



Атом для мира и развития

الوكالة الدولية للطاقة الذرية

国际原子能机构

International Atomic Energy Agency

Agence internationale de l'énergie atomique

Международное агентство по атомной энергии

Organismo Internacional de Energía Atómica

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Секретариат Международного агентства по атомной энергии (МАГАТЭ) свидетельствует свое уважение государствам — членам МАГАТЭ и имеет честь обратить их внимание на то, что **6–10 сентября 2021 года** в виртуальном режиме на платформе Microsoft Teams состоится **учебный семинар-практикум по перспективным направлениям использования нейтронной визуализации в сфере исследований и для практического применения** (далее именуемый «мероприятие»).

Цель мероприятия - представить и распространить самую последнюю, точную информацию об использовании нейтронной визуализации, известной также под названием нейтронная радиография и томография, в сфере фундаментальных исследований и для применения в промышленности.

В прилагаемом информационном листе приводится дополнительная информация о мероприятии.

Мероприятие будет проводиться на английском языке.

Государствам-членам предлагается назначить одного или нескольких специалистов в качестве представителей правительства для участия в данном мероприятии. Государствам-членам настоятельно рекомендуется определить подходящих участников из числа женщин.

Сообщения о назначении следует представлять в МАГАТЭ через компетентный национальный орган (министерство иностранных дел, постоянное представительство при МАГАТЭ или национальный орган по атомной энергии) не позднее **18 июня 2021 года** с использованием прилагаемой анкеты участника (бланка А). Заполненные и заверенные анкеты участников следует направлять либо по электронной почте на адрес Official.Mail@iaea.org, либо факсом на номер +43 1 26007 (направлять печатные экземпляры не нужно). Копии следует направлять по электронной почте ученому секретарю мероприятия г-ну Нуну Песоа Баррадашу (Mr Nuno Pessoa Barradas), Отдел физических и химических наук, Департамент ядерных наук и применений (эл. почта: N.Pessoa-Barradas@iaea.org), и административному секретарю г-же Марион Линтер (Ms Marion Linter) (эл. почта: M.Linter@iaea.org). После получения официальных сообщений о назначении ученый секретарь мероприятия свяжется с участниками напрямую и в установленном порядке согласует дальнейшие организационные вопросы.

МАГАТЭ не принимает на себя ответственности, а поставщик услуг виртуального совещания дает заверения и гарантии в отношении того, что такие услуги не содержат и что посредством программного обеспечения, используемого для проведения виртуальной конференции, никто из конечных пользователей не получит никаких вирусов, сетевых червей, программ,

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Секретариат Международного агентства по атомной энергии пользуется случаем, чтобы возобновить государствам — членам МАГАТЭ уверения в своем самом высоком уважении.



30 марта 2021 года

Приложения (только на английском языке):

- информационный лист
- анкета участника (бланк А)
- бланк для представления доклада (бланк В)



IAEA

International Atomic Energy Agency

Atoms for Peace and Development

Training Workshop on the Advanced Use of Neutron Imaging for Research and Applications

Virtual Event

6–10 September 2021

Ref. No.: EVT2004613

Information Sheet

Introduction

The use of neutron imaging at research reactors or spallation neutron sources for applications such as non-destructive examination of cultural heritage objects has already been proven in industrialized countries, and there is growing interest and capacity in developing countries. This technique allows for studies of a material's characteristics, including the internal structure, providing insights into fabrication techniques, provenancing, authenticity verification and manufacturing technology, without inflicting permanent damage to the material itself. The advantage of neutrons, compared to X rays, is that they are sensitive to many light elements, have deeper penetration length in metals and heavy elements, and are also sensitive to magnetic structures or externally applied fields. Furthermore, as neutron imaging technology has advanced, the individual techniques based on this type of imaging have become more precise and efficient, as well as much faster, specifically in the field of digital radiography (two-dimensional), computed tomography (three-dimensional), energy-selective neutron imaging or dynamic (real-time) neutron imaging. The extraordinary development in direct digital methods and increase in computational analytical power observed in the 21st Century now allows for excellent image quality and the ability to better process and analyse data. Today, the major fields in which neutron imaging is applied include cultural heritage, archaeology, the mining, oil and petroleum industries, car and aviation industries, environment and building materials, biology, medicine, physics, and the energy sector (ranging from the nuclear power industry to new technologies such as hydrogen fuel cells and lithium batteries).

