BULETIN

Think Nuclear Think Positive Act Proactive .. E=mc²

NUKLEAR MALAYSIA

FREE EDITION

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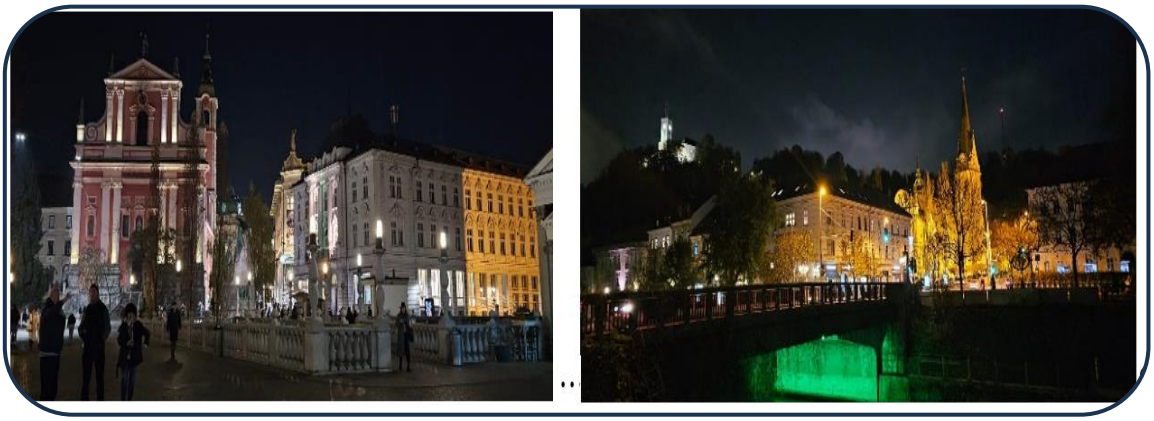

Ljubljana City at night

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EDITORIAL

After hard work by the editorial members, BNM 2025 Vol. 23, No. 2 is finally published. The editors would like to express their sincere thanks to all contributors and readers for their patience and loyal support to BNM. Congratulations MNS for its 36th anniversary. This effort is very much appreciated, and we hope this spirit will continue for all MNS activities and BNM, in particular. We know that the issuance of BNM needs very strong support and commitment from all members of MNS and readers in general. The editorial is very optimistic, with the good support and enough articles from the contributors the biannual issue of this bulletin will be published on schedule. We also observed that over the past few years there has been encouraging responses from contributors from a wide range of organizations and agencies. This can probably be improved in the future, as sharing and disseminating knowledge and information is one of the agendas of Malaysian Nuclear Society (MNS).

Authors could deliver the same message but probably from a different approach. The editorial would also like to welcome contribution from students at various levels of education and MNS has agreed to provide some token as an incentive for your efforts. The editor welcomes articles and news from any related science, technology, engineering regulatory and economy issues. However, the articles should reflect the title of this bulletin on news and information on nuclear. With the current scenario and trends on world energy demand, food and water security, environmental concerned, it is hoped that the contributed articles and news could be “hot” topic of discussions on nuclear.

The editorial would like to highlight that the peaceful use of nuclear technology for socio-economic development should be utilized to the maximum in order to put Malaysia on a par with developed countries by 2030. This is especially in the area of industrial, health, food and agriculture, water management and environmental protection.

To support this holistic infrastructure development, the editorial believed that capacity and nuclear-related human capital expertise needs to be strengthened. Experience, knowledge and expertise in the field of nuclear technology obtained during training programs, forums or visits will be able to be applied to Malaysia nuclear energy programs if it will be implemented in the future. The editorial has gone through exciting experiences in highlighting many activities related to nuclear science and nuclear technology among the members throughout the country.

In relation to that, the public acceptance program of nuclear technology as well need to be implemented effectively and continuously in order to spread the benefits of using nuclear technology peacefully in Malaysia. Hopefully through this Buletin Nuklear Malaysia that related to nuclear science, technology, engineering, regulatory and economy issues can help our efforts in improving the effectiveness of the Communication, Education And Public Awareness Program (CEPA) of nuclear technology throughout the country.

Chief Editor

Buletin Nuklear Malaysia, July 2025.

THIRD TRAINING WORKSHOP ON THE SAFE OPERATION AND APPLICATIONS OF NEUTRON GENERATORS, AUSTRIA

Puteri Nuraliah Husna Mohd Tajuddin

Nuklear Malaysia, Bangi

The Third Training Workshop on the Safe Operation and Applications of Neutron Generators was held on 4th until 15th November 2024 in the Nuclear Science and Instrumentation Laboratory, Seibersdorf, Austria. This training has been hosted by the Division of Physical and Chemical Sciences, Department of Nuclear Sciences and Applications, International Atomic Energy Agency (IAEA).

Through lectures and useful hands-on activities, the workshop aims to teach the participants to safely operate and utilize neutron generators, including demonstrating their applications and related modelling tools. Nine participants from Malaysia, Indonesia, Slovakia, Algeria, Tanzania, Ghana, Jordan, Syria, and Lebanon attended the workshop.

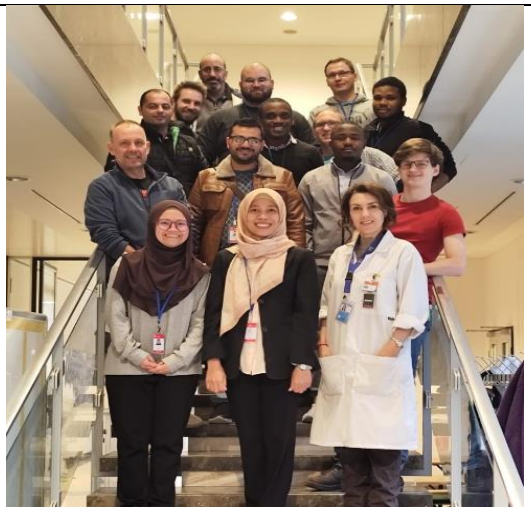
The workshop spans two weeks, offering a mix of lectures, hands-on training, and interactive sessions:

1. **Radiation Safety and Facility Tours**: Workshop began with introductions and a basic lecture on radiation safety. This is complemented by a guided tour of the facility to familiarize attendees with the operational environment.
2. **Technical Training and Lectures**: Neutron physics, nuclear electronics, and neutron detector technologies are among the main subjects covered. Practical sessions ensure participants gain hands-on experience in these areas.
3. **Advanced Applications**: Neutron Activation Analysis (NAA), which includes delayed gamma, prompt gamma, and cyclic NAA techniques is the main application that has been taught. This sessions also explore the utilization of neutron generator pulsing for enhanced analysis.
4. **Neutron Radiography**: Participants gain important knowledge on imaging methods and their uses in a variety of disciplines from hands-on sessions on neutron radiography.
5. **Neutron Spectrometry**: Advanced training on Bonner sphere spectrometry and other neutron spectrometry techniques has been provided.
6. **Nuclear Material Characterization**: Participants examined delayed neutron counting, neutron multiplication measurement, and uranium sample gamma spectrometry.
7. **Lab Setup and Commissioning**: Discussions on laboratory setup, safety analysis, and commissioning procedures are meant to provide participants with the knowledge needed for establishing facilities for neutron generators.
8. **Visit to AtomInstitut**: The program includes an educational visit to AtomInstitut, providing additional exposure to cutting-edge research and facilities.

Briefing on the operation and safety of neutron generators.

Data analysis session with the experts on NAA.

Visit to AtomInstitut, Vienna.



The experts and participants of Third Training Workshop on the Safe Operation and Applications of Neutron Generators.

Workshop on Development of EPICS-Based Instrumentation Control System in Accelerator Research Facilities

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The objective of the workshop held on 10 -14 June 2024 and aimed on equipping participants with the knowledge and skills needed to develop and implement control systems for instrumentation at accelerator research facilities using EPICS software. The workshop was held at the National Research and Innovation Agency (BRIN) in Yogyakarta, Indonesia. This initiative was fully funded by BRIN with support from the Asia Pacific Centre for Theoretical Physics (APCTP). This workshop provided a thorough and structured introduction to the Experimental Physics and Industrial Control System (EPICS), covering both its theoretical and practical applications.

EPICS is an open-source software framework, freely available and based on Ubuntu, a widely used Linux distribution. Although initially designed for use in accelerator facilities, EPICS has gained broad adoption across various domains. The applications such as industrial control systems, the STAR detector at the Relativistic Heavy Ion Collider (RHIC), telescope and observatory control rooms, synchrotron facilities, and other large-scale scientific instrumentation. Participants were introduced to the core architecture of EPICS, including the Channel Access protocol, Input/Output Controllers (IOCs), and Process Variables (PVs). The participants also explored how to integrate both hardware and software effectively to manage control systems and facilitate data acquisition, specifically in the accelerator physics. The workshop aimed to ensure that participants developed an understanding of EPICS components and system architecture, gained the ability to design and deploy EPICS-based control systems, and acquired fundamental knowledge in integrating hardware and software for efficient system management.

The workshop was structured as a comprehensive five-day program combining theoretical learning with practical application. During the workshop, participants were introduced to the EPICS. It commenced with the fundamentals of EPICS architecture and progressing toward hands-on system implementation. The early sessions focused on introductory concepts, including the core components of EPICS, such as PVs, IOCs, and the Channel Access protocol. As the course progressive, participants received training in basic Linux operations necessary for running EPICS, followed by the installation of EPICS tools on both Linux and Windows platforms. Subsequent modules covered practical topics such as setting up basic IOC configurations, establishing Channel Access communications, and understanding the networking requirements for EPICS-based systems. Participants involved in exercises involving network configuration, implementation of the EPICS PV Gateway, and setup of the EPICS Archiver for data logging. Further, the participants learnt the EPICS Sequencer for automation and were introduced to various graphical user interface (GUI) tools that enhance system interaction and visualization. The workshop concluded with applied sessions using real hardware by tested EPICS-based control systems in a simulated research facility environment. The workshop was facilitated by two invited experts from the Synchrotron Light Research Institute (SLRI), Dr. Keerati Manasatitpong and Mr. Natthawut Suradet.

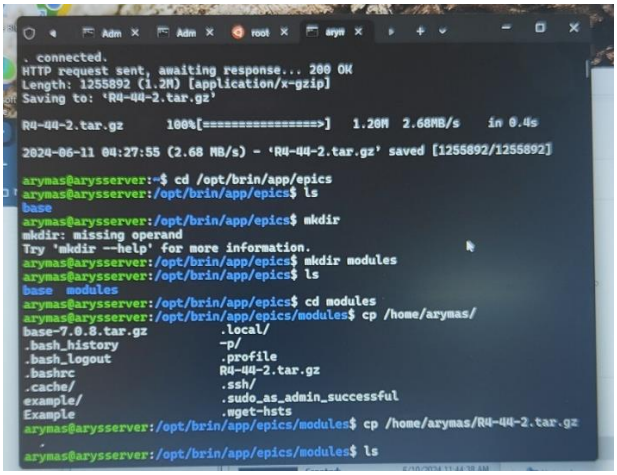
Additionally, the course provided foundational training in data handling and the development of remote monitoring interfaces. EPICS is capable of handling more than a thousand control parameters, which makes it particularly valuable for resolving complex control system issues within research environments. Its open-source nature allows it to serve as a cost-effective replacement for expensive, proprietary control

