

Physics

Facilitating the Peaceful and Practical Uses of Nuclear Science and Technology

The IAEA Physics Section helps Member States establish frameworks for the efficient, sustainable and safe use of advanced nuclear technologies, such as particle accelerators, research reactors, nuclear fusion facilities and associated instrumentation. Applications of these nuclear technologies help advance various fields, such as energy, health, food and agriculture, nuclear safety and security, cultural heritage, forensic science, industry and the environment.

Four Key Areas



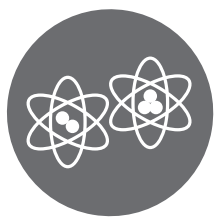
Accelerator Applications

Accelerators are used in both fundamental and applied research to characterize and qualify materials and objects, and to provide education and training for professionals in the nuclear sector. Major focus areas include applied research with three complementary probes, such as X-rays from synchrotrons, neutrons and ion beams from accelerators.



Research Reactor Utilization

Research reactors play an important role in the development of nuclear science and technology. They are used worldwide to produce radioisotopes for medical and industrial purposes. They also provide neutrons for research in physics, biology, the environment, materials science and energy, as well as for education and training of scientists and engineers.



Fusion

Fusion could be a safe and environmentally friendly source of energy in the future. The international fusion R&D programme is constructing the largest magnetic confinement experimental reactor called ITER. Currently, 35 countries are involved in its construction and over 100 more are engaged in fusion research as members of laboratory networks.



Nuclear Instrumentation

Successful use of nuclear technology depends on reliable instruments, monitoring and diagnostics equipment. These instruments allow the accurate measurement of both natural and man-made radiation.

By the Numbers

The IAEA Physics Section currently is leading

10 COORDINATED RESEARCH PROJECTS COVERING MORE THAN

100 RESEARCH INSTITUTIONS AND ORGANIZATIONS

Supporting more than

50 TECHNICAL COOPERATION PROJECTS IN MORE THAN **50 MEMBER STATES**

Our databases and information portals include the most recent developments of

237 RESEARCH REACTORS OPERATING IN **54 MEMBER STATES**

314 ION BEAM ACCELERATORS OPERATING IN **53 MEMBER STATES**

1270 CYCLOTRONS OPERATING IN **77 MEMBER STATES**

55 SYNCHROTRON LIGHT FACILITIES OPERATING IN **22 MEMBER STATES**

40 EXPERIMENTAL FUSION DEVICES OPERATING IN **15 MEMBER STATES**

The IAEA Physics Section offers access to state-of-the-art facilities through

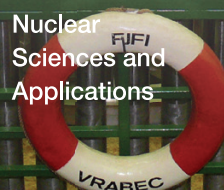
3 IAEA COLLABORATING CENTRES (TU DELFT, NETHERLANDS; ANSTO, AUSTRALIA AND CNEA, ARGENTINA)

3 BILATERAL AGREEMENTS WITH ELETTRA, ITALY; RBI, CROATIA AND ITER ORGANIZATION.



IAEA

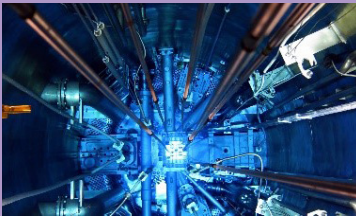
Nuclear
Sciences and
Applications



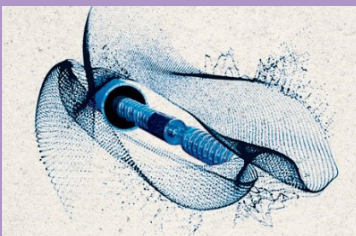
Key Activities

- Promoting the **utilization of accelerators and research reactors** in support of fundamental and applied research to irradiate or characterize materials, produce radioisotopes and provide training.
- Enhancing utilization of existing infrastructures through enabling **facility access for developing countries** without such facilities.
- Assisting in **planning and establishing new facilities**.
- Assisting Member States' laboratories in designing, installing, operating and maintaining the **nuclear instrumentation** needed for their research.
- Implementing training workshops and hands-on-training courses, including those at the **IAEA Nuclear Science and Instrumentation Laboratory** in Seibersdorf, partner laboratories in Member States or in cooperation with the International Centre for Theoretical Physics in Trieste, Italy.
- Facilitating **global fusion research and development** by fostering scientific and technological progress through international collaboration; supporting education and training; strengthening interactions between ITER and non-ITER members.

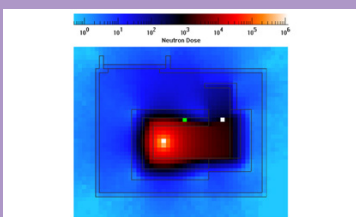
Recent Highlights



E-learning courses are effective tools for capacity building. The IAEA has recently launched several new e-learning courses, for example on Strategic Planning for National Nuclear Institutions; Nuclear Analytical Techniques for Forensic Science; Introduction to In-situ Techniques for Radiological Characterization of Sites; Introduction to X-ray Emission Spectrometry. In addition, the Neutron Activation Analysis (NAA) e-learning course, which was launched in 2017, has more than 200 users in over 50 Member States. Some of these topics will be discussed at the IAEA Conference on Research Reactors in Buenos Aires, Argentina, from 25 to 29 November 2019. More information at elearning.iaea.org.



The Accelerator Knowledge Portal benefits accelerator scientists, engineers, technology and service providers, the user community and policy makers. It hosts a global accelerator database, which includes 1679 individual facilities from electrostatic accelerators and cyclotrons, to synchrotron light facilities, spallation neutron sources and X-ray free electron lasers. Many of these facilities and related applications will be featured at the AccApp'20 hosted at the IAEA headquarters in Vienna, Austria, from 5 to 9 April 2020. More information at nucleus.iaea.org/sites/accelerators/.



The Nuclear Science and Instrumentation Laboratory (NSIL) is making progress towards the establishment of the Neutron Science Facility in Seibersdorf, Austria. In July 2019, Australia donated a deuterium-tritium-based neutron generator to NSIL. Since then, progress has been made towards the design of the shielding structures and components, planning future experiments and training courses. The facility will also host a brand-new deuterium-deuterium-based neutron generator and offer research and training opportunities in neutron applications, including NAA, neutron radiography, radiotracer production. The facility is expected to welcome its first users in 2020. For more information contact nsil@iaea.org.



The IAEA's biennial Fusion Energy Conference (FEC) is the largest global platform for sharing the latest research developments towards achieving practical fusion energy. The event attracts around 1000 participants from more than 40 Member States. The 2020 FEC will take place in Nice, France, and will feature a technical tour of ITER - the world's largest fusion experiment, which is scheduled to become operational at the end of 2025. More information at nucleus.iaea.org/sites/fusionportal/.