The International Atomic Energy Agency's (IAEA's) Research Reactor Database (<http://nucleus.iaea.org/RRDB/>) indicates that there are currently 237 research reactors worldwide in operational or temporary shutdown status. Of these, 69 in 37 countries report neutron radiography

activity. In addition, there are a number of additional neutron imaging facilities installed or planned at neutron spallation sources in several countries. However, the actual growth in use of these neutron imaging facilities is still well below its potential, particularly in developing countries, for a number of reasons: the need for modernization of instrumentation and software; insufficient experience and qualifications of the personnel involved in these advanced subjects; an inclination to adapt the technology to specific user needs; and the establishment of new protocols and standardization procedures, including the development of marketing strategies.

In 2015–2016, through a comprehensive survey that was jointly prepared and coordinated by the IAEA and the International Society for Neutron Radiology, a specific database of neutron imaging facilities was launched and established. This database contains (status as of March 2021) detailed technical information from 56 neutron imaging facilities worldwide. In addition, some dedicated round robin exercises have been organized recently by the IAEA, with the main purpose being to characterize and evaluate the performance capabilities of operational neutron imaging facilities, and to develop concrete actions for enhancing their performance and utilization. The IAEA developed an e-learning course on neutron imaging, which became available to Member States in 2020.

Objectives

The purpose of the event is to introduce and deliver the most recent, concise information on the use of neutron imaging — also known as neutron radiography and tomography — for both basic research and industrial applications.

Target Audience

The event is intended for individuals involved in the utilization of neutron imaging techniques or in the development or design of neutron imaging experimental facilities at neutron sources.

Working Language(s)

English.

Topics

The event will comprise off-line and on-line sessions. The off-line sessions will consist in pre-recorded presentations by experts in sessions devoted to specific topics, and in pre-recorded presentations by the participants on their neutron imaging work. The on-line sessions will consist on practical computational exercises led by experts, based on data made available previously and, wherever possible, free software. As part of the workshop, the participants are required to review the IAEA e-learning course on neutron imaging. A session will be dedicated to summarizing the review made.

The event programme will be designed to cover a range of topics that are relevant to Member States, especially developing countries, that are considering establishing or upgrading their neutron imaging facilities. The main objective of the event is to contribute to the enhancement of scientific-technological knowledge, innovation in infrastructure and human resources training in the area of neutron imaging using neutron beams for fundamental research and industrial applications. The topics will include:

- Principles of neutron radiography and tomography
- Mathematics of computerized tomography
- Instrumentation and instrument design for neutron imaging
- Detectors for neutron imaging
- Advanced neutron imaging techniques
- Applications of neutron imaging in research and industry
- Tutorials on neutron imaging: demonstration of software on experimental data handling, post-experimental analysis, image reconstruction and examination, finalization of results
- Facility reports: existing, new and planned facilities

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, participants are requested to send the **Participation Form (Form A)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) for onward transmission to the IAEA by **18 June 2021**. Participants who are members of an organization invited to attend are requested to send the Participation Form (Form A) through their organization to the IAEA by the above deadline.

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

Papers and Presentations

All participants are required to prepare a short presentation with voice-over for the off-line session of the workshop and therefore to submit an abstract of their work. The abstract will be reviewed as part of the selection process for participation. 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 Nuno Pessoa Barradas, the Scientific Secretary of the event (see contact details below), not later than **18 June 2021**. Authors will be notified of the acceptance of their proposed presentations by **31 July 2021**.

In addition, participants have to submit the abstract together with the **Participation Form (Form A)** and the attached **Form for Submission of a Paper (Form B)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or their organization for onward transmission to the IAEA not later than **18 June 2021**.

Key Deadlines and Dates

18 June 2021	Submission of Participation Form (Form A) and Form for Submission of a Paper (Form B), through the official channels
31 July 2021	Notification of the acceptance of proposed presentations
6 September 2021	Event begins

IAEA Contacts

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

Participation Form

Training Workshop on the Advanced Use of Neutron Imaging for Research and Applications

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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 Secretary N.Pessoa-Barradas@iaea.org and to the Administrative Secretary M.Linter@iaea.org.

Deadline for receipt by IAEA through official channels: 18 June 2021

Family name(s): (same as in passport)	First name(s): (same as in passport)	Mr/Ms
Institution:		
Full address:		
Tel. (Fax):		
Email:		
Nationality:	Representing following Member State/non-Member State/entity or invited organization:	
If/as applicable: Do you intend to submit a paper? Yes <input type="checkbox"/> No <input type="checkbox"/> Would you prefer to present your paper as a poster? Yes <input type="checkbox"/> No <input type="checkbox"/> Title:		

Form for Submission of a Paper

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Deadline for receipt by IAEA through official channels: 18 June 2021

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(s) and first name(s) of author presenting the paper (same as in passport):	Mr/Ms:	
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Date:

Signature of main author: