REPROLAM

Red de Optimización de la Protección Radiológica Ocupacional en LatinoAmérica y el Caribe

# NEWSLETTER

NUMBER 1, FEBRUARY 2023

CULTURA DE SEGURIDAD

## SAFETY FIRST

*Space dedicated to common understanding and the promotion of Safety Culture through information, analysis, dissemination of experiences and related news.*

### HAPPY 2023!

We resume our section "Safety First" in 2023, but not before wishing all our readers a Happy New Year, new personal and professional achievements and that we continue together promoting and building a greater culture of safety in organizations linked to the use of sources of ionizing radiation.

We would also like to know your interests in the topics to be covered in this section or any other suggestion.

You can write to laseguridadprimero2023@gmail.com
THANK YOU!

Rubén Ferro
Renán Ramírez

Communicate, communicate, communicate...

Communication plays a fundamental role in the development and preservation of a culture. We already know that the values, beliefs and patterns that define a culture are not genetically determined, that is, they do not come with the individual at birth but are transmitted from one person to another, from one generation to another, over time. Hence, communication is vital to create values and reinforce them. The same is true of safety culture. Leaders, colleagues, the environment are decisive elements of communication about the desired behaviors, to facilitate interaction, to learn and stay informed, and to act accordingly.

But in terms of safety, we not only need the means or channels of communication to exist, but also that this communication be effective, that promotes a permanent and extensive flow of information related to safety among personnel at all levels and areas of the organization, ensuring thus a shared and updated knowledge of everything that happens in the organization and its processes that have an impact on safety.


The safety culture is also a culture of information, which is based on the conviction that each member of the organization has about the usefulness and importance of informing and being informed about issues related to safety, as a means to make the right decisions, promote secure performance and participate in safety enhancements. Everyone, from top level managers to the last employee.

Effective communication also favors the development of what is known as "situation awareness", a safety soft skill that is critical for hazard identification, effective decision making and accident prevention, and is therefore , a desired skill when seeking a greater safety culture and better safety performance. Situation awareness is achieved when the person knows everything that happens and the state of things in their environment, which will have an impact on the quality of the action to be taken or the task to be carried out. Being informed and updated is vital for this. When there is a high safety culture, there is a strong culture of communication and greater situational awareness among all personnel in the organization.

**For this reason, if you are a manager or work to promote the Safety Culture, remember that having all possible channels of vertical and horizontal communication within the organization will favor correct behavior and appropriate decision-making with regard to safety. It is part of the Safety Culture of your organization. And do not forget that communication to and from interested parties external to the organization, such as patients, the public, clients, etc., are also part of that communication culture.**

[1] IAEA. COLLECTION OF IAEA TECHNICAL DOCUMENTS. TECDOC1995 Safety culture in organizations, facilities and activities related to the use of ionizing radiation sources, Vienna, 2022
[2] OGP. COGNITIVE ISSUES ASSOCIATED WITH PROCESS SAFETY AND ENVIRONMENTAL ACCIDENTS. Report 460. 2012.

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ISODOSIS DOSIMETRÍA COMPUTACIONAL

## REPROLAM ARTICLES: RETROSPECTIVE DOSIMETRY

### "TECHNIQUE FOR DOSE ESTIMATION IN CASE OF RADIOLOGICAL INCIDENT"

**Retrospective dosimetry** is a technique used to assess radiation exposure in situations where there is no conventional measurement system (areas affected by nuclear tests, radiological accidents, or nuclear disasters involving radiological terrorism -dirty bomb-, nuclear incident war or intentional/accidental explosion of, for example, a nuclear power plant). The objective is, therefore, the reconstruction of the absorbed doses caused by radiological accidents with the release of radioactivity or the irradiation of the environment and its inhabitants. For this, the methodology used is based on the variations of the physical or biological properties of different materials that can be altered by the absorption of ionizing radiation energy, for which reason ubiquitous materials have to be used as dosimeters.

In this sense, the main objectives in retrospective dosimetry are: on the one hand, to try to improve the quality of its measurements and dose estimates; and on the other, to disseminate the accumulated experience (in terms of the action protocol), from the laboratories that have developed it, for example, the CIEMAT Retrospective Dosimetry laboratory among them, to those that need to have this capacity. . The interest in the development of these procedures lies in the need to broaden the epidemiological base of studies on the effects of ionizing radiation on health, especially in the low dose range. The recommendations of the International Commission on Radiological Protection (ICRP), in the low dose range and for the so-called stochastic effects, are based on the linear hypothesis without threshold. In other words, it is assumed that the probability of appearance of effects depends linearly on the dose without there being a dose threshold for its appearance (ICRP 60), which must be validated with scientific data. There is a wide variety of materials that can potentially be used in retrospective dosimetry, which is why different measurement techniques have been developed, which are mainly biological (Fluorescence in situ hybridisation -FISH- or chromosomal aberrations) and physical (spin electronic resonance - RSE- and luminescent methods such as thermoluminescence -TL- or optically stimulated luminescence -OSL-).

