Neutron sciences are accelerating at MLZ!

Welcome to  Madhu Ghanathe

GNeuS Programme is proud to introduce you to its Fellows, selected within Call 1 in 2021

Few words about you and your research project

Hello, my name is Madhu Ghanathe. I recently completed my Ph.D. at **Bhabha Atomic Research Centre**, one of the premier nuclear facilities in India. I worked on the Ph.D. thesis "Structural, magnetic, electronic, and magnetotransport properties of magnetization compensation materials." To learn more about my Ph.D. research work, you can find my publications on Google Scholar.

I joined as a postdoctoral research fellow at the small-angle neutron scattering-I (SANS-I) group, at MLZ under supervision of Dr. Sebastian Muehlbauer. I am mainly working on quench safety and quench protection of metal-insulated superconducting coils for the next generation sample environment magnets. **Advancement in neutron research instrumentation is the primary goal of this project.** High temperature superconductor (HTS) magnet provides an extreme sample environment to provide magnetic field to detect weaker, often diffuse signals of (quantum) disordered systems or exotic electronic ordering phenomena. **Therefore, studying HTS magnet behavior and quench properties is essential aspect of the neutron research instrumentation**.

In this project, we are taking advantage of high-temperature superconductor (HTS) with metal as insulation technology to **develop a range of superconducting magnets for neutron scattering (SANS-I)** with the help of secondment industrial partner Bilfinger Noell GmbH (Local supervisor: Gehring Michael). It involves critical designing work such as, implication on the design of the magnet, engineering work, manufacturing metal insulated coils, coil terminal design, overall performance study.

Why did you apply specifically on GNeuS?

Besides fundamental research, **I am always keen to understand neutron instrumentation and the working principle behind each tool/device used in neutron devices**, such as neutron sources, monochromators, collimators, detectors, and sample environments. Developing and validating neutron research instruments for measuring the user-perceived quality of the research is much needed for future endeavors. This project directly paves the way and reveals new functionalities for future devices. and will help me to upgrade my skills in handling instrumentation facilities.

GNeuS is a MSCA co-funded program that provides a global, interdisciplinary, intersectoral approach in response to the grand challenges in the neutron field. This program will allow me to work on **fundamental studies (Magnetic systems)** and develop a high magnetic field sample environment on neutron research instrumentation. It will help me in my career goal to evolve as a **global neutron scientist** who can handle neutron instrumentation and work on fundamental physics aspects.

What is your background? How have you heard about GNeuS?

I have been working in a nuclear research facility in India, in neutron research. The neutron scattering technique has been used extensively in my Ph.D. research to study the magnetic properties and elucidate the commensurate and incommensurate magnetic structures. I have used many neutron instruments such as **neutron diffractometers, polarised neutron spectrometers**, etc., and I have visited and carried out neutron scattering experiments in mega nuclear facilities such as **ANSTO, Australia, and ISIS-RAL, UK**.

During my final Ph.D. thesis submission days, I heard about the GNeuS program from one of my senior postdoc researchers from JCNS. He recommended me to apply for the GNeus program. As the name says, "Global neutron scientist," it is spread all over the neutron community in the world.

What impacts do you expect from the GNeuS fellowship?

My current project within GNeuS program, **quench safety and quench protection of the next generation sample environment magnet**, is carried out with the company Bilfinger-Noell (Secondment industrial partner). A critical perspective on industry involvement in my research gathers an intersectoral approach to the project. The industry role engages me, and I learn new things apart from the previous research.

A **novel Ansatz approach plays a significant role in the quench safety and protection of metal-insulated superconducting coils**. Therefore, we propose to build a demonstrator using the novel metal-insulated technology to examine its quench behavior and magnetic forces.

Moreover, this project requires **finite element method (FEM) simulations of the magnetic fields** (in particular stray fields), the magnetic forces, and the thermal management study. Our project provides an **essential key technology for the next-generation magnets for the sample environment at MLZ.**

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie Grant Agreement N°101034266.

www.gneus.eu