

PHYSICS

ENI - Experimental investigation of irradiation effects on superconductors for fusion applications

Funded By	ENI S.P.A. [Piva/CF:00905811006]
Supervisor	LAVIANO FRANCESCO - francesco.laviano@polito.it
Contact	Dott. Stefano Loreti Ing. Antonio Trotta
Context of the research activity	The aim of this activity is assessing the radiation hardness of superconducting materials when exposed to high energy particle irradiation, such as neutrons in a compact fusion reactor. Part of the experimental activity will be performed at ENEA (Frascati)
Objectives	The goal of this project is to deepen the understanding of neutron radiation effects on the superconducting materials employed in fusion reactors through experimental investigation. To fully investigate the possible issues affecting HTS in the fusion environment, it is necessary to expose them to the primary particles (neutrons) and to investigate the expected damage regimes both in terms of total level of introduced disorder (fluence effects) and of damage accumulation rate (flux effects). Moreover, irradiation needs to be performed at cryogenic conditions while measuring the properties of the sample, and all the characterization should be carried out without heating the sample above 100K in order to avoid defects annealing. However, since as of today no ideal (i.e. with the spectrum and flux expected from the fusion environment) neutron source exists, it is necessary to develop new neutron irradiation experimental approaches. In this frame, our group is collaborating with researchers of the Frascati Neutron Generator (FNG) at ENEA Frascati to design, develop and test a unique irradiation and characterization facility. The candidate will contribute to: • the design of the sample environment • the realization of the irradiation and measurement chamber at FNG • the definition of the irradiation conditions • the definition of a characterization protocol (before/during/after irradiation) • performing the irradiation experiments • analyze the result and establish the operation limits and radiation hardness of the materials

**Skills and
competencies
for the
development of
the activity**

Basic knowledge of nuclear engineering, preferred previous experience with cryogenics and superconductivity