

## 6.9 SCHOOLS, WORKSHOPS, ACQUAINTANCE PROGRAMMES, CONFERENCES, FOUNDATION DAY & NATIONAL SCIENCE DAY CELEBRATIONS

### Acquaintance Program on Geochronology facility at IUAC on April 07, 2021

Pankaj Kumar

The objective of the program was to create awareness about the existing facilities, the process to utilize these instruments and a flavor of research being done with instruments under National Geochronology Facility (NGF) among the geoscience community. For this purpose, a flyer was prepared and widely circulated through email to the Indian Universities and institutes. In response to the flyer, a total of ~ 360 students and faculties registered for the participation. A Webex link for the program was generated with the help of ICT group, IUAC and it was shared along with the program schedule to all the registrant. The program was convened by Dr. Pankaj Kumar and Mr. Sunil Ojha. The welcome address was given by Dr. Pankaj Kumar and the inaugural address was given by Director IUAC, Prof A. C. Pandey highlighting the importance of developing a geochronology facility at IUAC for the research in different interdisciplinary subjects. The event hosted four lectures about the research facilities at IUAC with emphasis on geochronology facility and the research work being carried out using these facilities. Mr. Sunil Ojha started with the introduction to IUAC, its facilities and programs covering all the available and developing ion accelerator facilities at IUAC. Dr. Pankaj Kumar discussed the evolution of AMS and geochronology facilities at IUAC. He also introduced all the AMS and geochronology group members and their ongoing research work. The quality of the data generated at IUAC has been proven by the publication of work in high impact journals. Mr. Rajveer Sharma gave a presentation on AMS sample preparation and measurements using XCAMS. Dr. Atul Singh presented on "Geochronology in Earth Sciences". He discussed that environment is divided into different systems such as atmosphere, biosphere, hydrosphere, etc. Dr. Sundeep Chopra also motivated the participants to IUAC for the usage of facilities and informed them about the future plans to procure many more instruments under the encouragement of the Ministry of Earth Science for the set-up of the National Geochronology Facility at IUAC, Delhi.

### Acquaintance Program on AMS at Mumbai University

S. Ojha

An IUAC Acquaintance program focussing AMS program was held on 8<sup>th</sup> February 2022. The program was conducted via online mode due to the pandemic condition during that time. There were 12 talks by experts from IUAC, Mumbai University, BARC-TIFR, Deccan College, Pune and BSIP Lucknow. The function was inaugurated by the Director IUAC and Vice Chancellor Mumbai University. Basics of AMS, its instrumentation, various ongoing scientific studies and future prospects were discussed in the program. Upcoming carbon AMS facility at Mumbai University was also featured in the program. IUAC is providing all technical expertise to Mumbai University Accelerator Centre to make their AMS facility successful. Faculties, Post Docs and PhD students working in the relevant fields attended the program. We had also sent invite to all potential users of AMS facility all over India. Around 300 participants registered for the program and we expect to attract many new users as a result of the successful program.

### A Twin International Workshop (online) to discuss the experiments with THz radiation & electron beam in the field of Materials Science & Biological Science.

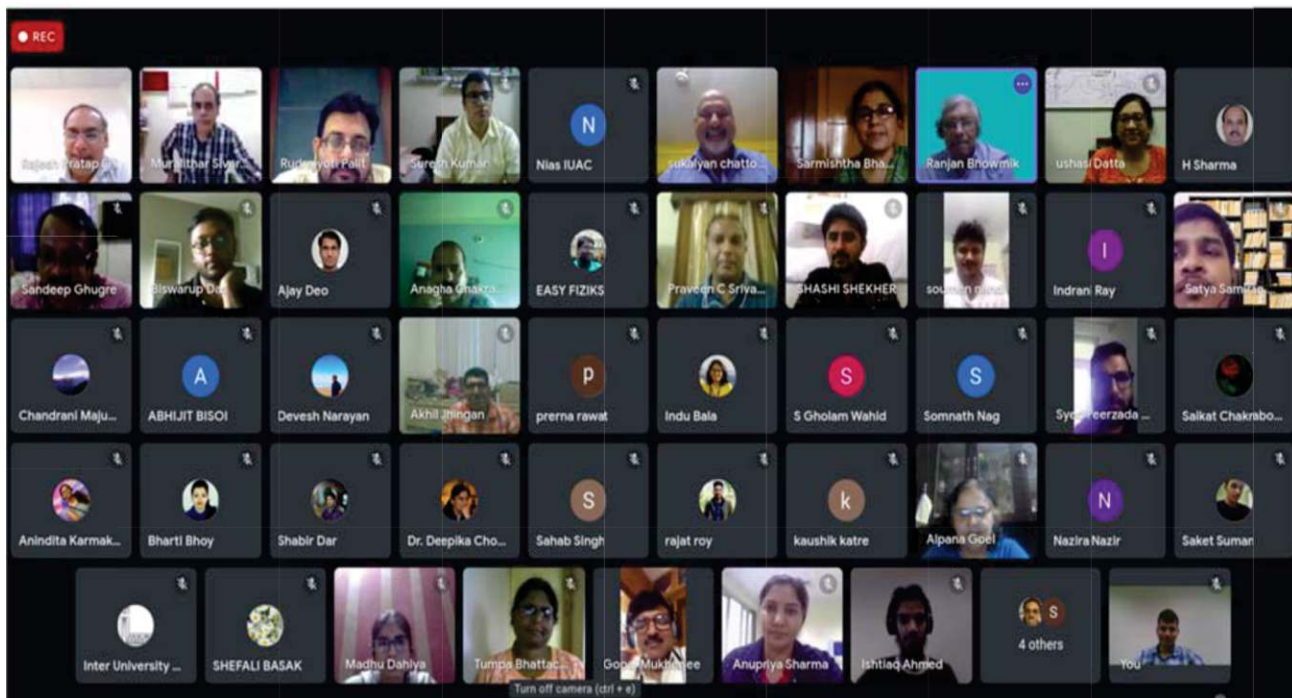
S. Ghosh

An online Twin International Workshop was organized at IUAC during June 23-25, 2021 to discuss the various possible experiments in the field of Materials Science and Biological Science what can be accomplished with the THz radiation and Electron beam to be made available shortly from the upcoming Free Electron Laser facility of IUAC. The total registered participants of this Virtual workshop were more than 100 and they were from various national and international institutes including IUAC. There were 27 oral presentations delivered during the three days workshop and the speakers were from reputed Indian Institutes like, TIFR, various IITs, IISER, CBS, SBNCBS, INMAS, various universities, industries and Foreign institutes like DESY, HZDR, GSI, Germany; Stockholm University, Sweden. The workshop was concluded with an elaborate 'discussion session' to take a note of the summary of all the comments, suggestions, etc. of the participants.

### Workshop on Recent results from INGA at IUAC

R. P. Singh and Yashraj

A two-day workshop on 'Recent results from INGA at IUAC' was organized online during June 28 – 29, 2021. More than 80 participants attended the workshop in which recent results from experiments performed with Indian National Gamma Array at IUAC, VECC and TIFR were presented. 2021 being the centenary year of nuclear isomer discovery, a special session was devoted to studies on nuclear isomers. The means to combine different ancillary devices with INGA were also discussed in the workshop.



### Workshop on “Artificial Intelligence, Machine Learning & Computational intelligence” (AIMLCI-21)

J. Antony and B.K. Sahu

A Two days online workshop on “Artificial Intelligence, Machine Learning & Computational intelligence” (AIMLCI-21) was inaugurated by Dr. Nandini Kannan, Director, IUSSTF, New Delhi during July 27-28, 2021. Eminent speakers from IITs, CERN, DAE, Harvard and Purdue USA etc. delivered 21 talks in different domains of science and technology. The main areas covered included the fundamentals of Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), High Performance Computing (HPC), IoT and Neural Networks for Particle Accelerators, High Performance Computing (HPC) system for science and Engineering Problems, Accelerator Safety applications etc. The workshop was attended by a large number of students and faculty members (approx. 136) from Indian universities. The video of each talk is also published in AIML website.

### Online School-cum-workshop on Ion Beams in Sensors Development; 7-8 Sept. 2021

V.V. Sivakumar and I. Sulania

Sensors are all around us and in some way or the other we use them in our daily life. Ion beams can play a vital role in enhancing the sensing properties of sensors such as Gas Sensors, Bio-Sensors, Pesticide and Urea Sensors and Optical Sensors etc. An Online School-cum-workshop on Ion Beams in Sensors Development was organized by Inter University Accelerator Centre, New Delhi in virtual mode from 7<sup>th</sup> to 8<sup>th</sup> Sept. 2021 on google meet platform. The basic topics covered were (i) Basics of Sensors, ii) Basic of ion interaction with matter, iii) Ion beams in sensor engineering iv) Optical Sensors, (v) Bio-Sensors, (vi) Gas Sensors, vii) Chemical Sensors and viii) Microwave Sensors. There were Total 17 resource persons delivered lectures/talks with 15 speakers from India and 1 each from USA and Sweden. There were about 250 researchers participated in the online event.



Photograph of the participants of Online School-cum-workshop on Ion Beams in Sensors Development; 7-8 Sept. 2021

Prof. A C Pandey, Director, IUAC, New Delhi, opened the workshop with his kind opening remarks emphasizing the role of sensors in our day-today life. The workshop provided an exposure to the research scholars, the young faculty members and researchers of various Institutes / Universities working in the similar advanced field of Sensor applications and on how the Materials properties can be modified using ion beams.

### Atomic and Molecular Physics Workshop

D. Swami and C.P. Safvan

The workshop was conducted online on the 17<sup>th</sup> and 18<sup>th</sup> of November 2021. Registration was free and open to all. There were about 120 registrations, however the actual number of participants at any given time was observed to be in range of 55 to 60. There were 18 speakers, with 5 student presentations. A brief introduction to the facilities at IUAC by Mr. Deepak Kumar Swami was followed by the full academic session. Talks ranged from atomic physics with captured muons (muonic atoms) to studies on polyaromatic hydrocarbons and their implications to origin of life in space. Covering a wide range of fields in experimental Atomic and Molecular Physics, the workshop provided a platform for discussion on several aspects. The experimental facilities at IIT Kanpur and TIFR were also described by speakers, in addition to presentation by IUAC users on the work done at IUAC in the recent past.

