

Physics Section activities in support of research and applications using synchrotron-light facilities and increasing their transnational cooperation

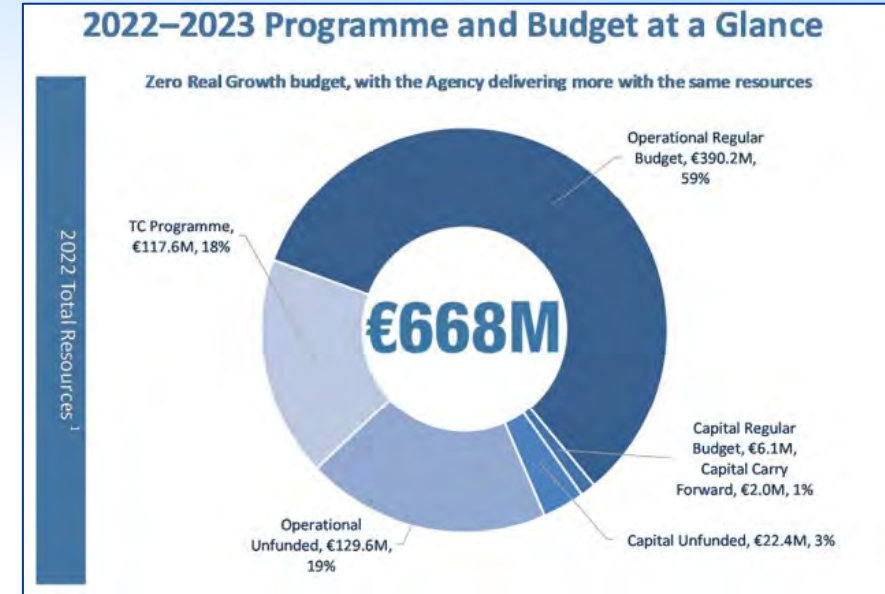
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International Atomic Energy Agency - IAEA
Dept. of Nuclear Science and Applications,
NAPC/Physics Section

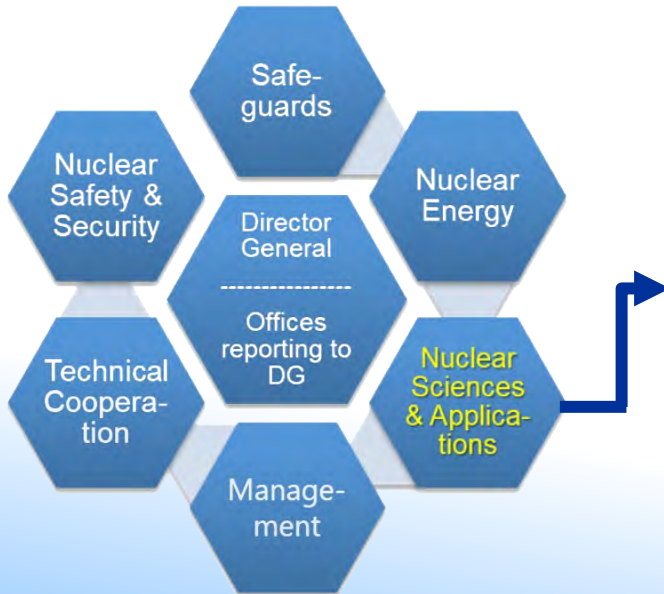
IAEA: An autonomous international organization within the United Nations system



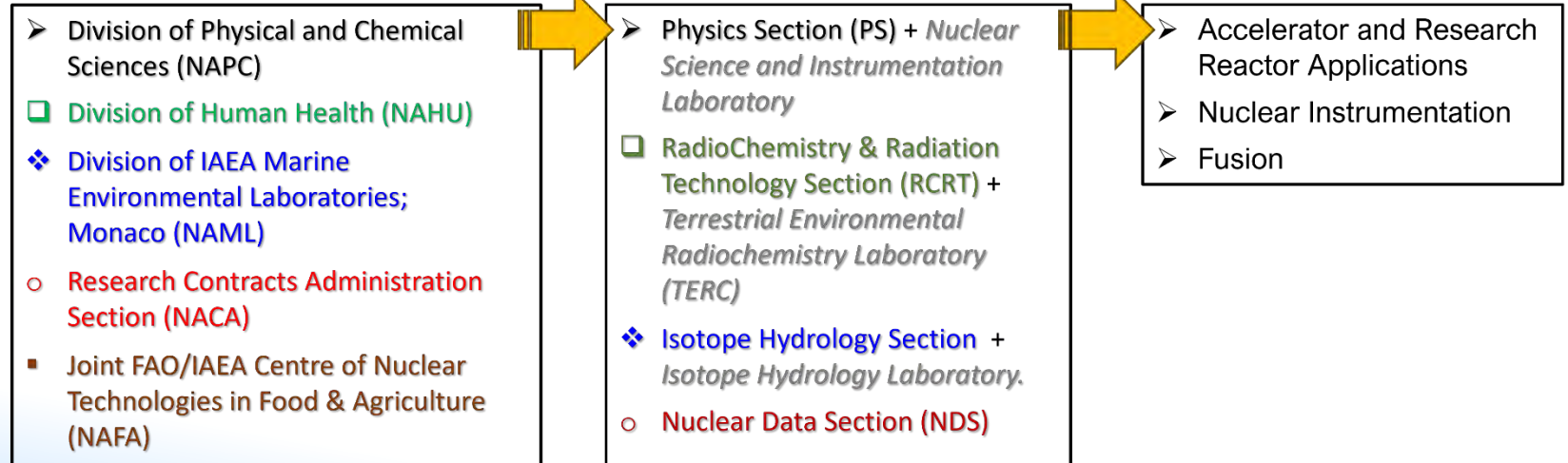
- 178 Member States (Sept.2023);
- 2500+ staff from over 100 Member States; HQ in Vienna
- Labs in Seibersdorf, Vienna and Monaco
- Regional offices in Toronto and Tokyo
- Liaison offices in New York and Geneva



Structure



Department of Nuclear Sciences and Applications



IAEA's Mission: to serve the Member States

- assist its Member States, in planning & using nuclear science & technology for peaceful purposes
- facilitate transfer of knowledge in a sustainable manner to developing Member States
- develop nuclear safety standards and promote high levels of safety in applications of nuclear energy, and the protection of human health and the environment against ionizing radiation;
- verify through its inspection system that States comply with their commitments to use nuclear material and facilities only for peaceful purposes.

The 12 IAEA laboratories



Water Resources



Food & Agriculture

Human Health

Nuclear Science

1. Insect Pest Control
2. Animal Production & Health
3. Plant Breeding & Genetics
4. Soil and Water Management & Crop Nutrition
5. Food Safety and Control
6. Dosimetry Laboratory
7. Terrestrial Environment
8. Nuclear Science and Instrumentation



Marine Environment



The tools



- [Consultancy Meetings](#): 5 to 10 experts are invited to provide specialized advice and recommendations on particular scientific or other aspects of relevance for the IAEA's programmes and activities.
- [Technical Meetings](#): Technical events with 30-40 participants, aiming at enhancing interaction among experts, share knowledge and expertise, establish scientific collaborations and create topical networks.
- [Coordinated Research Projects \(CRPs\)](#): Networks of 10-15 research institutes from developed and developing countries that work in coordination for 3-5 years to acquire and disseminate new knowledge/technology. Periodic meetings are organized to report progress and plan/coordinate future activities.
- [Training Workshops, Courses and dedicated Schools](#): Events enabling participants to acquire specific knowledge on a given subject of interest. Organized at IAEA labs, ICTP Trieste, or at labs in member states
- [Publications of technical documents and guides](#): Publications of reported results, shared good practices and lessons learned; produced by CRPs or Technical Meetings.
- [Collaborating Centres](#): IAEA Member State institutions/organizations are designated as *IAEA Collaborating Centres (CC)* to cooperate in the implementation of selected programmatic activities of the Agency.
- [National, regional, interregional Technical Cooperation \(TC\) projects](#): projects to build capacity via Expert Missions, training of personnel, purchase of equipment, assistance in establishing new facilities, ...

