CONTRATOS PREDOCTORALES 2020 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

High field superconductors for high-energy physics applications

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:
(2.000 characters – including spaces)

Surface coatings made of high-temperature superconductor RE(=Y,Gd)$Ba_2Cu_3O_{7-x}$ (REBCO) are emerging as a technology to boost several research fields of high-energy physics, such as the detection of the Axion, the particle candidate to constitute Dark Matter, where the REBCO coating can dramatically enhance the detection sensitivity of haloscope cavities. REBCO coatings will also help the next generation of circular hadron colliders, such as the future circular hadron-hadron (FCC-hh) collider from CERN, the successor of the LHC, a particle accelerator aiming at 100 TeV center-of-mass collision energy in a 100 km circumference ring. In this case, the superconducting coating will "dissipate" the electric field generated by the image currents produced by the accelerated protons, which otherwise it will create instabilities in the proton path hampering the production of collisions. The new linear Muon colliders could also benefit from REBCO superconducting coatings, as such colliders need resonant cavities with a high quality factor operating at high magnetic fields, something that can only be achieved with high-temperature superconductors.

The aim of this research project is to generate knowledge in the field of high-temperature superconducting vortex physics in the microwave frequency range at very high magnetic fields, and in general under situations mimicking working conditions found in high-energy physics environments such as the mentioned above. This knowledge will be fundamental to enable technologies that will start as proof-of-concepts within our group. The project is in the framework of a long-standing collaboration of the SUMAN group at ICMAB, CERN and the Institute of High Energy Physics (IFAE, located at UAB campus of Bellaterra, Spain) and extends to develop, design and study the scalability and feasibility of such proof-of-concepts.

JOB POSITION DESCRIPTION:
(2.000 characters – including spaces)
Include all the relevant information about the position, role, responsibilities and skills required within the project/group

We are searching for a candidate willing to undertake a PhD in experimental physics, in the field of physics of superconductors, with the following focus directions:

- Study of the vortex pinning and dynamics at very high magnetic fields (up to 16T) and low temperatures (down to 4.2K), from the DC regime to the microwave regime (up to the GHz) of high temperature superconducting materials.
- Study the relationship between the microwave response of the superconducting mixed state and the material microstructure (thickness, defects, artificial pinning centers…).

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The position will involve use of cryogenic equipment, microfabrication techniques and electric and magnetic characterization techniques.

The candidate will be integrated in a working team with expertise in superconductivity and microstructure analysis by Transmission Electron Microscopy.

ICMAB offers an excellent working environment, including:

- a creative, world-class interdisciplinary research environment for fundamental and applied nanoscience state-of-the-art infrastructure for the fabrication and characterization of nanostructured materials.
- a highly regarded scientific education.
- a strong international science network.

Academic background /working experience of the candidate:

- Bachelor in physics and a Master in a relevant area. (candidates finalizing the Master degree in June 2022 can also apply).
- A high level of English is required due to highly international collaborative nature of the research project.
- High motivation to experimental research.
- Working aptitudes in a collaborative group.

Knowledge on Superconductivity, academic grades and research experience will be considered in the evaluation

We invite applications from excellent candidates anywhere in the world.

GROUP LEADER:

Title: Dr.
Full name: Joffre Gutierrez Royo (Researcher ID: R-9015-2018)
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Research project / Research Group website: https://suman.icmab.es/

RELATED LINKS TO THE POSITION (optional)
Tittle link: "The Future Circular Collider Study"
URL: https://fcc.web.cern.ch/Pages/default.aspx

Tittle link: "The hunt for dark matter"
URL: https://iaxo.web.cern.ch/content/home-international-axion-observatory

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