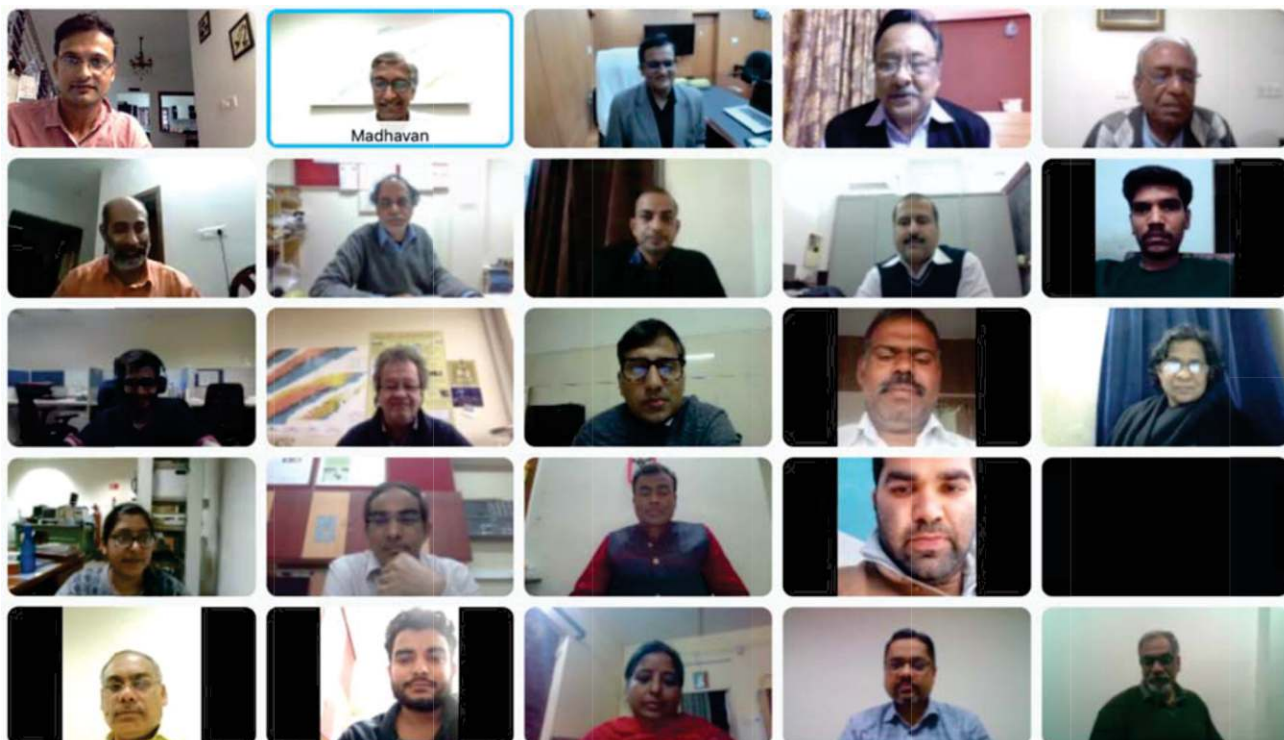
We are grateful to the Director for his inspiring inaugural address and his continuous support for the organization of the workshop.

### Online Workshop on “Physics with Recoil Separators”

N. Madhavan, S. Nath and J. Gehlot

A two-days online workshop on “Physics with Recoil Separators” was held on February 24 and 25, 2022 which was attended by more than 100 participants. The workshop was inaugurated by Prof. A. C. Pandey, Director, IUAC followed by the talk “Introduction to Recoil Separators and Research with HIRA and HYRA facilities” by Dr. N. Madhavan (IUAC). Invited talks from abroad included “Physics with recoil kinematic separators at FLNR, JINR, Dubna by Prof. Alexander Yeremin of FLNR, JINR (Russia), “Research with recoil Separators at ATLAS” by Dr. Dariusz Seweryniak of Argonne National Laboratory (USA), “Isomer Spectroscopy via Particle Tagging” by Prof. Partha Chowdhury of University of Massachusetts, Lowell (USA), “ $S^3$  coming online @ GANIL/SPIRAL2” by Prof. Dieter Ackerman of GANIL (France), “Research using the EMMA Spectrometer” by Prof. Barry Davids of TRIUMF (Canada), “Transfer reactions studies with the MAGNEX separator” by Dr. Manuela Cavallaro of INFN-LNS (Italy), “Quasielastic barrier distributions for SHE synthesis using gas-filled recoil ion separator GARIS by Dr. Taiki Tanaka formerly from RIKEN (Japan) and presently at Australian National University (Australia), “Synthesis of new transuranium isotopes in multinucleon transfer reactions using velocity-filter SHIP” by Dr. H. M. Devaraja, formerly from GSI (Germany) and presently at FLNR (Russia). Late evening session was included on the first day to facilitate speakers from North America due to the large time difference. Dr. S. Nath (IUAC) delivered the talk

“Study of multi-nucleon transfer using Recoil Mass Spectrometers”. There were talks summarising the research studies carried out using HIRA/HYRA by Prof. A. M. Vinodkumar (Calicut University, Kerala), Prof. S. Mandal (University of Delhi, Delhi), Prof. B. R. Behera (Panjab University, Chandigarh), Dr. Gopal Mukherjee (VECC, Kolkata), Dr. K. Kalita (Gauhati University, Guwahati), Dr. E. Prasad (Central University of Kerala, Kasaragod), Dr. S. Kalkal (Thapar University, Patiala), Dr. Anagha Chakraborty (Visvabharati, Shantiniketan) and Dr. M. Maiti (IIT Roorkee, Roorkee). Dr. Ajit Kumar Sinha (Former Director, UGC-DAE-CSR, Indore) delivered the Summary talk and Prof. A. C. Pandey, Director, IUAC delivered the concluding remarks.

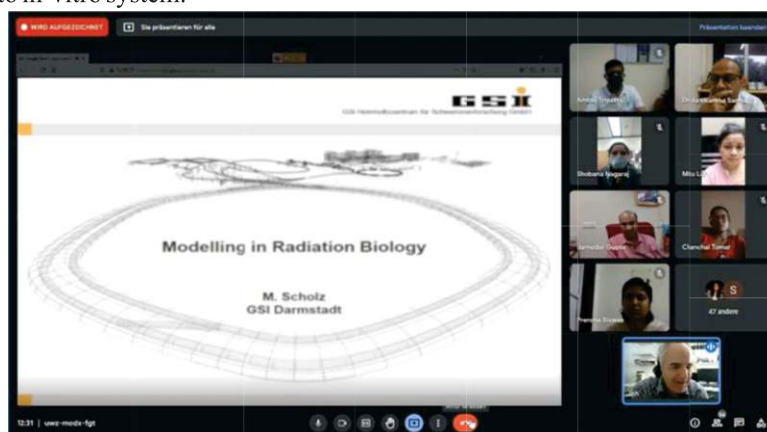


#### 4<sup>th</sup> National School on Heavy Ion Radiation Biology

S.A. Khan

4<sup>th</sup> National School on Heavy Ion Radiation Biology (NSHIRB 2021) was successfully conducted at IUAC in online mode during August 17-20, 2021. IUAC's director Prof. A. C. Pandey welcomed all the school participants and inaugurated the school. In his speech, he highlighted the wide applications of radiation biology research in tumour therapy, space radiation study and fundamental molecular biology. The school was designed to provide fundamental insights in the field of Heavy Ion Radiation Biology to the students and researchers of life science.

The main aim of this school was to provide fundamental insight about radiation interaction and help the students understand basics of radiation biology. The school programme was mainly based on 7 categories viz. Introduction and Basics of Radiation interactions, Statistical methods in Biology, Mathematical Modelling, Basics of Radiation Chemistry, Molecular Biology and Cell biology Techniques, Biological and Chemical Dosimetry, Decontamination and De-corporation requirement in radiation disaster management. The subject matters discussed in the school were mostly limited to in-vitro system.

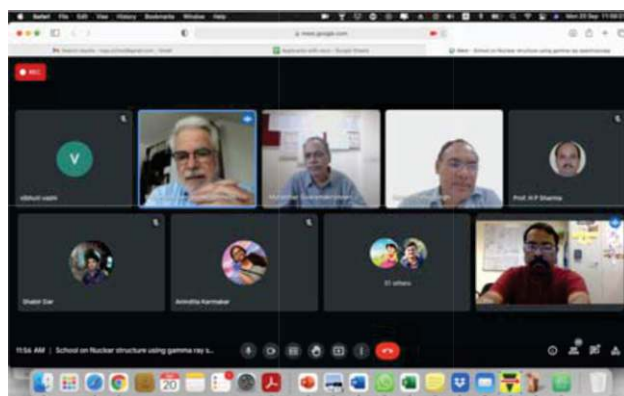
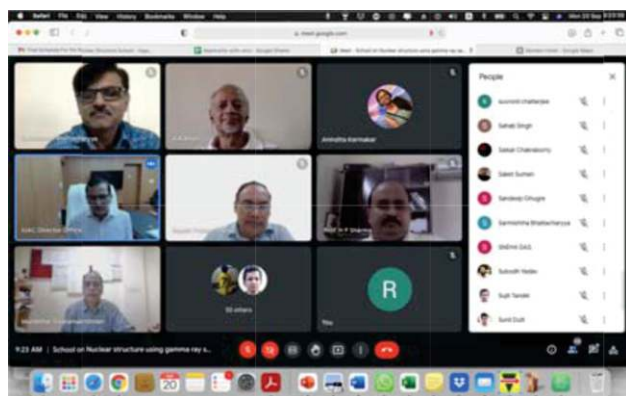