The IAEA Technical Cooperation Programme

Primary mechanism for transferring nuclear technology to Member States, implemented through **National**, **Regional** or Interregional TC Projects

- Capacity building
- Networking
- Knowledge sharing
- Partnership building



Expert assistance

Fellowships
Scientific visits



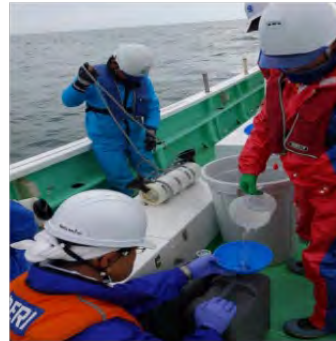
Equipment &
materials



Conferences,
Symposia

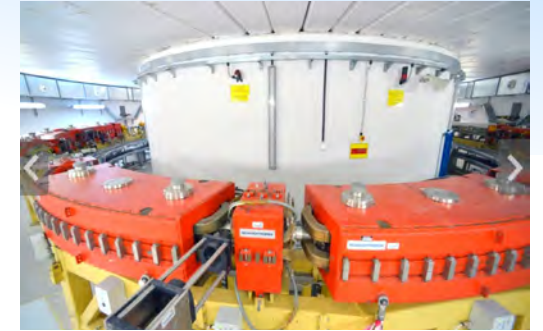


Training courses
& workshops



IAEA

The SESAME Interregional TC Project (2010-2023; ≈2M€)



(SESAME was inaugurated on May 16, 2017, in Jordan)

Over the last decade IAEA has provided **extensive support to train staff at SESAME to commission and run the facility**. This has included instruments, the training of 66 technical and scientific fellows in beamline technologies, and **over 30 expert missions to SESAME** to help build capacity in the installation and testing of equipment.

IAEA also facilitated the networking of SESAME staff with experts from other synchrotron facilities in Europe, the United States and Japan.

In 2018, Training Workshop held in SESAME, Jordan, with remote connection to Elettra

New Interregional TC project : INT0104.

The RER6039 Regional TC Project (SEEIIST)



Developing Human Resources for Setting Up an Ion Beam Therapy Centre within the Joint South East European International Institute for Sustainable Technologies



Forum on New International Research Facilities in South East Europe
ICTP, Trieste, Italy, 25 – 26 January 2018.

Development Objective:

To build critical mass of human resources initially needed for the merits of the emerging hadron tumour therapy and research facility – SEEIIST.



Pavia, Italy; Oct. 11-13, 2023

Event in conjunction with the IAEA-CNAO Regional Workshop on Hadrontherapy under the Technical Cooperation project RER6039

In collaboration with

Directors: Ester Oriandi, Saverio Altieri, Sotirios Charisopoulos

Decisions on

- Overall Workplan of TC project
- Capacity building through scientific visits
- Training program (Fellowships)
- Next workshops

HADRON THERAPY SYMPOSIUM
STATUS AND PERSPECTIVES, PLANS FOR NEXT GENERATION FACILITIES
18 - 21 October 2024
Thessaloniki

International and Local Organising Committee:

Yiota Foka (GSI/SEEIIST) chair	Panagiotis Bamidis (AUTH/AHEPA) co-chair
Peter Gruebling (SEEIIST)	Emmanouil Papanastasiou (AUTH/AHEPA)
Sandro Rossi (CNAO)	Maria Bigaki (Papageorgiou/IAEA) co-chair
Nicholas Sammut (Univ. Malta)	Antonis Czaplewski (AHEPA)
Maurizio Vretenar (CERN)	Stefanos Triaridis (AUTH/AHEPA)
	Kostas Badalas (Papageorgiou)
	Maria Topalidou (Papageorgiou)

Scientific Committee:

Piero Fassati (MedAustron)	Seimí Harrabi (MIT)
Marco Durante (GSI)	Ester Oriandi (CNAO)
Fabian Eberle (MIT)	Joao Seco (DKFZ)
Angela Facchini (CNAO)	Maurizio Vretenar (CERN)
Yiota Foka (GSI/SEEIIST)	Sotirios Charisopoulos (IAEA)

