What EU Funding programmes would I regularly scan if I wanted to submit proposals on Electronics for Gaseous Detectors?

2nd DRD1 Collaboration Meeting
June 21st, 2024

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EIC Pathfinder Work Programme

What for?

- Deep tech projects. Taking forward breakthrough deep tech projects with a high degree of scientific and technological ambition and risk (TRL 1-4).

Who can apply?

- Consortia of different independent legal entities established in different countries of EU Member States or Horizon Europe Associated Countries.

What you get?

- Grants of up to EUR 3 million (Pathfinder open) or EUR 4 million (Pathfinder Challenges), coaching & mentoring, networking.

More Information HERE

Research Infrastructures Work Programme

What for?

- Especially calls under the label HORIZON-INFRA-TECH; Next generation of scientific instrumentation, tools, methods, and advanced digital solutions for Research Infrastructures.

Who can apply?

- Consortia of different independent legal entities established in different countries of EU Member States or Horizon Europe Associated Countries.

What you get?

- Grants of average EUR 5 million.

More Information HERE

ERC Synergy GRants

What for?

- The ERC's grants operate on a 'bottom-up' basis without predetermined priorities. Applications can be made in any field of research.

Who can apply?

- A group of two to maximum four Principal Investigators (PIs) working together and bringing different skills and resources to tackle ambitious research problems. One will be designated as the corresponding PI (cPI).

What you get?

- Synergy Grants can be up to a maximum of € 10 million for a period of 6 years (pro rata for projects of shorter duration).
- However, an additional € 4 million can be requested in the proposal in total to cover eligible 'start-up' costs for Principal Investigators moving to the EU or an Associated Country from elsewhere as a consequence of receiving an ERC grant and/or the purchase of major equipment and/or access to large facilities.

More Information HERE

Marie Skłodowska-Curie Doctoral Networks

What for?

- Implementing doctoral programmes by partnerships of organisations from different sectors across Europe and beyond to train highly skilled doctoral candidates.

Who can apply?

- Doctoral Networks are open to international consortia of universities, research institutions, businesses, SMEs and other non-academic organisations.

What you get?

- Paid recruited researchers that will do a PhD in the scientific programme described in the submitted proposal. The duration of each fellowship is between 3 and 36 months. The EU provides support for each recruited researcher in the form of
    - a living allowance; a mobility allowance; if applicable, family, long-term leave and special needs allowances.

- In addition, funding is provided for
    - research, training and networking activities; management and indirect costs.

More Information HERE

Some tips (1)

- If/When you have a concrete idea for a project, please fill in a template like this example

Project Executive Summary

Project Name an Acronym: **ROSETTA** RadiatiOn ShiElding Training for fuTure professionAls **(just temporary and tbd by the submitting consortium)**

European Commission Call details: Marie Curie Programme,
MSCA Doctoral Networks 2022
Deadline: **15 November 2022**

Project Motivation:

The use of high-energy ionizing radiations is rapidly growing in many scientific and industrial areas such as energy (e.g. maintenance of nuclear reactors and management of nuclear waste), medical diagnostics, food irradiation, production processes (e.g. defects detection in metal castings), space exploration, high-energy physics experiments, etc.

Therefore, reliable and novel radiation shielding materials are required and essential for different emerging and challenging applications. Let us consider briefly some illustrative examples:

1. In space exploration, especially for long-term manned missions, the action of cosmic rays and/or solar wind on the metallic shell of a common spacecraft produces cascade neutrons, which are directed towards its interior part and contributes significantly to the radiation dose absorbed by the crew in a deep space mission. This fact makes radiation shielding materials, not only interesting for the Space industry but for the Aeronautic sector in general.
2. In the field of radiation-related healthcare, the protection of workers is essential. Current solutions rely on protective equipment made of lead and lead composites/compounds. A major drawback, for example, is that lead aprons, due to their heavyweight, are not easy to wear therefore highly hampering the operator's actions. More importantly, the toxicity of lead entails both a risk to the worker and the environment in general. Therefore, there is an urgent need for alternative and environmentally sustainable solutions.
3. The industrial field of production processes makes extensive use of radiation-processed polymers. For example, the fabrication of wires and cables uses them due to their high resistance towards solvents, ageing and high temperatures. In addition, manufacturing of "heat-shrinkable" packaging films, tubing and foams are other well-established applications where they play a key role as based materials. As well, the process of radiation-induced scissoring in Teflon allows its use as filler in numerous applications.
4. Applications related to the use of advanced neutron sources such as neutron activation analysis (NAA), neutron radiography, active neutron interrogation technique, and neutron capture therapy have also strongly emerged over the past two decades. During operating conditions in such applications, unwanted neutron particle radiation escapes and interacts with the atoms of the surrounding materials making the working environment radioactive. Consequently, novel shielding materials with structural and functional integrity are key for guaranteeing protection in accordance with appropriate safety standards.

It is clear that novel radiation shielding solutions are in high demand. When considering specifically mixed neutron-gamma-rays shielding, the polymer materials appear as promising candidates. In this regard, significant research has been focused to the study of polymers and composites formed by the incorporation

Project Executive Summary

of additional bulk and micro materials. Promisingly, the results show that, for those, their radiation shielding ability increases. Nanostructure materials have also attracted a lot of research attention because of their potential in the development of new technologies and applications.

Unfortunately, in Europe, although the existing research and knowledge is of excellent quality, there is a lack of a standardised training programme for young researchers aiming to become the future professionals in a field of increasing demand. Moreover, there is a need to establish an enduring network of scientific, academic and industrial organizations where such training programme can take place hands-on, designed and assessed by top professional in the field. The following project aims to address this gap.

General Project Objectives:

1. Establishing a radiation shielding training programme for future professionals in the field by focusing on novel solutions for gamma and neutron radiation related applications.
2. Piloting this programme by including elements such as:
   - Computerized analysis and synthesis of radiation-shielding composite materials.
   - Simulation of the radiation transport through the studied materials (e.g. Monte Carlo technique).
   - Design and fabrication of novel materials and technology concepts.
   - Testing in relevant research and industrial environment.
3. Paving the way for the sustainable continuation of the training programme beyond the project duration and explore the possibility of expanding it to other scientific and industrial areas within the radiation shielding domain.

Work Package Structure (Bird's Eye View):

The Work Package structure of the project is designed according to the three pillars of the objectives above.

WP1. Project Management
Management and administration of the project.

WP2. Design and fabrication of novel materials and technology concepts

This will be a workpackage especially dedicated to the design and production of samples of novel materials with specific radiation shielding properties. This workpackage will be in dynamic interaction with WP 3, as the latter will provide scientific results that will be used to fine-tune the optimization of the processes in the workflow of WP2.
The design and analysis of materials and structures is an important part of the overall project that aims to develop novel radiation shielding and at the same time advanced engineering solutions. A research objective that is very much looked forward, is to determine limits for the production of materials that can be used in much lighter structures for a wider range of industrial applications.
The boundaries of the mechanical properties that will be obtained from the computations will be incorporated in the fabrication of the materials and the different fabricated samples will then be subject to additional tests that will be done in the context of WP3 and WP4.

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For these advancements to take place, increased computer power (hardware) and development of well-engineered computer software will be required and these will be ensured by the proposed partner (NTNU).
PhD trainings could be oriented to work related with the design and analysis process, for instance, based on numerical simulations (e.g. finite element method) or advanced experimental investigations with modern data acquisition and analysis tools.

The idea is that the materials are put as soon as possible to test in WPs 3 and 4.