A snapshot taken during the lecture by Dr. M. Scholz in the HIRBS School

Dr. Asitikantha Sarma (from IUAC, New Delhi, India), Dr. Michael Scholz, Dr. Alexander Helm, Andreas Maier, Katja Kratz (all from GSI, Darmstadt, Germany), Dr. Damodar Gupta (from INMAS, DRDO, New Delhi, India), Dr. Nagesh N Bhat (from BARC, Mumbai, India) Dr. Sabyasachi Bhattacharya (from Indian Statistical Institute, Kolkata, India), Dr. Utpal Ghosh (from Kalyani University, Nadia, India) delivered the lectures in the school. About 200 external participants (students, scholars and faculties) participated in the school. The expert opinions on acute effects and radiation carcinogenesis, flash carbon therapy, Radon therapy and signalling and treatment of the cancer by hadron therapy must have helped the radiation biology researchers.

### School on Modern techniques in gamma ray spectroscopy of nuclei

R. P. Singh and R. Kumar

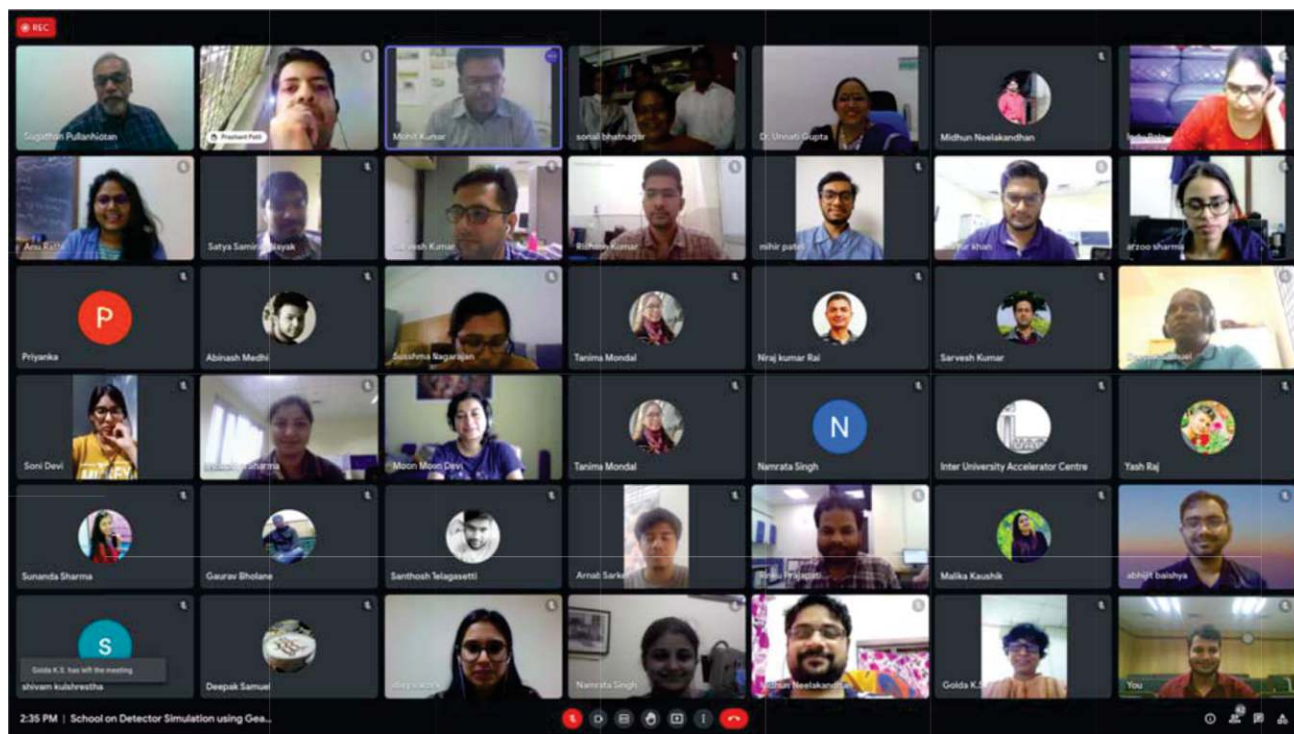


A five-day school on 'Modern techniques in gamma ray spectroscopy of nuclei' was organised online from 20 – 24 September, 2022. Some of the topics covered in the school were basic methods of  $\gamma$ -ray spectroscopy, lifetime measurements of excited nuclear states in nano to picosecond range, electric and magnetic moment measurements, Coulomb excitation techniques, Gosia analysis and tracking-type  $\gamma$ -detectors. The speakers were experts from the respective fields from various national and international institutes. The school was attended by more than 100 participants.