CLICK AND DISCOVER THE PROGRAMME

FREE REGISTRATION FOR IN-PERSON ATTENDANCE IS OPEN UNTIL 10 October, 2024

<https://indico.cern.ch/event/HadronTherapySymposium>

Thessaloniki, Greece; Oct. 18-19, 2024



IAEA Collaborating Centres

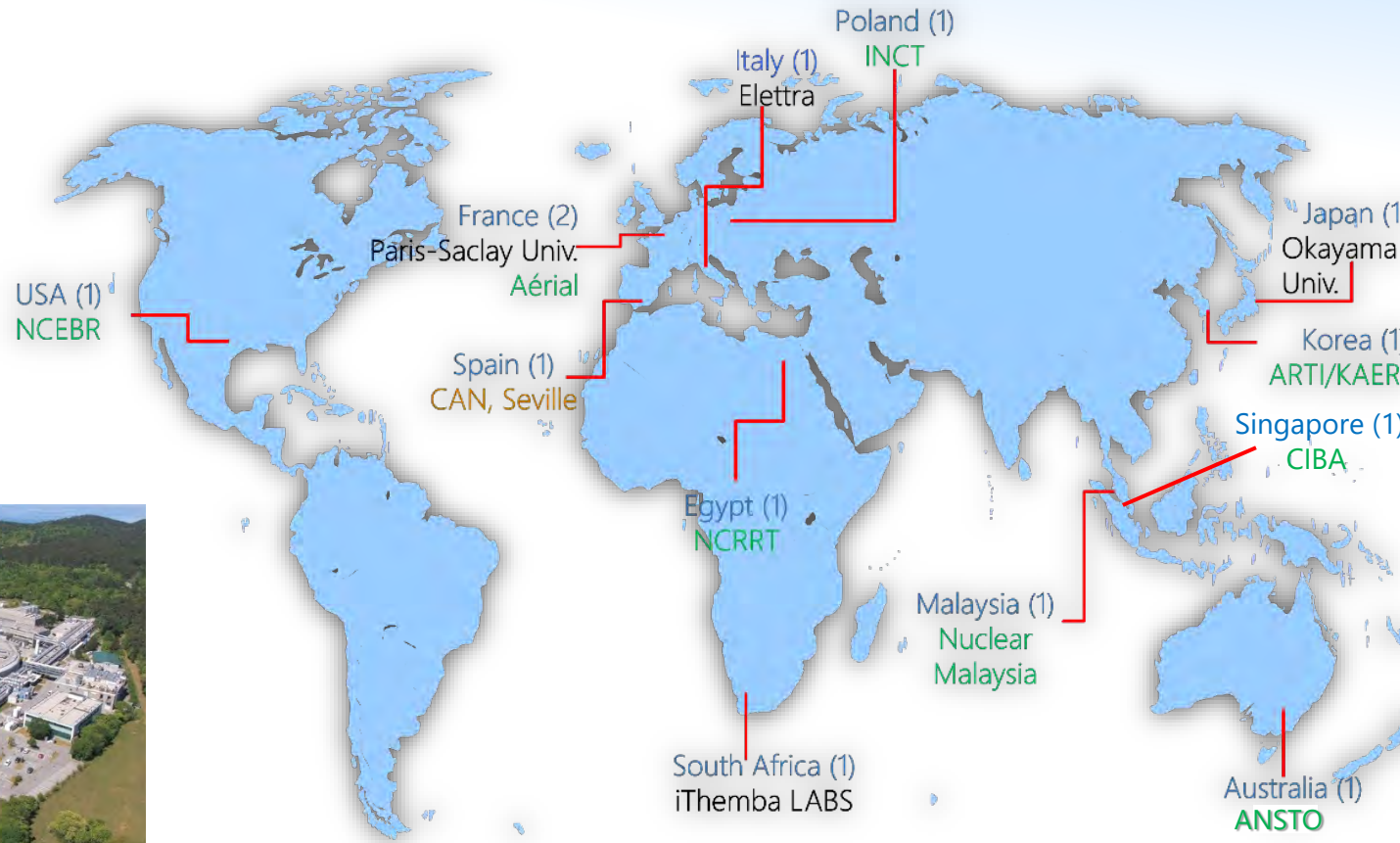
to cooperate in the implementation of selected IAEA programmatic activities



