Istituto Nazionale di Fisica Nucleare

Progetto	**Evading quantum noise with superconducting circuits in axion dark matter search**
Esperimento / sigla proponente	QUAX
Laboratorio ospitante	LNL
Contact person presso il laboratorio	A. Ortolan
Periodo previsto:	Giugno 2022 – Marzo 2023
Sezioni e tutor proponenti:	PD - C. Braggio/ LNL - A. Ortolan
Descrizione attività (max 1000 caratteri)	At the low energy frontier of particle physics, experiments that test the validity of fundamental theories require detectors at the ultimate level of sensitivity allowed by quantum mechanics. In cavity-based searches of axion dark matter (DM), vacuum fluctuations of the cavity field fundamentally limit the sensitivity to an axion-induced field. With today's leading technology based on quantum-limited linear amplifiers, it may take centuries to probe the existence of this leading DM candidate through the most plausible parameter space. Such quantum limits can be overcome if microwave photon counting is adopted. While single photon detectors in the optical domain rely on photo-assisted ionisation in different materials (semiconductors, superconductors), in the microwave domain detection of individual photons is a challenging task because of the photon energy being roughly five orders of magnitude lower than that of optical photon. Very recently practical single microwave photon detectors have been introduced in the field of quantum information science, following an impressive progress made in the fabrication of superconducting quantum circuits. Crucial advantages over existing single photon detection architectures, including the low dark count rate, tunability, and continuous operation will be exploited to demonstrate a quantum-enhanced search of axions at the QUAX haloscope.
Altre indicazioni: (max 500 caratteri)	
Facility che il laboratorio ospitante mette a disposizione	Laboratorio QUAX; Foresteria (se possibile accesso); Mensa
Note:	