### IUAC School on Detector Simulation using Geant4

P. Sugathan

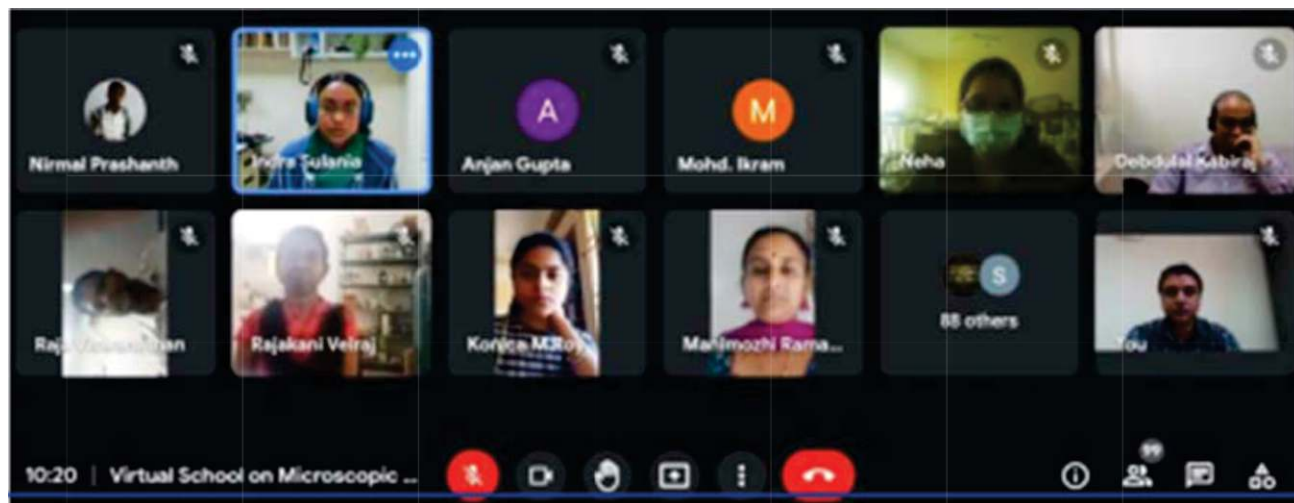
A four day school on detector simulation using Geant4 was conducted online on Google Meet platform during 26<sup>th</sup> to 29<sup>th</sup> October, 2021. Geant (GEometry AND Tracking) is a toolkit for simulating the passage of particles/radiation through matter using Monte Carlo methods. It provides facilities for handling geometry, tracking, detector response, run management, visualization and user interface. The school was meant for young researchers with working knowledge of Radiation Detectors to learn the basics of GEANT4 toolkit for Monte Carlo simulation of detectors. Total 105 registered participants attended the program which includes research scholars and young faculties/scientists from various institutes, colleges, Universities and research organizations all over the country. Topics covered in the school includes Basics of Radiation Detectors, Monte-Carlo Simulations, Introduction to GEANT4, Installation & Simulations and Building of Examples. To make the program more interactive and effective, in addition to on-line lectures, hands-on sessions and special interaction sessions in google classroom were part of the school. Prof. A.C. Pandey, Director of IUAC welcomed the participants and inaugurated the program, which was followed by lectures on introduction to Radiation detectors and basics of Geant4 by Dr. P. Sugathan, Scientist of IUAC. Dr. Deepak Samuel, Physics Dept., Central University of Karnataka delivered lectures and hands on practical sessions on Simulation on Alpha scattering experiment. Dr Sonali Bhatnagar, Physics Dept. Dayalbagh Educational Institute, Agra delivered lectures and gave practical lessons on Simulation of Scintillator detector. Dr Moon Moon Devi - Physics Dept., Tezpur University, Assam introduced the Simulation Water Cherenkov detector and demonstrated the compilation and building of examples. The school was concluded with an open discussion with the participants.



### Virtual School on Microscopic Characterization Techniques (TEM/SEM/AFM)

D. Kabiraj, S.A. Khan

A school on microscopic characterization techniques (TEM/SEM/AFM) was organized at IUAC from 9-12 November 2021. The event was held virtually on the Google Meet platform because of Covid-19. Due to the importance of the topics in the school, IUAC received overwhelming response from the researchers for participation. However, only 205 participants could be selected from over 500 received applications because of the limitations of the online platform. Seventeen experts including four from abroad gave lectures covering the basics to advanced topics concerning these techniques. Apart from these lectures, there was a demonstration session on TEM data analysis using GMS software.

