IAEA
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Atoms for Peace and Development

Joint IAEA–French Alternative Energies and Atomic Energy Commission Technical Meeting on Neutrons for Nuclear Sciences and Applications

Hosted by the
Government of France

through the
French Alternative Energies and Atomic Energy Commission

CEA Saclay, Gif-sur-Yvette, France

14 - 17 October 2024

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Information Sheet

Background

Since discovery of neutrons in 1932 by James Chadwick they have found application in many fields of science and technologies. Production of neutrons has been primary related to the operation of research reactors (RRs) and accelerator-based neutron sources. The multidisciplinary research that neutron facilities can support encompass neutron beam research and applications; material characterization and testing; elemental analysis; production of radioisotope for medical, environmental, and industrial applications; nuclear energy developments; capacity building for nuclear science and technology programmes and many others[1].

Traditionally moderate to intense neutron fluxes were supplied via research reactors. To date some 226 reactors in 54 countries continue to operate[2]. However, many of the research reactors are approaching the end of their operational lives and others require refurbishment upgrades to meet the current technological standards and safety requirements.

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Applications of Research Reactors, Nuclear Energy Series No. NP-T-5.3, IAEA, Vienna (2014).
[2] IAEA Research Reactor Database: https://nucleus.iaea.org/RRDB.

In the last few decades, accelerator-based neutron sources[3] have emerged along with research reactors for neutron beam research. Facilities based on spallation induced by proton beams with energies up to 1 GeV on heavy targets such as lead or tungsten can provide neutron intensity of up to 10^{18} n/s. Such facilities drive forward state-of-the-art research and technological developments, however very few technologically advanced countries can afford operation of spallation neutron source not only due to the high capital and operational costs but also because of uniqueness of underpinning technologies, construction, and qualification of the personnel for their operation.

Many countries operate low-energy accelerator-based neutron sources[3]. Despite their lower intensities in comparison with the spallation neutron sources, these facilities continue to have a crucial role in offering access to neutron sources of moderate intensities. In more recent years, advancements in a variety of lower-energy accelerator and neutron production target technologies have progressed significantly and led to substantial enhancement in the Compact Accelerator-Based Neutron Sources (CANS)[4] capacities and areas of their utilization. Depending on the choice of technology, they can reach neutron intensity up to 10^{13}-10^{14} n/s and accommodate techniques that were not feasible in the past. Such high intensity CANS can complement low to medium neutron flux research reactors and be a first alternative for those Member States who do not wish to embark on an establishment of a research reactor – a much more complex and demanding undertaking.

CANS are currently being built in hospitals for clinical boron neutron capture therapy (BNCT)[5], at universities and research organizations as nuclear data, materials research and testing facilities[6,7], and in some cases are also being developed as international neutron centres[8]. The current achievements are the foundation for further development of this dynamically evolving field both in technological and utilization aspects for advancement of the science and technology. In this context, one also needs to mention separately the recent establishment of the Neutron Science Facility (NSF)[9] at the IAEA Laboratories in Seibersdorf. This facility is based on DD and DT compact neutron generators and aims mainly for capacity building, demonstration of some research and applications using low intensity neutron sources. The IAEA also has future plans to build an electrostatic accelerator, mainly for ion beam analytical research but also including a neutron production station.

Given the recent developments it would seem prudent to explore the complementary roles that CANS and research reactors may play in introducing neutron technologies to countries where such technology has not previously found a home, or re-invigorating neutron research in countries where research reactors exist but may be underutilized. A review of main principles, advantages and limitations of the different neutrons source technologies has been done at the IAEA Consultancy Meeting on the Development of a New Initiative on Neutrons for Nuclear Sciences and Applications (Neutrons4NA) that took place in Vienna from 18 to 20 December 2023 to assist Member States in the strategic planning for their present and future nuclear research infrastructure involving neutron sources. The participating international experts believe that that there is an apparent need among Member States for establishing a forum to gather interested parties with a common ambition in developing access to nuclear science and applications using neutron sources and put forward an action plan for follow up activities under the auspices of the IAEA.

[3] IAEA Interactive Map of Accelerators: https://nucleus.iaea.org/sites/accelerators/Pages/Interactive-Map-of-Accelerators.aspx

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Compact Accelerator Based Neutron Sources, IAEA-TECDOC-1981, IAEA, Vienna (2021).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Advances in Boron Neutron Capture Therapy, Non-serial Publications, IAEA, Vienna (2023)

[6] Neutrons for Science (NFS) facility, https://www.ganil-spiral2.eu/scientists/ganil-spiral-2-facilities/experimental-areas/nfs/

[7] RIKEN Accelerator-driven compact Neutron Systems (RANS), https://rans.riken.jp/index-e.html

[8] International Fusion Materials Irradiation Facility, DEMO Oriented Neutron Source (IFMIF-DONES) https://ifmif-dones.es/

[9] IAEA Neutron Science Facility (NSF), https://nucleus.iaea.org/sites/nuclear-instrumentation/Pages/neutrons.aspx

Objectives

The purpose of the event is to bring together all interested parties with a common goal of developing facilitated user access to nuclear sciences and applications using neutrons, based on the two main pillars of compact accelerator-based neutron sources and research reactors. The event will contribute to information sharing with respect to existing experiences, good practices and lessons learned as well as new projects and initiatives to establish and operate neutron sources at the national, regional and international levels.

Agenda Topics and Technical Visits

Participants are expected to report on their existing experience in planning, designing, establishing and utilizing neutron sources, particularly with low or medium fluxes. Experience from facilities with high flux neutron sources can also be discussed, provided it is relevant to facilities with low or medium flux neutron sources. The meeting will also include presentations by IAEA staff, invited experts and technology providers.

The meeting will also include group discussions on specific topics regarding the development of an IAEA initiative on Neutrons4NA, drafting meeting report and recommendations.

A technical tour to accelerator-based neutron source and related ancillary facilities of the CEA Saclay will be organized.

Target Audience

The meeting is intended for decision makers, managers, researchers and users of both operating or planned accelerator- and research reactor-based neutron sources, including technology developers and providers representing both public and private sectors.

Member States are invited to designate one or more participants for this meeting. Member States are strongly encouraged to identify suitable women participants.

Working Language(s)

The working language of the meeting will be English. All communication and papers must be sent to the IAEA in English. No simultaneous interpretation will be provided.

Participation and Registration

All persons wishing to participate in the event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

In order to be designated by an IAEA Member State or invited organization, participants are requested to submit their application via the InTouch+ platform (https://intouchplus.iaea.org) to the competent national authority (Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA by **8 July 2024,** following the registration procedure in InTouch+:

1. Access the InTouch+ platform (https://intouchplus.iaea.org):
   - Persons with an existing NUCLEUS account can sign in to the platform with their username and password;
   - Persons without an existing NUCLEUS account can register here.

2. Once signed in, prospective participants can use the InTouch+ platform to:
   - Complete or update their personal details under 'Complete Profile' and upload the relevant supporting documents;
   - Search for the relevant event under the 'My Eligible Events' tab;
   - Select the Member State or invited organization they want to represent from the drop-down menu entitled 'Designating Authority' (if an invited organization is not listed, please contact InTouchPlus.Contact-Point@iaea.org);
   - If applicable, indicate whether financial support is requested and complete the relevant information (this is not applicable to participants from invited organizations);
   - Based on the data input, the InTouch+ platform will automatically generate the Participation Form (Form A) and/or the Grant Application Form (Form C);
   - Submit their application.

Once submitted through the InTouch+ platform, the application, together with the auto-generated form(s), will be transmitted automatically to the required authority for approval. If approved, the application, together with the applicable form(s), will automatically be sent to the IAEA through the online platform.

NOTE: The application for financial support should be made, together with the submission of the application, by **8 July 2024**.

For additional information on how to apply for an event, please refer to the InTouch+ Help page. Any other issues or queries related to InTouch+ can be sent to InTouchPlus.Contact-Point@iaea.org.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters.

Participants are hereby informed that the personal data they submit will be processed in line with the Agency's Personal Data and Privacy Policy and is collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required. The IAEA may also use the contact details of Applicants to inform them of the IAEA's scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA's mandate. Further information can be found in the Data Processing Notice concerning IAEA InTouch+ platform.

Papers and Presentations

The IAEA encourages participants to give presentations on the work of their respective institutions that falls under the topics listed above.

Participants who wish to give presentations are requested to submit an abstract of their work. The abstract will be reviewed as part of the selection process for presentations. The abstract should be in A4 page format, should extend to no more than 1 page (including figures and tables) and should not exceed 500 words. It should be sent electronically to Mr Danas Ridikas and Ms Valentina Semkova, the Scientific Secretaries of the event (see contact details below), not later than **8 July 2024**. Authors will be notified of the acceptance of their proposed presentations by **2 August 2024**.

In addition to the registration already submitted through the InTouch+ platform, participants have to submit the abstract, together with the Form for Submission of a Paper (Form B), to the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA not later than **8 July 2024**.

Expenditures and Grants

No registration fee is charged to participants.

The IAEA is generally not in a position to bear the travel and other costs of participants in the event. The IAEA has, however, limited funds at its disposal to help meet the cost of attendance of certain participants. Upon specific request, such assistance may be offered to normally one participant per country, provided that, in the IAEA's view, the participant will make an important contribution to the event.

The application for financial support should be made, together with the submission of the application, by **8 July 2024**.

Visas

Participants who require a visa to enter France should submit the necessary application as soon as possible to the nearest diplomatic or consular representative of France.

Scientific Secretaries:

Mr Danas RIDIKAS & Ms Valentina SEMKOVA
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Administrative Secretary:

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Subsequent correspondence on scientific matters should be sent to the Scientific Secretary/Secretaries and correspondence on other matters related to the event to the Administrative Secretary.

Enclosure: Form for Submission of a Paper (Form B)

Form for Submission of a Paper

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To be completed by the participant and sent to the competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA, or National Atomic Energy Authority) of his/her country for subsequent transmission to the International Atomic Energy Agency (IAEA) either by email to: Official.Mail@iaea.org or by fax to: +43 1 26007 (no hard copies needed). Please also send a copy by email to the Scientific Secretaries Mr Danas Ridikas and Ms Valentina Semkova, Division of Physical and Chemical Sciences, Department of Nuclear Sciences and Applications (d.ridikas@iaea.org & v.semkova@iaea.org) and to the Administrative Secretary Ms Ivana Andrejic-Dukic (I.Andrejic-Dukic@iaea.org).

Participants who are members of an invited organization can submit this form to their organization for subsequent transmission to the IAEA.

Deadline for receipt by IAEA through official channels: 8 July

Title of the paper:		
If applicable: Abstract ID in IAEA-INDICO:		
Family name(s) and first name(s) of all author(s) (same as in passport(s):	Scientific establishment(s) in which the work has been carried out	City/Country
1.		
2.		
3.		
Family name and first name(s) of author presenting the paper (same as in passport(s):	Mr/Ms:	
Mailing address:		
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I hereby agree to assign to the International Atomic Energy Agency (IAEA):

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Date: **Signature of main author:**