WP3. Radiation studies and experimental tests at various irradiation facilities

The CMS detector at CERN is well known worldwide for the discovery of the Higgs Boson that led to the award of the Physics Nobel prize in 2013. An important part of it is the Forward Shielding. It serves as a stopper for the energetic particles that are generated close to the beam line in the region between the Hadronic Forward calorimeter and the Target Absorber, whilst allowing access to the beam-pipe components whenever needed for maintenance or repair activity. Data from CMS muon chambers show that there is still a significant amount of background noise present in the outermost layers of the detector. Simulations clearly indicate the need for additional shielding materials to suppress most of the existing background noise. However, the mechanism of the Rotating Shielding has reached its loading maximum capacity and other integration aspects prevent any substantial improvement to the present Forward Shielding. The solution to this problem will be investigated by an international effort that will lead to the creation of a novel material, which will be also used as an efficient radiation shielding around accelerators but also for other purposes where similar radiation environments can be encountered. Therefore, the new shielding that is foreseen to be installed at the CMS detector after the Long Shutdown 4, will be a good demonstrator for the first large scale testing of the novel material(s) that will be one of the outcomes of this project.
To complement the calculations that will be performed in WP2, this workpackage will include:

- Computerized development of radiation-shielding materials. The objective of the research will be to computationally develop composites that have appropriate attenuation coefficients and consequently can be used effectively as radiation shielding in high energy mixed gamma -neutron fields as the one encountered at CMS.
- MC simulations of the radiation transport through the studied materials and of the radiation hardness of the materials; The amount of damage produced by irradiation in the samples, like electronic energy loss, nuclear energy loss, etc, will be estimated by using Monte Carlo simulation techniques such as stopping and range of ions in matter (SRIM) and transport of ions in matter (TRIM). Also, detailed Monte Carlo radiation transport simulations will be done to evaluate the efficiency of the material for radiation shielding purposes. This will be done with the two most commonly used MC radiation transport codes FLUKA and GEANT. CERN will undertake the FLUKA simulations however in order to increase accuracy in computation and minimise statistical uncertainties, calculations will also be performed with the GEANT code by another partner (to be identified).
- Radiation hardness experiments: these will be done at various irradiation facilities of CERN within a wide energy range and if deemed necessary, also at facilities outside CERN. The aim will be to define the limits of the most

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crucial material properties (stress, elasticity etc) at different irradiation conditions and settings and tune accordingly the fabrication process so that the final product- material will be efficient and safe for its use as a radiation shielding for various applications.

WP4. Testing for Industrial Application
To be decided depending on potential industrial partners interested; one has already been identified.

WP5. Coordination and supervision of the Training Programme
This is a WP explicitly dedicated to the coordination of all activities of the training network. Since the training is closely linked to the overall R&D&I done in the project, this WP will have synergies with WP 2, 3 and 4 and obviously with WP 1.
Among other relevant tasks to be agreed among the interested partners, this WP includes a final self-evaluation of the training. Meaning for example, sending questionnaires to the students and researchers involved asking questions such as what did you learn/miss, how you would improve the programnme, etc.

WP6. Knowledge and Technology Transfer

The tasks in the WP would be oriented to the organization of webinar/workshops, etc where the technology generated during the project is presented to different industrial and academic communities potentially interested. The WP could be also reinforcing the training programme by including, for example, training for the PhDs on technology transfer, entrepreneurship skills as well as an introductory course to standards and regulatory affairs regarding radiation shielding.

WP7. Dissemination and outreach

This WP will contain dedicated tasks and actions for ensuring the proper dissemination of results to a variety of audiences, ranging from specialized ones to the general public. This WP could also be integrated in the training programme by offering the PhDs training about how to disseminate project results to different audiences, how to write a short piece of news, etc.

Envisioned Consortium: CERN (Coordinator; leader in WP 1, WP 3 and WP7; strongly supporting roles in the rest of the WP).

- 2-3 Academic organization (role tbd).
- 3-4 Industrial Organizations (role tbd).

Envisioned project duration: 4 years

- Send it to me and I will be more than happy to provide further advise.

Some tips (2)

- It is extremely difficult for an EU project proposal nowadays to be funded without any industrial organization in the consortium taking an active role in it.

- So please, partner with industry.

- The competition is very hard. Therefore, if you decide to go for a proposal, think that for it being competitive, it requires 3 months of intensive work.

- Thus, don't waste your time in calls with a deadline nearby.

- Make sure that:

    - You have the time required to write a competitive proposal before the deadline.
    - You want to go for it.
    - You are committed to spend the necessary time and work.

- Stay tuned because many of the Work Programmes I mentioned will be launched again by September/October.

Thanks and Questions