Elettra Sincrotrone, Trieste, Italy

Synchrotron applications
and technologies

Support the IAEA in the
implementation of activities
in the IAEA Programme
“Nuclear Techniques for
Development and
Environmental Protection”



Elettra's Work plan

- Assistance to developing MSs **intending to build synchrotron facilities** including training of their **scientists & technologists** in light sources design and beamline design control systems & detectors.
- Assistance to developing MSs in implementing new methodologies for **expanding the application fields of synchrotron and FEL techniques.**



Signing ceremony, 9 Nov. 2021

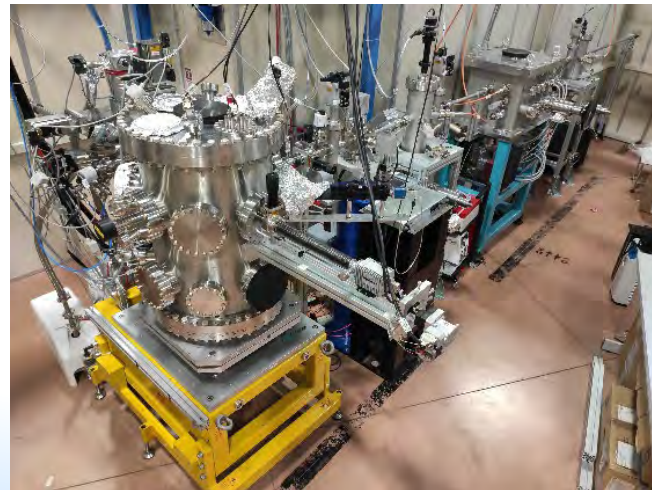
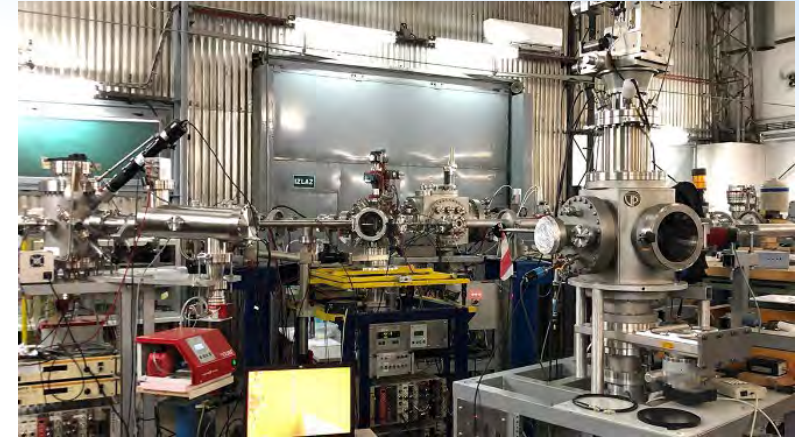
Facilitating access to state-of-the-art accelerator facilities

IAEA-RBI agreement; co-shared infrastructure

- 20 days of the beam time available for the developing countries
- Annual training workshops, with emphasis on hands-on-training
- New He ion source for dual-beam capability commissioned (fusion research)

IAEA-Elettra agreement; joint XRF beamline

- Dedicated beam-time for users; +20 research groups from +15 MSs annually
- Annual training workshops, with emphasis on hands-on-training
- Recent improvements of the beam line and end-station
- UHVC 'Mirror Facility' for training commissioned at NSIL Seibersdorf





IAEA

Training young scientists and accelerator operators

Training Workshop: Hands-on Operation & Maintenance of Electrostatic Accelerators; RBI, Zagreb, 9-13 Dec. 2019

