed using the facility. Later we headed on to lotus temple and Akshardham temple.



LOTUS TEMPLE

The lotus temple also known as the Bahai House of Worship or Bahai Mashriqul-Adhkar Temple is one of the best architectural marvels in the country in modern times. The white marble structure is also called the Taj Mahal of the 20th century but it is so much more than just a splendid piece of architecture. It is a place where several visitors from all across the globe come for peace, meditation, prayers and stud

Located New Delhi, the Lotus Temple is a famous tourist attraction of the city. Unlike other places of worship which usually have an idol of a deity people pray to, asking for either forgiveness or something that they deeply desire, the Lotus Temple is a rather unique place of worship. It is known for its beautiful flower-like architecture and marvelous ambiance that make it a popular tourist attraction for people of all faiths. The Bahai Lotus Temple is one of the world's most beautiful religious buildings and a must-visit when in Delhi.

AKSHARDHAMTEMPLE

We headed to a Akshardham temple. It is as an external of devotion-purity and Peace. The Mandir is a humble tribute to Bhagwan Swaminad Aaryan, the avatar, Devas, and great stages of Hinduism. It has over 200 murtis representing many of the spiritual Stalwarts over many millennia. Mandir is built from Intricately, curved Sandstone we witnessed a breath taking 24 minutes presentation. It was a combination of multi coloured laser- video projection underwater flames, waterjets and surrounding Sound After those exciting programs we went back to hotel.

THE RAJ GHAT

On 3rd February we went to Raj ghat after Spending some time for shopping in Sarojini Market. Raj Ghat is a memorial dedicated to Mahatma Ghandhi. It is a black marble plat- form that marks the spot of mahatma Gandhi's cremation on 31 January 1948 assassination.

THE RED FORT

From Raj ghat after lunch we went to see Red fort. Red fort is a historical fort in Delhi that served as the many residences of the Mughal emperors. Shahjahan Commissioned. Its construction on 12 May 1638. It has red sandstone from there we headed tour last destination of our tour which was to the street Infront of Juma masjid. After spending some time there, we headed to the railway station and boarded the train.

RETURN JOURNEY -an experience well deserved

We boarded the train Trivandrum central 67 express from Nizamuddin Railway station by 10:30 pm. As we all laid down our backs on the train berths, we recall all the moments we lived and the memories we created during this trip. The first morning in the train was cold as expected. As we moved temperature increased and we were halfway home. We knew we would not get much time before we are back to the pavilion. We sat, sang, danced, played a round or two of Dumb we could spend together. As the sun set down the second day, we were counting back with much scepticism. And with this, our trip came to an end.

“They say travelling is not about the destination, it’s about the journey”.

In the words of students, “It might be true for some or many . From all these experiences we would cherish that All Good Things Comes to an End but the memories linger on and on.

On 5th January 2023 we boarded the Shornur to Nilambur passenger train at 2:00 pm. We reached home place Nilambur at 4:00 pm.



CONCLUSION

The 10 days offered 1000's of memories to hold on and it serves our mind and soul with visual and colourbloom sights. During this trip we got to see a lot of historical and cultural important places in close and in person. It was full of experiences and each destination presented us with a lot of exiting sights and new information. The historical monuments such as Taj Mahal, Red fort, Qutab Minar etc.. had amazed our views which traces a wide and diverse past for our nation. IIT Delhi and IUAC was also a delightful experience .Being future physics graduates, this was an auspicious occasion to witness nation's top research and educational centres. All these experiences has made us more informed and aware about the world around us and widened our perspective. The interaction with the faculty from two different premier national institutes was both fascinating and inspiring. All of the discussions with the respective faculty members were informative and as undergraduate students, we found out a lot about the different opportunities available for us in such institutes. We are extremely thankful for the Department of Physics at MarThoma College, Chungathara and the respective faculty members of IIT and IUAC Delhi for the successful organisation and execution of the study tour.