



Átomos para la paz y el desarrollo

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

Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Phone: (+43 1) 2600 • Fax: (+43 1) 26007
Email: Official.Mail@iaea.org • Internet: <https://www.iaea.org>

In reply please refer to: **EVT1805403**
Dial directly to extension: (+43 1) 2600-28231

La Secretaría del Organismo Internacional de Energía Atómica (OIEA) saluda a los Estados Miembros del OIEA y tiene el honor de señalar a su atención la celebración de la **Reunión Técnica sobre Ensayos No Destructivos mediante Radiografía Muónica: Situación Actual y Nuevas Aplicaciones**, que tendrá lugar en la Sede del OIEA en Viena (Austria) del **9 al 12 de septiembre de 2019**.

La finalidad de la reunión es evaluar la situación actual y las posibles aplicaciones de la radiografía muónica en los ensayos no destructivos, y elaborar un plan de acción para desarrollar y facilitar su uso.

La reunión se celebrará en inglés.

Se invita a los Estados Miembros a designar a una o más personas para que participen en esta reunión y se los alienta encarecidamente a seleccionar con ese fin a mujeres calificadas.

Por lo general, el OIEA no está en condiciones de sufragar los gastos de viaje ni de otra índole de los participantes en la reunión. No obstante, dispone de fondos limitados para ayudar a cubrir los gastos de asistencia de determinados participantes. Esa ayuda puede ofrecerse normalmente, previa solicitud expresa, a un participante por país, siempre que, en opinión del OIEA, la persona para la que se solicita pueda hacer una contribución importante a la reunión. La solicitud de apoyo financiero debe presentarse en el momento de la designación de los participantes mediante el formulario de solicitud de subvención adjunto (Formulario C).

Cabe señalar que el OIEA no paga ninguna indemnización por daños o pérdida de efectos personales. Tampoco proporciona seguro médico a los participantes en eventos del OIEA. Por lo tanto, se recomienda que estas personas adopten las medidas necesarias para contratar por su cuenta un seguro privado. No obstante, el OIEA cubrirá mediante un seguro los accidentes y enfermedades claramente relacionados con los servicios prestados al OIEA.

Las designaciones deben presentarse al OIEA por conducto de la autoridad nacional competente (el Ministerio de Relaciones Exteriores, la Misión Permanente ante el OIEA o la Autoridad Nacional de Energía Atómica), a más tardar el **25 de junio de 2019**, por medio del formulario de participación adjunto (Formulario A). Los formularios de participación debidamente cumplimentados y autorizados deben enviarse por correo electrónico a la dirección Official.Mail@iaea.org, o por fax al número +43 1 26007 (no se precisan copias impresas). Asimismo, han de enviarse copias por correo electrónico al Secretario Científico de la reunión, Sr. Francois Foulon, División de Ciencias Físicas y Químicas, Departamento de Ciencias y Aplicaciones Nucleares (correo electrónico: F.Foulon@iaea.org), y a la Secretaria Administrativa, Sra. Marion Linter (correo electrónico: M.Linter@iaea.org). Una vez recibidas las designaciones oficiales, el Secretario Científico de la reunión contactará directamente a los participantes en relación con otras cuestiones de organización, como los detalles del viaje, según proceda.

En caso de que los Gobiernos desearan, además, nombrar uno o más observadores para que presten asistencia y asesoramiento a los participantes designados, se les ruega que comuniquen al OIEA los nombres y las señas de esos observadores a más tardar en la fecha antes indicada. De conformidad con las normas establecidas, corresponde a los Gobiernos sufragar los gastos de asistencia de los observadores que envíen a los eventos del OIEA. Este no paga ninguna indemnización por daños o pérdida de efectos personales de los observadores, ni por enfermedad, lesión o fallecimiento durante los viajes o en relación con su asistencia a los eventos del OIEA.

La Secretaría del Organismo Internacional de Energía Atómica aprovecha esta oportunidad para reiterar a los Estados Miembros del OIEA el testimonio de su distinguida consideración.