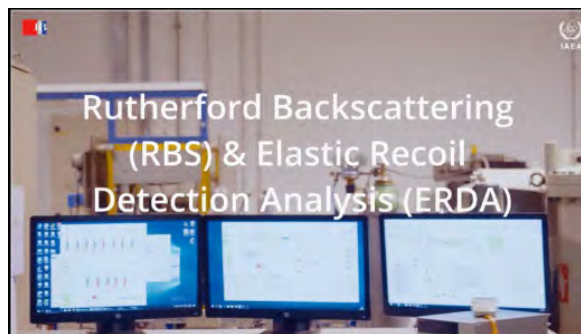
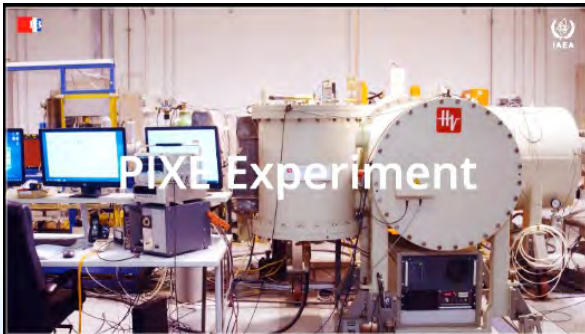


- ✓ **Accelerator** controls, control software, voltage measurements and stabilization, Dew point measurements, Magnetic hysteresis evaluation, Terminal voltage calibration.
- ✓ **Vacuum systems:** setting up & measurements, leak detection, RF&DC discharges in gases.
- ✓ **Ion sources:** beam extraction, beam current measurements, changing source parameters, element selection & optimization, changing Duoplasmatron operation
- ✓ **Beam optics:** Basic theory, beam focusing & steering, quadrupole alignment, beam brightness & size measurements.

Repeated: iThemba LABS, J'burg, SAF, Dec. 2022, & RBI, Zagreb, Croatia, Oct. 2023

Training Workshop: Advances in Ion Beam Techniques & Applications (Virtual), RBI, Zagreb, Croatia, 1-5 March 2021

Intro-lecture (60-90 min) – Demo video (≈20 min.) – Discussion/Questions/Exercises (90 min) – Homework (data analysis)
36 trainees (10 from Africa) – [17 female] – 16 Member States



<https://nucleus.iaea.org/sites/accelerators/Pages/IBA-video-demonstrations.aspx>

Repeated: RBI, Zagreb, Croatia, Nov. 2022 and JSI, Ljubljana, Slovenia, Oct. 2024; Planned: CNEA, Bariloche, Argentina, May 2025

Training and research opportunities at the Neutron Science Facility / NSIL, Seibersdorf

New IAEA Neutron Facility Delivers First Hands-on Training

Michael Amdi Madsen, IAEA Office of Public Information and Communication

NOV
24
2022

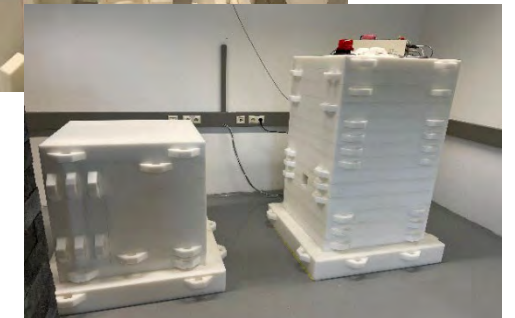


Francois Idjiwole handles a neutron generator at the new IAEA facility in Seibersdorf, Austria. (Photo D. Calma/IAEA)



NSF is based on two neutron generators, operational since 2022:

- **D+D reaction** → **2.45 MeV neutron source** (fission neutrons, $5e6$ n/s); US EB funded
 - **D+T reaction** → **14.1 MeV neutron source** (fusion neutrons, $5e8$ n/s); Australia donation
- Training courses: 20+ fellows trained (2 weeks each)
→ Internships: 6 interns trained (6-12 months each)
→ Interest from Member States continues to grow



1. Strategic Planning for National Nuclear Institutions
2. Specific Considerations & Guidance for Establishment of Ionizing Radiation Facilities
3. Introductory training course for research reactor personnel (English/Spanish)
4. Neutron Activation Analysis
5. Neutron Imaging
6. Nuclear Analytical Techniques for Forensic Science
7. Portable X-ray Spectrometry Techniques for Characterization of Valuable Archaeological/Art Objects
8. Quality Assurance of X-ray Fluorescence Analysis of Airborne Particulate Matter
9. Introduction to Total reflection X-ray Fluorescence
10. Introduction to X-ray Emission Spectrometry
11. Introduction to electrostatic accelerators: from basic principles to operation and maintenance
12. Ion-beam Engineering of Materials for Quantum Technologies
13. Accelerator Mass Spectrometry Radiocarbon Dating for Heritage and Forensic Science
14. Introduction to in-situ techniques for radiological characterization of sites

Overall objective	To support Member States in the <u>establishment of networking</u> to increase the knowledge and utilization of synchrotron light sources.
Expected outcome	<u>Establishment of a collaborative network</u> between end-users through networking of institutes, resulting in increased sharing of knowledge and technical experiences among participating countries.
Main outputs	<ol style="list-style-type: none">1. Increase the utilization of the network of synchrotron facilities including remote access.2. Share best practices, technical knowledge, and training opportunities.3. Training programs and workshops for synchrotron techniques and related areas.4. Effective funding mechanisms for equitable access to and training at synchrotron facilities.
Duration	2024-2028



Participants

IAEA Staff	PMO: Mr. M. Malek; TO: Mr D. Ridikas
8 IAEA Invited Intern. Experts	Australia, Canada, France, Germany, Italy, Jordan, South Africa, USA
Country Representatives	Cyprus, Indonesia, Jordan (2), Latvia, Malaysia, Oman, Thailand (5), Türkiye, Uzbekistan

Meeting Conclusions

The project workplan for the first 18 months has been revised and agreed. It includes four main activities to be supported by the project:

- pooling of available training materials/courses into a dedicated repository,
- collection of case studies / success stories for outreach purposes
- individual country mapping exercises (on request; Latvia, Malaysia, South Africa, and Thailand)
- ad hoc requests from individual counterparts relevant to project objectives.

Modalities and scope of activities for organization and support to training events will be defined based on requests received from the project counterparts and in consultation based on requests received from the project counterparts and in consultation with the IAEA, intern. experts and possible hosting organizations.

Meeting material and other documents were collected and will be made available to all participants after the event in a shareable folder.

Program Overview

Day 1	Keynote presentations by IAEA PMO and TO, SESAME team members and international experts (Knowledge Exchange & Capacity Building and Collaborative Network Development)
Day 2	Training Needs Assessment
Day 3	Developing Targeted Training Programs
Day 4	Resource Allocation and Network Building
Day 5	Future Directions and Workplan Development



Collaborative Network Development

The collection of training and teaching materials will be managed by a Task Force Group (TFG), still to be established by the project counterparts and international experts. The TFG would also manage the entire process, from design to implementation and evaluation. Preliminary steps also have been identified:

- Step 1: Survey and assess all available current material. Assess it for quality and standard, target, thematic area and mode of delivery and educational level.
- Step 2: Communicate personally with the originators to explain the universal training project and pooling of available to share training materials.
- Step 3: Develop a web platform to allow access to the material
- Step 4: Designate reviewers of the material to check for quality and consistency.
- Step 5: Material that can be used as “revisable training material for short learning programs (SLP) and courses, will be handled in a separate project. **The AfLS could drive this project, possibly in cooperation with other interested entities.**
- Step 6: Assign feature labels to the material so that data can be collected into a database reflecting the provenance data, subject content and other meta-data. The aim is to provide sufficient hooks for an AI based analysis of the performance and gaps in the deployment of the training.

The TFG would have Thematic and Technique subgroups that could focus on the development of specific sectors within the data, for example, paleo archaeology as a thematic area or molecular structure determination as a technique. The TFG would also create the Editorial Board for the material further review.



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Atoms for Peace and Development

Thank you for your attention

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