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INSTITUT DE PHYSIQUE

RECHERCHES SUR LA PHYSIQUE MÉSCOPIQUE À PARTIR DE GRAPHÈNE ET DE JONCTIONS JOSEPHSON / *JOSEPHSON JUNCTION SPECTROSCOPY OF MESOSCOPIC SYSTEMS*

Responsable : Çağlar GIRIT

RECHERCHE

The Flux Quantum Lab ($\Phi 0$) has been part of the young team incubator in the physics institute of Collège de France since fall 2014. We are developing a highly sensitive spectrometer to probe the energy levels in solid-state quantum devices. The spectrometer is built out of nonlinear superconducting quantum circuits called Josephson junctions. In the 2015-2016 academic year, we set up the laboratory and began performing experiments. We installed a dilution refrigerator, allowing us to obtain the low temperatures (10 mK) needed to operate the Josephson junction spectrometer. We set up a cleanroom at Collège de France and installed equipment to fabricate the spectrometer and other quantum devices. The team consisting of the group leader, two doctoral students, one postdoctoral researcher, and one maître de conférences associé (MFCA, Collège de France) has started work on several projects:

- 1) Development of the Josephson junction spectrometer for broadband spectroscopy of quantum devices.
- 2) Application of the spectrometer to the study of plasma resonances in Josephson junction circuits, Andreev states in multi-terminal weak links, and diabolic points in topologically non-trivial quantum systems.
- 3) Investigation of the properties of closely spaced weak links, including modification of the Andreev bound state spectrum, phase locking between coupled Josephson junctions, fabrication of ϕ junctions, and correlated supercurrent generation.
- 4) Applications of Josephson junction circuits in metrology and high-frequency electronics.

Design and implementation of Josephson junction based precision voltage sources and broadband local oscillators.