In this sense, a Retrospective Dosimetry by luminescence laboratory must have different techniques for the preparation of ceramic, synthetic and natural materials, for their subsequent dosimetric evaluation. The sample preparation stages include treatments of a mechanical, chemical and thermal nature in order to separate the mineral components or phases with dosimetric properties from the matrix. The evaluation is carried out using TL and OSL for its application in emergency situations due to a radiological accident.

Recently, within the objectives set within the **EURADOS WG10** (Retrospective Dosimetry) working group, research in this area is oriented towards the development of measurement protocols to determine the potential use of everyday materials as personal dosimeters. For this, the effort is focused on locating a series of materials (gem minerals -Fig 1-, biogenic materials -kidney stones-, etc.) with luminescent properties which are analyzed both chemically and structurally, to determine the impurities present in the stones. samples and which are responsible for the luminescent emission. Subsequently, each of the materials is dosimetrically characterized, checking: its sensitivity to different types of ionizing radiation; its dose response, adequate detectable dose range (from 20-30 mGy); response reasonably independent of radiation energy; reproducibility of the data obtained, stability of the dosimetric information with time and temperature; isotropy in its response and that it does not undergo any physical or chemical change during its use, nor does it depend on external agents (humidity or some corrosive agent) that modify its sensitivity.

In this sense, **REPROLAM** appears as an optimal framework to bring together laboratories from different Latin American and Caribbean countries, which have an adequate infrastructure to be able to participate in R&D Projects, carry out intercomparisons and organize workshops and courses in retrospective dosimetry that allow the validation of these innovative methods and the exchange of experiences among its members, optimizing measurement techniques, reducing uncertainties in the measurement of the dose.

**Virgilio Correcher**
*CIEMAT-Retrospective Dosimetry Laboratory*

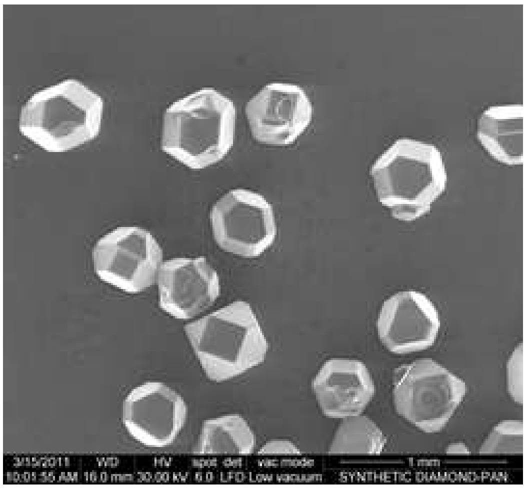



Fig 1. Image obtained by scanning electron microscopy of diamonds, materials potentially useful as dosimeters in retrospective conditions from their luminescent emission.

IAEA
International Atomic Energy Agency
*Atoms for Peace and Development*

# RESULTS OF THE IAEA QUESTIONNAIRE ON RETROSPECTIVE DOSIMETRY USING PHYSICAL METHODS IN THE FRAMEWORK OF PROJECT RLA9088

**OBJETIVE**

One of the objectives of the IAEA RLA9088 project is to promote retrospective dosimetry capabilities in workers in the region (Latin America and the Caribbean), establishing, if necessary, a network of laboratories capable of having a rapid and reliable response in situations where it is necessary to reconstruct the doses absorbed by workers caused by radiological accidents, in which conventional measurement systems are not available or there are doubts as to their results. It is in these situations that retrospective dosimetry is used to determine the absorbed dose, both biological and physical, as stated in the IAEA GSG-7 safety guide.

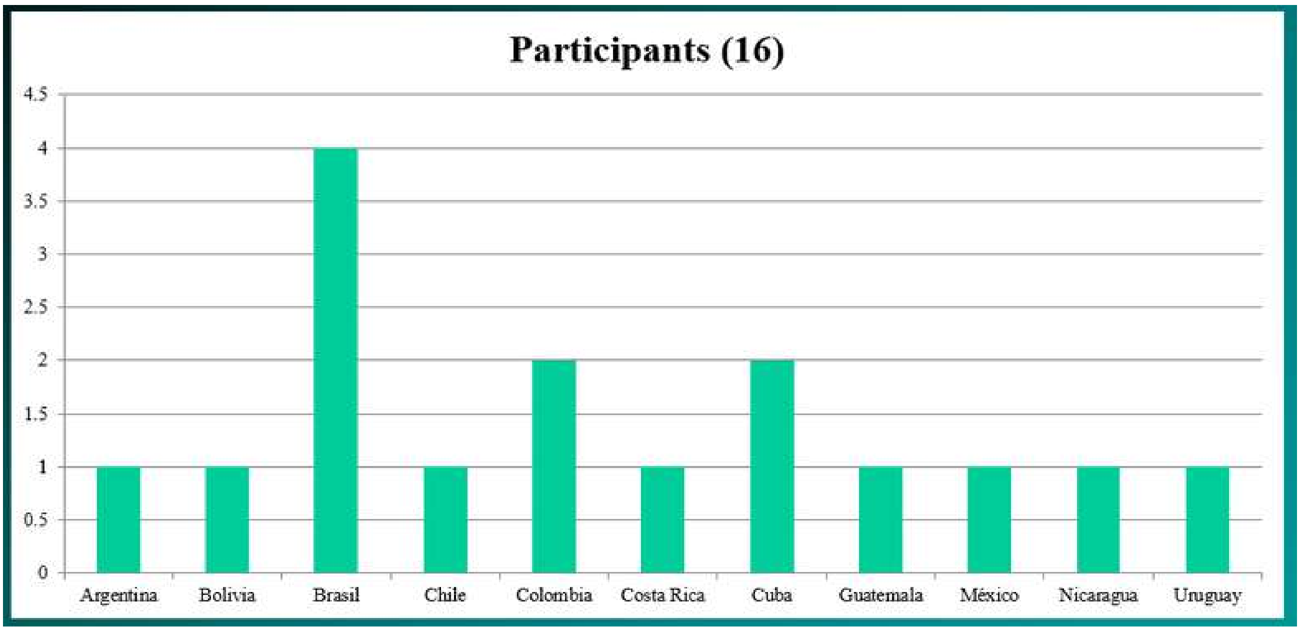
To achieve this objective, it is necessary to study the state of national capacities in the region. In this sense, this IAEA questionnaire is aimed at determining current capabilities in terms of retrospective physical dosimetry.

**SCOPE**

This questionnaire was proposed to obtain information from the maximum number of laboratories in the region that use physical dosimetry techniques (luminescence –thermoluminescence and optically stimulated luminescence- and electronic spin resonance –ESR-).

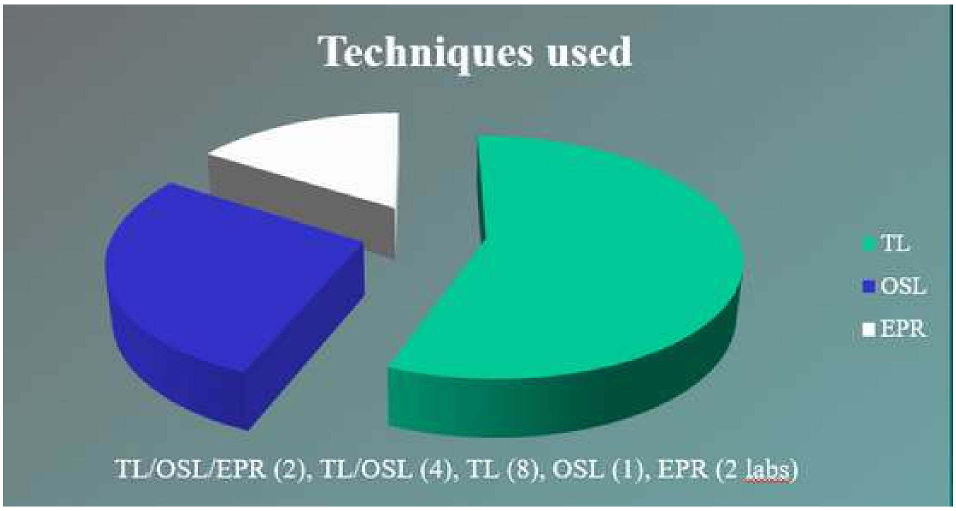
**RESULTADOS**

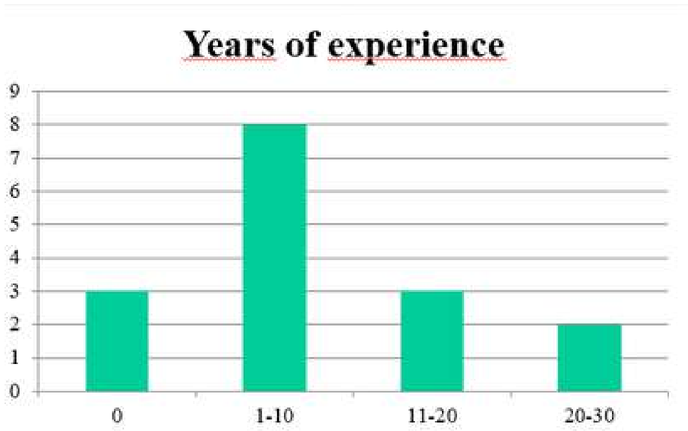
From the data obtained in the questionnaire, the strengths of each of the participants were identified and what would be the aspects to improve or correct to optimize their capabilities.



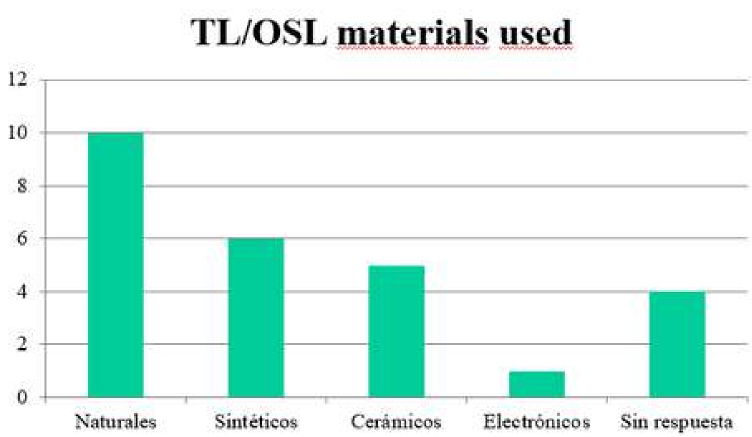
- Regarding the experience of the laboratory, "How long has the laboratory been using TL and OSL?", "What kind of materials does it analyze using TL and OSL?; Does it have experience in the study of TL and OSL of natural materials, ceramics and/or electronic components? Natural materials, Ceramic materials, Electronic components"

The results obtained were the following:





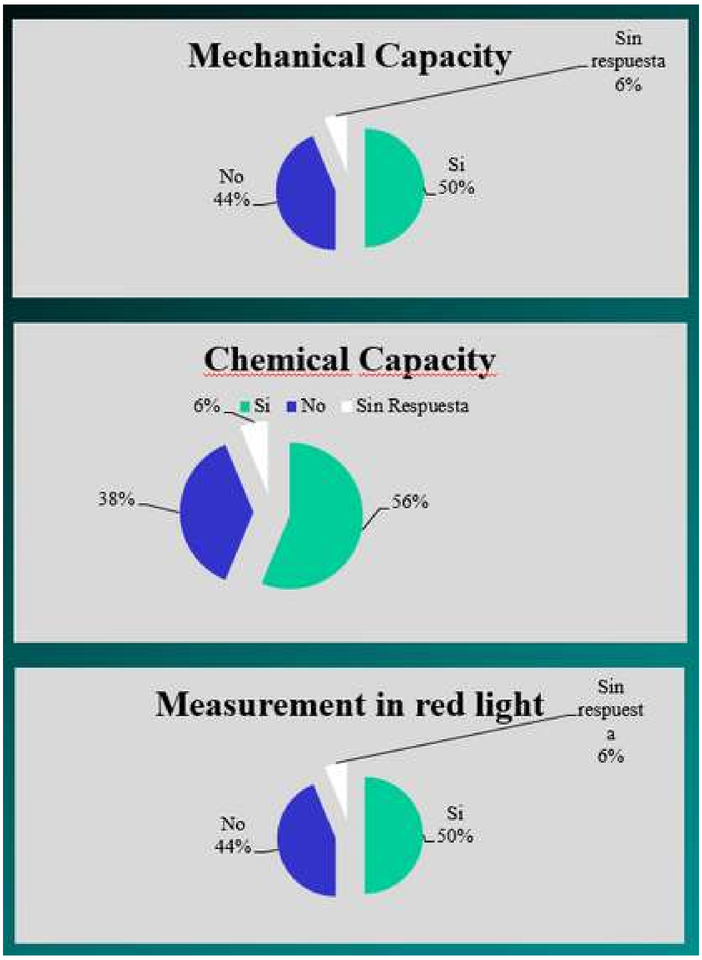


- Regarding the training of the laboratory for the preparation of the samples, where the following must be indicated:

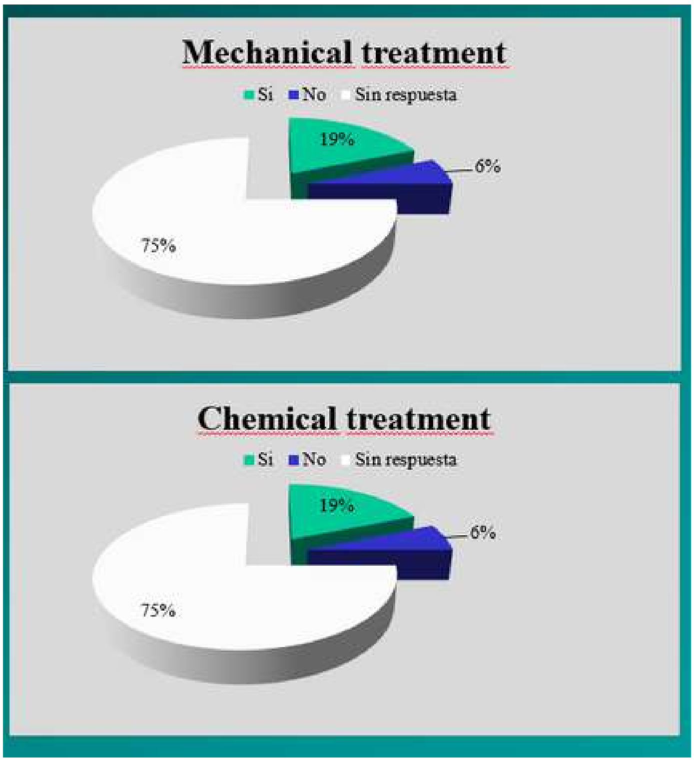
"Does the laboratory have the ability to chemically and mechanically treat the samples? Can it treat the samples in the presence of red light?"

The results obtained were the following:

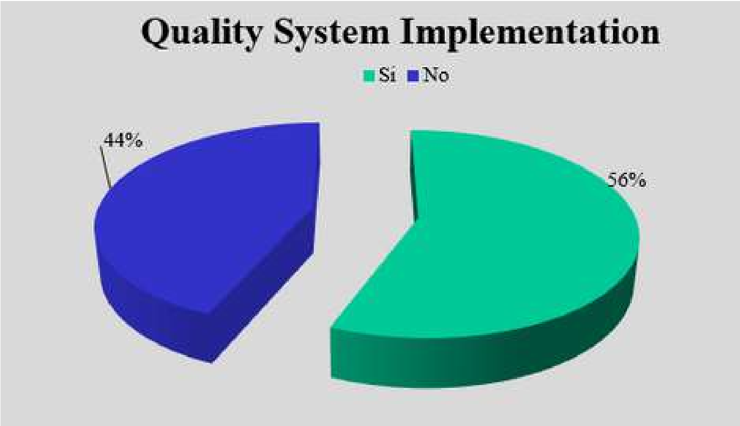
TL/OSL



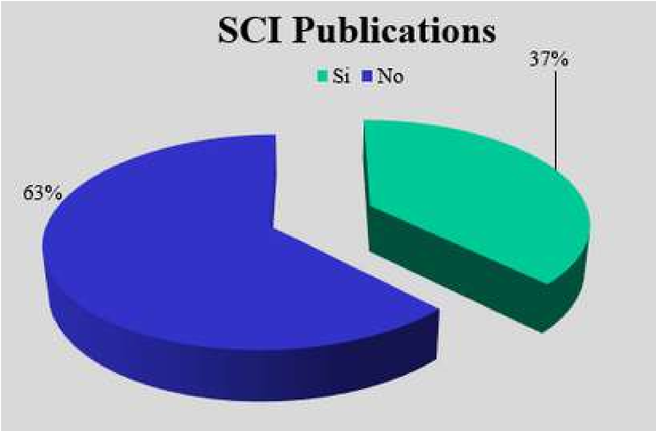

EPR

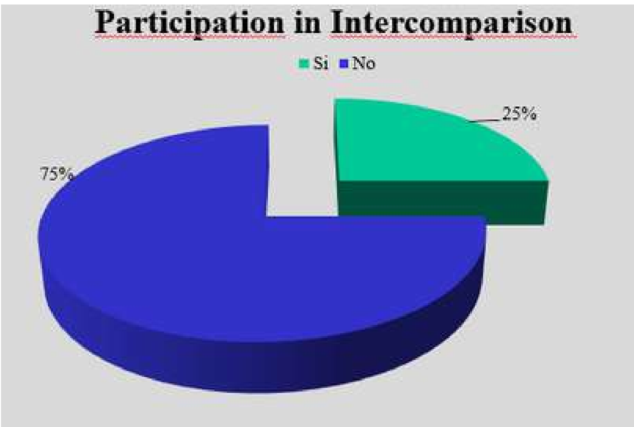


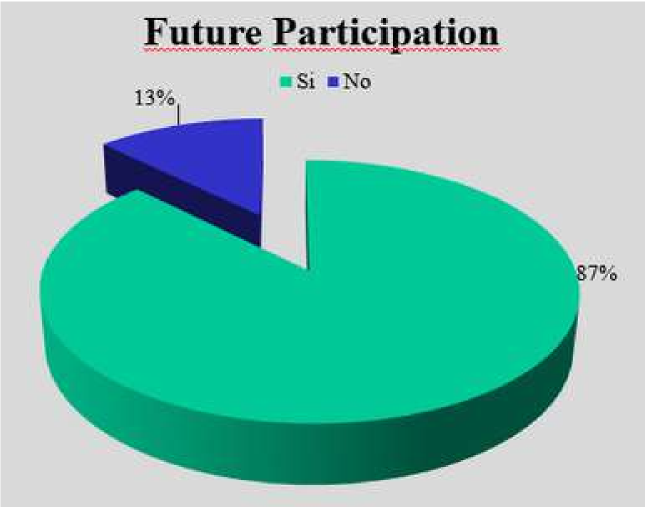
- Describe the data processing, if a quality control system is in place:




- Availability to participate in activities related to the creation of the laboratory network in Latin America and the Caribbean; "Has your laboratory participated in intercomparison exercises before?" The results were the following:



**CONCLUSIONS**

- The disparity of the results implies the need for a significant effort to provide the region with an adequate infrastructure in the field of Retrospective Physical Dosimetry (TL/OSL and EPR).
- A plan is needed to harmonize the actions of the largest possible number of laboratories in Latin America and the Caribbean
- The solution involves organizing: (i) informative webinars, (ii) training workshops including different activities (sampling, mechanical and chemical treatment of samples, measurement protocols, etc.) and (iii) intercomparison exercises.


The US Nuclear Regulatory Commission (NRC) 35th Regulatory Information Conference (RIC), which will take place March 14-16, 2023, will be a "hybrid" event. The RIC is open to all. Although there are no fees for the conference, all attendees must be registered.

The US Nuclear Regulatory Commission's Annual Regulatory Information Conference (RIC) is the largest public meeting hosted by the agency, bringing together nearly 3,000 participants from more than 30 countries representing stakeholders from other government agencies , industry, international organizations and the general public. The RIC is sponsored by the Office of Nuclear Reactor Regulation and the Office of Nuclear Regulatory Research, and provides an open environment in which diverse stakeholder groups can learn, share, and discuss information about important and timely nuclear regulatory activities and emerging problems.

The RIC offers an illustrious technical program featuring experts from across the agency, as well as speakers from industry, academia, and the community. Throughout the conference, attendees can engage in dynamic sessions with panelists addressing a wide range of topics of interest. To complement the technical program, interactive digital exhibits will be available for participants to view at their leisure. Attendees also have the opportunity to take tours of the NRC Operations Center to round out their overall conference experience.

For more information: **https://www.nrc.gov/public-involve/conference-symposia/ric/index.html**

The Network for the Optimization of Occupational Radiological Protection in Latin America and the Caribbean (REPROLAM) is a scientific and cultural society, non-profit, political, religious or racial, of unlimited duration, whose objective is to promote the optimization of occupational radiological protection. REPROLAM seeks to expand academic and scientific cooperation among its members, with the aim of promoting adequate radiological protection for workers.

Visit our website for more information: **http://www.reprolam.com/**
How to contact: **reprolam2020@gmail.com**