11 de abril de 2019

Documentación adjunta (en inglés únicamente):

Reseña informativa

Formulario de participación (Formulario A)

Formulario de presentación de memorias (Formulario B)

Formulario de solicitud de subvención (Formulario C)



IAEA

International Atomic Energy Agency

Atoms for Peace and Development

Technical Meeting on Non-destructive Testing Using Muon Radiography: Present Status and Emerging Applications

**IAEA Headquarters
Vienna, Austria**

9–12 September 2019

Ref. No.: EVT1805403

Information Sheet

Background

Non-destructive techniques, such as X-ray and gamma radiography, have been widely used in various metal and processing industries to improve product quality and assess the safety and integrity of structures. Their technical, economic and environmental benefits have been well demonstrated and recognized in many industrial sectors. These techniques are based on radiation generators or sealed sources that are used in both laboratory environments and industry.

Muon radiography, which is based on cosmic rays, may provide alternative or complementary solutions without the need for a man-made source and thus without regulatory constraints. Indeed, cosmic rays generated through the interaction of high-energy particles (mainly protons) in the earth's upper atmosphere produce copious numbers of pi-mesons, some of which decay into muons. Muons have properties similar to electrons but have a much larger mass. They interact mainly through weak and Coulomb interactions so that they can reach the surface of the earth. While other high-energy particles (protons, electrons and gamma rays) are filtered out by the shielding of the atmosphere, muons represent 98% of terrestrial cosmic rays at ground level.

The flux of muons at the ground level is about 10 000 per minute per square metre and the mean free path of muons is substantial. As a result, some muons can penetrate hundreds of metres of rock. Thus, muons can be used as a highly penetrating non-destructive probe. The technique of muon transmission/attenuation can be best applied to static situations where days of exposure time are

available, and detectors with large areas (square metres) can be used. The technique has been used for applications ranging from archaeological studies, volcanology and geological imaging, and is known as muon transmission radiography or muon transmission tomography.

Another tomographic technique is also under development — muon scattering tomography. This technique involves measuring both the incident and the transmitted muon and determining the amount of scattering the muon has undergone to ascertain the thickness of the material the muon has traversed.

In muon transmission radiography, the statistical precision is proportional to λ/\sqrt{N} , where λ is the stopping range of muons (~ 1000 g/cm² at the earth's surface) and N is the muon fluence (integrated flux) through a resolution element of size l . In muon scattering tomography, the precision is proportional to $l/\sqrt{2N}$.

Both of these techniques may be exploited in numerous applications ranging from geology, industry and civil engineering to security and safeguards. Recently this field of research attracted attention from various groups around the world, and the number of publications dealing with muon radiography or muon tomography has increased considerably in the last few years.

However, since muon radiography is an emerging technique, there are still open questions and scientific challenges to be addressed.

Objectives

The event aims to serve as a forum for participants to discuss and share recent advances in muon radiography, as well as to evaluate the status and current trends regarding practical applications of muon radiography, both in developed and developing IAEA Member States.

The event will provide an opportunity to bring together the stakeholders involved in this activity, including those engaged in the development of muon radiography techniques and associated instrumentation, as well as their potential end users.

Since the IAEA is playing an important role in the dissemination of knowledge and transfer of relevant technologies, the event will also be used to develop strategies to facilitate the technical advancement of these techniques and their applications.

Target Audience

The event is intended for individuals from Member States that are directly involved in the development or utilization of muon radiography techniques.

Topics

The following topics will be discussed:

- Recent development in detection systems, data acquisition and data analysis in muon radiography techniques;
- Experience and lessons learned from the development and utilization of muon radiography techniques;
- Identification of challenges to be overcome to facilitate and widen applications of muon radiography techniques; and
- Development of strategies to further enhance collaboration in the advancement of muon radiography techniques and their promotion among potential users, both in developed and developing Member States.