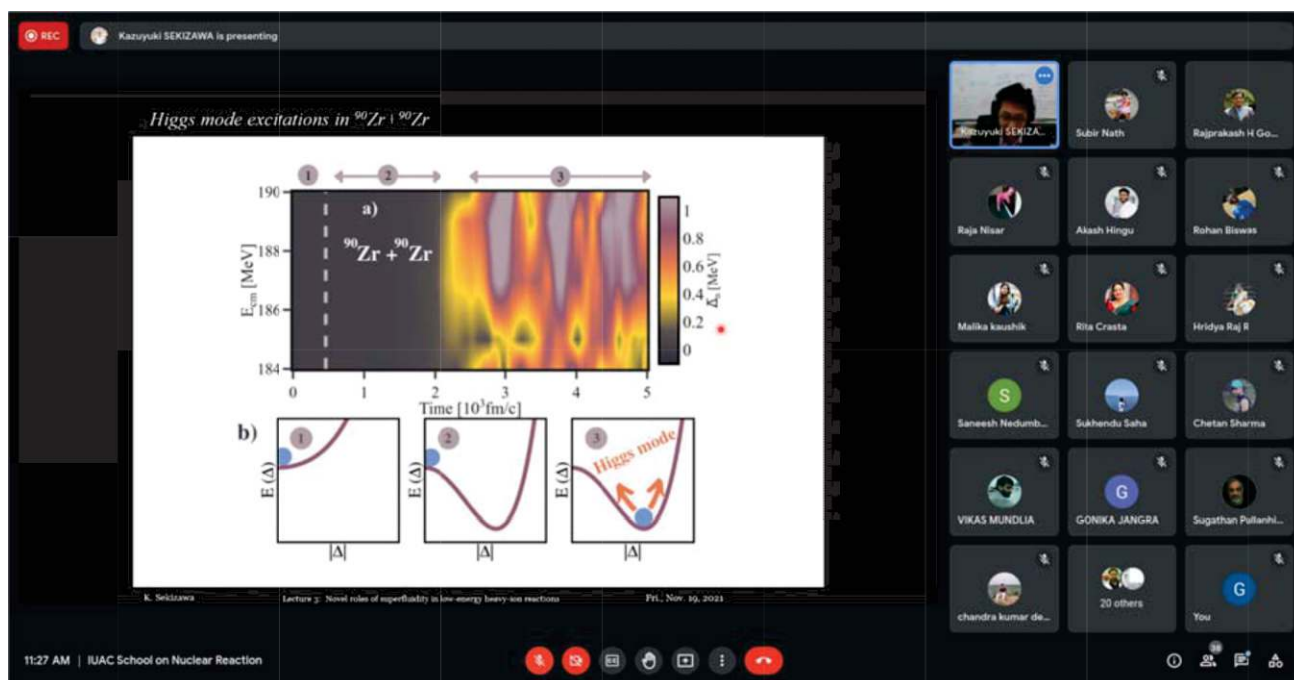


Snapshot of the Google Meet screen during a session in the workshop

### IUAC School on Nuclear Reactions 2021

Golda K. S. and S. Nath

IUAC School on Nuclear Reactions 2021 was conducted online during 15 – 20 November, 2021. About 130 candidates were selected for participating in the program which included research scholars and young faculties from various institutes, colleges and universities of the country. A wide range of topics related to nuclear reactions in the low energy domain were covered *e.g.*, transfer reactions, fusion near and deep below the barrier, nuclear fission, fusion with unstable beams, astrophysical nuclear reactions, Langevin dynamics in fission, TDHF and extended approaches, CRC and CDCC formalisms and detectors in reaction studies.

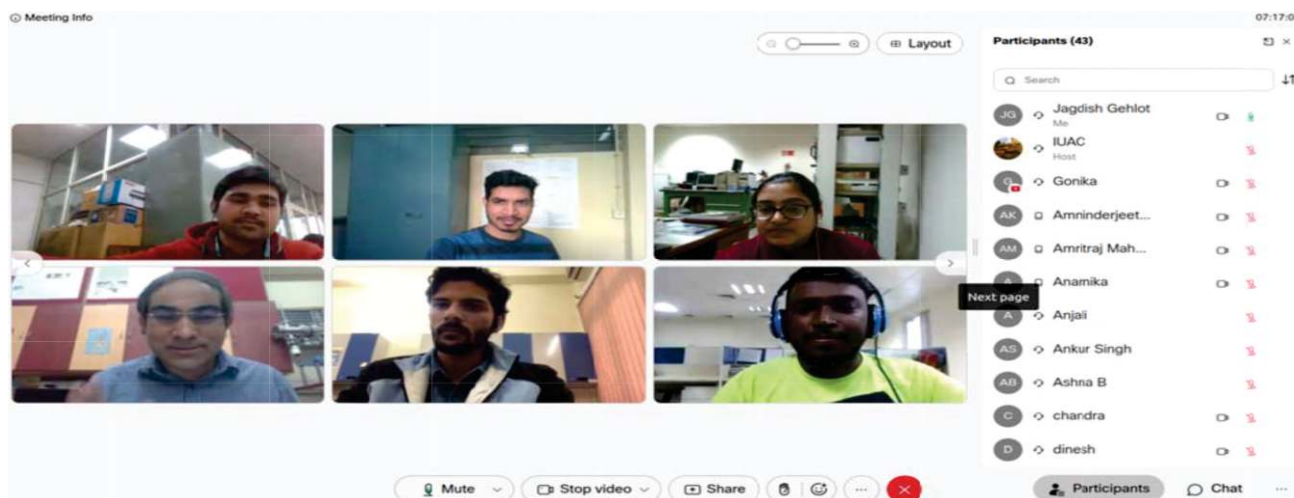


An organic balance between theoretical and experimental aspects of the field was ensured while selecting the topics. The list of speakers included Prof. G. Gangopadhyay (University of Calcutta, Kolkata), Dr. J. Sadhukhan (VECC, Kolkata), Prof. A. M. Vinodkumar (Calicut University, Calicut), Dr. E. Prasad, (Central University of Kerala, Kasaragod), Prof. A. M. Moro (University of Seville, Sevilla, Spain) and Dr. K. Sekizawa (Tokyo Institute of Technology, Tokyo, Japan) besides speakers from IUAC. Special evening lectures were delivered by three eminent scientists of the country on topics of wider interest. These talks were attended and appreciated by general audience in addition to the participants. Dr. Amit Roy (Former Director, IUAC) delivered a talk on “Resonance reactions and their decisive role in our existence”. Dr. D. K. Srivastava (Former Director and Distinguished Scientist, VECC) delivered a lecture titled “Shades of green energy to combat global warming”. A lecture on “Nuclear physics research, spin-offs and relevance to society” was delivered by Dr. S. Kailas (Former Director, Physics Group, BARC). One session was dedicated for presentations by the participants. Soft copies of the study materials were shared with the participants at the end of the school.

### Orientation Programme on HIRA/HYRA Usage

J. Gehlot and Gonika

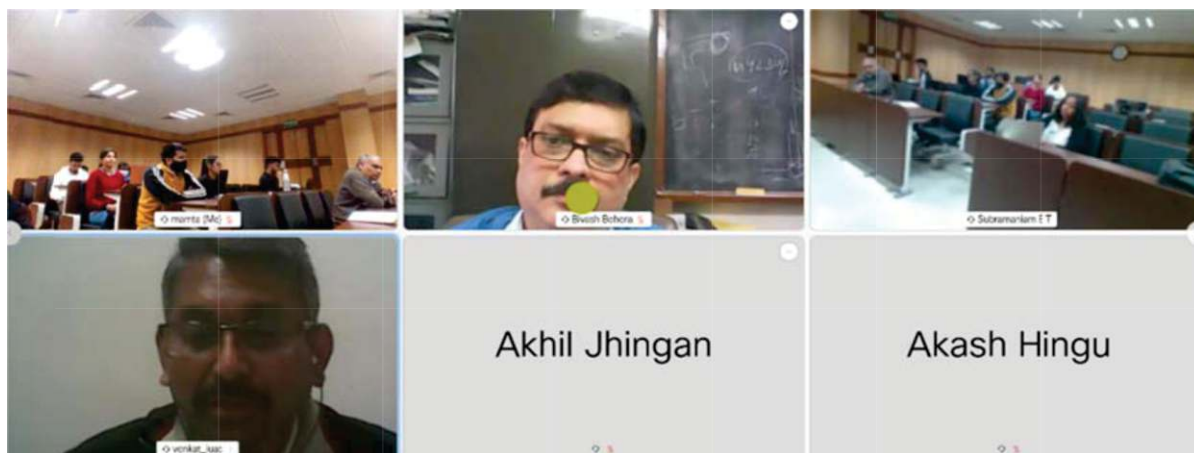
A one-day Orientation Programme on HIRA/HYRA Usage was conducted online on February 23, 2022 for the benefit of research scholars from various universities and institutes in the country. Nearly 40 participants took part in the Orientation Programme which was inaugurated by Prof. A. C. Pandey, Director, IUAC. The lectures were delivered by Dr. N. Madhavan, Dr. S. Nath, Dr. J. Gehlot and Mrs. Gonika. The scholars were introduced to the recoil separators/spectrometers namely, the Heavy Ion Reaction Analyzer (HIRA) and HYbrid Recoil mass Analyzer (HYRA), their operation, experimental planning, preliminary calculations, focal plane detectors, extraction of transmission efficiency through Monte Carlo simulation, optimization for fusion, transfer and quasi-elastic back-scattering experiments, aberrations and their minimization to improve the mass resolution, etc. through these lectures.



### School on Data Acquisition Systems

E. T. Subramaniam and S. Muralithar

A two-day school on “Data Acquisition Systems” (DAS) was organized in hybrid mode (offline for local participants and online for others) at IUAC on February 21 and 22, 2022. The school was planned to provide a detailed perspective from signal generation to high-resolution, high-speed data acquisition systems and their evolution. A VME-based advanced data acquisition system, comprising of a VME crate controller ROSE along with its software NiasMARS and an event identifier module VGEM, has recently been developed at IUAC.



Apart from the lectures to teach the basics, case studies with practical examples were discussed during the school for the benefit of PhD scholars and young researchers working primarily in the field of experimental nuclear physics. About 100 participants attended the school online. Experts from various national laboratories were invited to deliver lectures. The topics covered in the school included (a) basics of data acquisition systems, (b) signal generation and detection techniques, (c) analogue and digital signal processing, (d) advanced DAS and (e) software aspects of DAS.

### School on ROOT-based data analysis

E. T. Subramaniam and R. P. Singh

A three-day school on "Root based data analysis" was organized in hybrid mode (offline for local participants and online for others) at IUAC during March 1 – 3, 2022. In recent times, large volumes of data are collected by modern data acquisition systems from complex experimental setups. Analysis of the data requires high levels of computational and software skills. In major accelerator-based laboratories worldwide, ROOT-based software is used for facilitating complex analysis of data with ease. For the newly developed VME-based data acquisition system at IUAC also, ROOT format was opted for storing the data, as this is widely used by the international physics community.