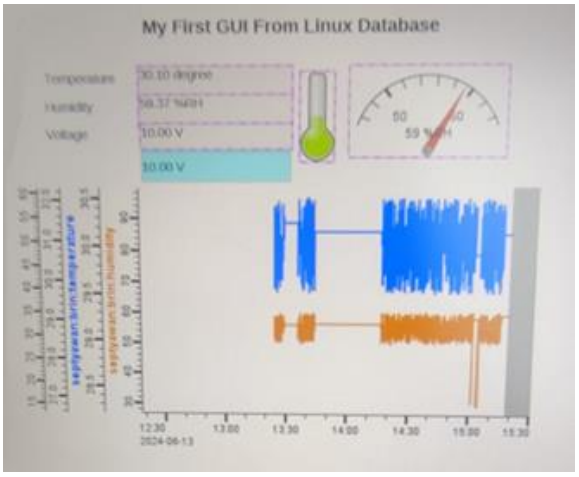
software. Beyond enhancing familiarity with the EPICS software, the workshop also served as a strategic platform for BRIN to address specific technical issues in their ongoing project which is to develop a synchrotron power control system. Despite BRIN's extensive experience with EPICS, challenges in fully understanding the software had contributed to project delays. It was anticipated that the recommendations from SLRI experts would help BRIN overcome these difficulties, while also advancing participants' skill in the software. Although Nuklear Malaysia was not directly involved in BRIN's decision-making processes or subsequent actions, BRIN expressed openness to any support from Nuklear Malaysia that could assist in resolving the EPICS-related challenges in their synchrotron control system project.

In conclusion, EPICS stands out as a highly capable control system software suite that is free to use and does not require licensing. It offers a comprehensive set of tools, libraries, and applications for developing distributed control systems in real time. Such capabilities make it ideally suited for managing large-scale scientific equipment, including particle accelerators, telescopes, and synchrotrons. The increasing adoption of Linux, particularly Ubuntu, as an operating system in research environments is driven by its open-source model, cost-free availability, and resistance to common threats like viruses and malware issues that are more prevalent in Windows systems.

Currently, EPICS has not been implemented within any control systems at Nuklear Malaysia. However, it presents a promising alternative to licensed software platforms currently in use, which often require costly procurement. That said, EPICS is not a beginner-friendly tool; its effective use requires a deep understanding of system architecture, especially the seven-layer Open Systems Interconnection (OSI) model that underpins the software's design. While the workshop did not result in direct contributions to resolving BRIN's technical issues, the knowledge gained through hands-on experience with EPICS was considered highly valuable. As a preliminary step toward adoption, it is recommended that EPICS be piloted in systems requiring continuous monitoring, such as those tracking radiation exposure, temperature, and humidity, especially across large-scale facilities.

Opening ceremony with experts, participants, and BRIN management.





Basic EPICS system using Arduino for data storage, developed during the workshop (left). User interface prototypes developed during the workshop (right).

Site visit to **DECY-13** to identify issues with BRIN's synchrotron project.

Workshop on Non-Destructive Examination, In-Service Inspection and On-line Monitoring for Research Reactors (EVT2202277)

Nurul A'in Ahmad Latif

Malaysian Nuclear Agency

The International Atomic and Energy Agency (IAEA) has conducted a training workshop on Non-Destructive Examination, In-Service Inspection and On-line Monitoring (OLM) for research reactors on 4th to 8th November 2024 at Vienna, Austria. The workshop was attended by 24 participants from member states of IAEA with different background including the Non- Destructive Testing (NDT) practioners, reactor operators and regulatory. The participants represent a diverse range of reactor types, power levels, utilization programs and safety aspects. The comprehensive five days workshop includes both a classroom presentation and a practical session. This workshop provides participants with essential knowledge to improve the longevity and reliability of research reactors.

The objective of this workshop is to extend the operational lifespan of research reactors. The workshop focuses on preventing the development of unexpected defects and ensuring the ongoing safety and reliability of reactor systems. Through NDT inspection and monitoring techniques participants learn to detect potential issues early, enabling timely maintenance and reducing the risk of unexpected failures. By enhancing the management of reactor conditions, the workshop enables member states to sustain and prolong the safe operation of their research reactors for the foreseeable future.

The participants from Malaysian Nuclear Agency, Mr. Amry Amin Abas and Miss Nurul A'in Ahmad Latif (left). The experts and participants of the EVT2202277 workshop (right).

Meanwhile, the objective of online monitoring is to enhance the efficiency and safety of reactor operations by automating key processes and minimizing risks. This includes reducing the time spent by instrument technicians on manual calibration thus decreasing the potential for human errors during calibration. Online monitoring aims to improve the reliability of instrumentation and control systems ensuring a rapid response to transients and accidents.

Country presentation.

One day practical session was conducted at TRIGA Research Reactor at TU Atominstitut, Stadionallee 2, under supervision Dr. Mario Villa. The participants were divided into 3 groups and each group will take turns performing the practical sessions as scheduled. The practical involves the visual testing (VT) of reactor pool internals using IAEA underwater camera systems. The second practical session focuses on ultrasonic testing (UT) including a demonstration of IAEA UT equipment, calibration using a standard block and the inspection of wall thickness and pipe welds. The last practical session was eddy current testing (ET) demonstration on surface defect detection using array eddy current probe.

Practical session conducted at TRIGA Research Reactor at TU Atominstitut, Stadionallee 2.

In conclusion, this training workshop provided invaluable knowledge, hands-on experience and equipping participants with the essential tools to enhance the safety, longevity, and reliability of research reactors. The workshop focused on the early identification of potential issues through NDT inspection and online monitoring, tackling key aspects of reactor operations to ensure their ongoing safe performance. Ultimately, the workshop provided participants with essential technical skills and encouraged international collaboration to protect the future operation of research reactors around the world.

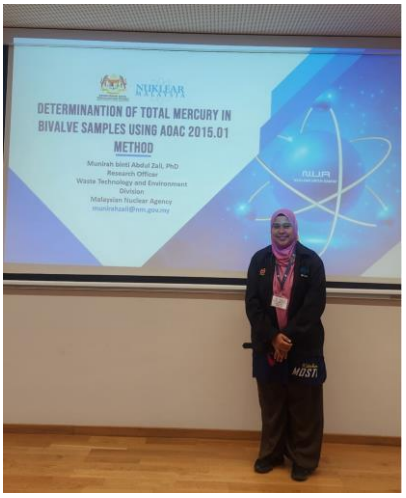
International Workshop on the Harmonisation of Protocols and Quality Concepts for the Monitoring of Mercury and Mercury Compounds in Marine Ecosystems

ChM Dr Munirah Abdul Zali

Malaysian Nuclear Agency, Bangi

The International Workshop on the Harmonisation of Protocols and Quality Concepts for the Monitoring of Mercury and Mercury Compounds in the Marine Environment was held from 10th to 15th November 2024 at Jožef Stefan Institute, Ljubljana, Slovenia. The workshop was hosted by the Government of Slovenia through the Jožef Stefan Institute, with the support of the International Atomic Energy Agency (IAEA). It was attended by 20 participants from Slovenia, Argentina, Bangladesh, Brazil, Cuba, Jamaica, Kenya, Mexico, Nicaragua, Thailand and Malaysia. The participants of this workshop were trained by Ms. Milena Horvat, an expert researcher in mercury studies in the environment, and Ms. Sabine Azemard a Reference Material Specialist at the International Atomic Energy Agency (IAEA) Monaco.

Lecture Session.



Country Presentation.

Group photos with experts and participants.

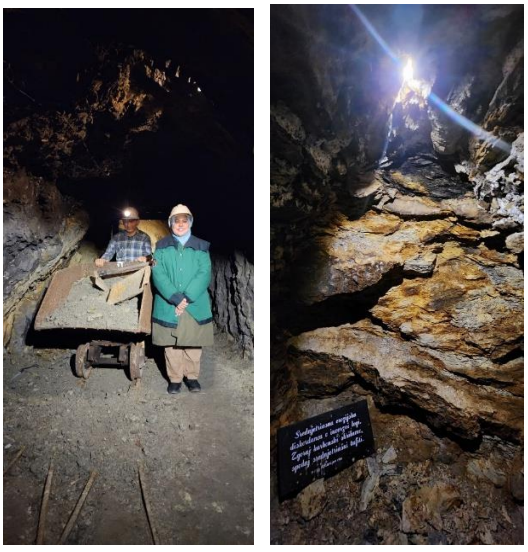
Mercury Analysis Laboratory Visit.

The event aims to discuss and exchange views on the harmonisation of technical criteria and to prepare guidelines for sampling strategies and the determination of mercury and mercury compounds in marine samples. The learning agenda for this workshop includes an introduction to mercury as a global pollutant,

the Minamata Convention, sampling strategies for water and sediment sampling, analytical methods for mercury, and the implementation of quality control and quality assurance.

The participants also visited Idrija Mercury Mine, one of the UNESCO World Heritage Sites in Idrija Town for approximately an hour's drive from Ljubljana City. The Idrija Mercury Mine is famous for being the second-biggest mercury mine in the world. Over centuries, Idrija miners dug out over 700 kilometres of tunnels and shafts reaching 380 metres in depth at different levels and produced almost 150 thousand tonnes of mercury throughout Europe and worldwide for scientific, agricultural, and industrial purposes.

Excursion to UNESCO Heritage Idrijia Mercury Mine.



The tunnel in the mining area where the mercury has been found.

The IAEA aims to strengthen ocean health for sustainable development. With over 70 per cent of the Earth's surface covered by oceans, they are vital for maintaining livelihoods by providing food, regulating global climate, and preserving biodiversity. However, threats such as pollution from radioactive and non-radioactive contaminants such as mercury, climate change, ocean acidification and deoxygenation, are affecting marine life, food security and human health, the attainment of sustainable development goals (SDGs) relating to ocean health remains in question.

This workshop discussed strategies for monitoring mercury and mercury compounds in marine

environments with appropriate sampling and analytical techniques. With the help of experts and the discussion among the participants, a guideline for this project will help researchers worldwide in conducting the monitoring of these pollutants in marine ecosystems. The excursion to Idrija Mercury Mine resulted in a deeper understanding of the impact of mercury and mercury compounds contamination and the urgent need to prevent these contaminants from entering the environment and food web. These knowledge-sharing and learning experiences contribute to research collaboration and foster future discussions to support the Minamata Convention on Mercury worldwide.


The famous Dragon Bridge at Ljubljana City.


View of Ljubljana City at night.

MEXT NUCLEAR RESEARCHER EXCHANGE PROGRAMME IN QUANTUM SCIENCE TECHNOLOGY (QST), TAKASAKI JAPAN

Dr. Farah Fadzehah Hilmi

Radiation Processing Technology Division
Malaysian Nuclear Agency

MEXT fellowship program takes place from 24th September 2024 until 21st December 2024, in Quantum Science Technology (QST), Takasaki Japan. The fellowship focused on the synthesis and modification of bioadhesive hydrogels for potential medical applications such as wound healing. It provided a unique opportunity to collaborate with experts, enhance laboratory skills, and gain exposure to cutting-edge research techniques in gamma irradiation and material science. The primary objective of the research was to develop a bioadhesive hydrogel system using **Polyvinyl Alcohol (PVA)** and **L-DOPA**, inspired by mussel adhesive proteins, to improve wound healing properties. Key activities during the fellowship included:

- **Hydrogel Fabrication**

A PVA solution was prepared and gamma-irradiated at QST's advanced facilities, creating a crosslinked hydrogel with enhanced mechanical strength. This method eliminates the need for toxic chemicals, making it safer for medical applications.

- **Surface Modification**

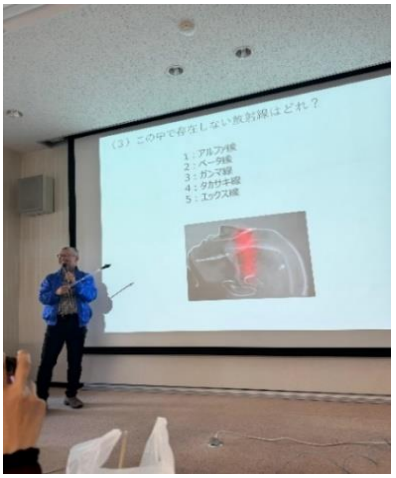
L-DOPA, a mussel-inspired adhesive material, was incorporated into the hydrogel through gamma radiation. This modification enhanced the adhesive strength of the hydrogel, particularly in wet environments, making it suitable for biomedical applications.

- **Characterization**
  - The modified hydrogels were characterized to evaluate their adhesive strength, swelling capacity, and surface morphology.
  - Analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) was also conducted to assess incorporation of LDOPA on the backbone polymer.