Expected Outputs

The expected output is an event report based on the abstracts and presentations of the participants and on subsequent round-table discussions. The report will:

- Provide an overview of the recent development in detection systems, data acquisition and data analysis in muon radiography techniques;
- Gather the experience and lessons learned from the development and utilization of muon radiography techniques by practitioners and end users; and
- Identify opportunities for Member States to access/utilize muon radiography techniques as a complementary non-destructive testing technique.

Structure

The meeting will consist of plenary sessions and round-table discussions

Time will be allocated for the participants to present Member State experiences and needs.

Working Language(s)

English.

Participation

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 **25 June 2019**. 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 above deadline.

In addition, persons wishing to participate are invited to submit a one-page abstract addressing one or more of the topics listed above. The Scientific Secretaries will assess eligibility based on the contents of the abstract.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters. 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 using the **Grant Application Form (Form C)** which has to be stamped, signed and submitted by the competent national authority to the IAEA together with the **Participation Form (Form A)** by **25 June 2019**.

Venue

The event will be held at the Vienna International Centre (VIC), where the IAEA's Headquarters are located. Participants must make their own travel and accommodation arrangements.

General information on the VIC and other practical details, such as a list of hotels offering a reduced rate for IAEA participants, are listed on the following IAEA web page:
<http://www-pub.iaea.org/iaeaevents/GeneralInfo/Guide/VIC>.

Participants are advised to arrive at Checkpoint 1/Gate 1 of the VIC one hour before the start of the event on the first day in order to allow for timely registration. Participants will need to present an official photo identification document in order to be admitted to the VIC premises.

Visas

Participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria at least four weeks before they travel to Austria. Since Austria is a Schengen State, persons requiring a visa will have to apply for a Schengen visa. In States where Austria has no diplomatic mission, visas can be obtained from the consular authority of a Schengen Partner State representing Austria in the country in question.

IAEA Contacts

Scientific Secretaries:

Mr Francois Foulon

Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 28231

Fax: +43 1 26007

Email: F.Foulon@iaea.org

Mr Patrick Dominique M. Brisset

Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 21745/21747

Fax: +43 1 26007

Email: P.Brisset@iaea.org

Administrative Secretary:

Ms Marion Linter

Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 VIENNA
AUSTRIA

Tel.: +43 1 2600 25119

Fax: +43 1 26007

Email: M.Linter@iaea.org

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

Participation Form

Technical Meeting on Non-destructive Testing Using Muon Radiography: Present Status and Emerging Applications

IAEA Headquarters, Vienna, Austria

9–12 September 2019

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 F.Foulon@iaea.org and to the Administrative Secretary M.Linter@iaea.org.

Please attach a passport copy or other document of identification (ID).

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: 25 June 2019

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

Technical Meeting on Non-destructive Testing Using Muon Radiography: Present Status and Emerging Applications

IAEA Headquarters, Vienna, Austria

9–12 September 2019

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 F.Foulon@iaea.org and to the Administrative Secretary M.Linter@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: 25 June 2019

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:	
Mailing address:		
Tel. (Fax):		
Email:		

I hereby agree to assign to the International Atomic Energy Agency (IAEA):

- the copyright; or
- the non-exclusive, worldwide, free-of-charge licence (this option is only for those authors whose parent institution does not allow them to transfer the copyright for work carried out in that institution) granting the IAEA world rights for the use of the aforementioned material in this and any future editions of the publication, in all languages, and in all formats available now, or to be developed in the future (digital formats, hard copy etc.).

Please note: If granting the licence mentioned above, please supply any copyright acknowledgement text required.

Furthermore, I herewith declare:

- that the material submitted to the IAEA is original, except for such excerpts from copyrighted works as may be included with the permission of the copyright holders thereof, has been written by the stated authors, has not been published before, and is not under consideration for publication by another entity;
- that any permissions and rights to publish required for third-party content, including but not limited to figures and tables, have been obtained, that all published material is correctly referenced; and
- that the material submitted to the IAEA does not contain any libellous or other unlawful statements and does not contain any materials that violate any personal or proprietary rights of any person or entity.

Date:

Signature of main author:

