



# UNIVERSITÀ DI PARMA

DEPARTMENT OF MATHEMATICAL,  
PHYSICAL AND COMPUTER SCIENCES

## Call for Annual Research Grant, renewable for 1 additional year

Characterization of molecular spin qubits/qudits for quantum technologies by conventional and innovative magnetometric techniques

This Research grant program deals with the magnetometric characterization of molecular nanomagnets, which represent ideal test beds for new quantum technologies. A particular aspect that will be studied regards the magnetic relaxation mechanisms in crystals of magnetic molecules, because relaxation and, more generally, decoherence constitute a major obstacle in the envisaged technological applications [1]. Single crystal and powder experiments will be carried out based on conventional AC and DC SQUID magnetometry, aimed at probing the magnetization behavior and the quasi-elastic dynamic susceptibility. A Cantilever Magnetometry probe especially suitable for microcrystals will be utilized to obtain information on the magnetic anisotropy. This research activity is required to identify the molecules to be used for encoding of quantum algorithms with molecular spins and the most appropriate algorithms. Innovative magnetometric techniques will be also explored, based on DC micro-SQUIDs operating in a dilution refrigerator, which will be able to detect the magnetic moment and the dynamic susceptibility of tiny crystals of molecular qubits/qudits at very low temperatures (below 100 mK) [2]. Moreover, pump-and-probe experiments on different timescales will be designed on the micro-SQUID setup, in order to explore a different method for the manipulation and detection of ensembles of molecular qubits/qudits at very low temperatures.

### References

1. A. Chiesa, F. Cugini, et al., Phys. Rev. B 101, 174402 (2020)
2. E. Moreno-Pineda, W. Wernsdorfer, Nat. Rev. Phys. 3, 645–659 (2021)

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**Call for the research grant:** <https://www.unipr.it/en/node/103064>

**Deadline:** September 21, 2023

**Interview:** October 16, 2023

**Job start date:** November 1, 2023

**Duration of the contract:** one year, renewable

**Annual gross salary** (taxes included) 1° level - € 23.891,00