As part of the fellowship, participants engaged in several workshops, collaborative events, and facility tours:

- **QST Open Day (20 September 2024)**

  The event showcased QST technological advancements and research activities. The QST facilities is open for the public and the scientist exhibiting their products and the technologies to the visitors. Apart from that, visitors explored interactive exhibits, demonstrations, and presentations, offering insights into cutting-edge technologies and fostering networking opportunities.



- **FNCA 2024 Workshop on Radiation Processing and Polymer Modification (RPPM) for Agricultural, Environmental and Medical Applications (4 - 8 November 2024)**

  The FNCA meeting served as a platform for knowledge exchange between international experts (10 countries) in nuclear science and material research. The meeting focused more on the radiation processing and polymer modification to be applied in agricultural, environmental and medical application. The discussions included regulatory guidelines and the potential applications of advanced materials in various industries.

- **SciFiesta in Takasaki City (10 - 11 December 2024)**

  SciFiesta, held at the Takasaki City Center, brought together researchers from QST for an exciting conference focused on scientific advancements and innovations. The event featured both poster and oral presentations, providing an excellent opportunity for researchers to share their latest findings and engage in discussions. The conference showcased a variety of projects rooted in QST, offering participants a broader view of the institution's ongoing research. Additionally, SciFiesta served as a hub for networking, allowing attendees to forge new connections, exchange ideas, and explore

potential collaborations. This event was instrumental in stimulating creative thinking and generating new ideas within the research community.

- **Facility Tours and greetings by the Director of QST**

As a fellow in MEXT programme, the participants had chance to visit QST's irradiation facilities, advanced biodevice labs, and the Takasaki Ion Accelerators for Advanced Radiation Application (TIARA) facilities. These tours provided a closer look at the operational aspects of gamma irradiation and ion beam technologies used in material modification. QST scientists and officers offered detailed explanations about the capabilities of the facilities, including how ion beam applications are used for precise material alterations. These hands-on insights bridged the gap between theoretical concepts and their real-world application.

During the last day of the program, participants had the honor of meeting the General Director of QST Takasaki, Dr. Maekawa Yasunari who welcomed attendees. In addition, the fellowship was highlighted by a visit from Dr. Muhammad Rawi Mohamed Zin, the Deputy Director General of the Malaysian Nuclear Agency. His visit emphasized the importance of strengthening the ties between Malaysia and Japan in scientific research and nuclear technology.

Mesyuarat Agung Tahunan Kali ke 6 Women in Nuclear (AGM WiN Malaysia)

WiN Malaysia

Pada 6 Februari 2025 yang lalu, mesyuarat agung tahunan kali ke 6 telah berlangsung di Bilik Seminar Agensi Nuklear Malaysia. Seramai 36 orang ahli Women in Nuclear (WiN-MNS) Malaysia menyertai mesyuarat secara fizikal dan atas talian. Mesyuarat dimulakan dengan ucapan aluan daripada Presiden WiN sesi 2023 – 2025, Dr. Siti A'iasah Hashim. Dr Zainah Binti Adam telah dilantik sebagai Pengerusi Mesyuarat dan Puan Wan Syazlin Binti Wan Junoh dilantik sebagai pencatit minit mesyuarat. Sejurus selepas itu, Setiausaha WiN, Puan Puteri Nuraliah Husna telah melaporkan aktiviti yang diadakan dalam tempoh 2023 – 2025.Mesyuarat pada kali ini telah membubarkan Barisan Exco sesi 2023 – 2025 dan membuat lantikan baharu untuk sesi 2025 – 2027. Pada AGM tahun ini, Dr. Siti A'iasah Hashim telah mendapat undian tertinggi untuk menyandang jawatan Presiden bagi sesi 2025 - 2027 dan Dr. Hasni Hassan dilantik sebagai Timbalan Presiden yang baru. Manakala Barisan Exco telah dipilih di kalangan ahli yang hadir melalui undian. Semoga dengan pelantikan Barisan Exco sesi 2023 – 2025 dapat memantapkan lagi pengurusan dan mengekalkan prestasi baik WiN Malaysia.

Barisan Exco WiN Malaysia sesi 2025 – 2027

Gambar sekitar mesyuarat berlangsung