

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Matériaux et Phénomènes Quantiques
CNRS identification code: UMR 7162
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Internship location: Université Paris Diderot - CNRS UMR 7162
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Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: ANR

Towards light control of van der Waals magnets

Understanding and controlling emergent phases in low-dimensional systems is one of the central challenges in condensed matter physics. **Van der Waals (vdW) materials**, composed of atomically thin layers held together by weak interlayer forces, provide an ideal platform to address this challenge. Their reduced dimensionality gives rise to unique quantum phenomena such as **magnetism and multiferroicity in the two-dimensional (2D) limit**. The fragile nature of these ordered phases, governed by enhanced fluctuations, makes them exceptionally tunable by external parameters, and, crucially, by light.

In this internship, which is expected to continue as a PhD project on laser control of 2D magnetism, the student will begin with the **optical characterization of vdW magnets such as CrSBr and NiI₂ using Raman spectroscopy**, a powerful probe of low-energy excitations in the millielectronvolt (meV) range. The work will involve temperature-dependent and polarization-resolved Raman measurements **to identify phonons and magnons and track their evolution across magnetic phase transitions**. The aim is to uncover the spin-lattice coupling mechanisms that underpin magnetic ordering in these materials.

The internship will provide extensive hands-on experience **in optical spectroscopy, mechanical exfoliation of 2D crystals, cryogenic measurements, and data analysis**. *The long-term goal, to be pursued in the subsequent PhD, will be to use ultrafast laser pulses to manipulate spin-lattice coupling and induce novel magnetic quantum phases that are inaccessible through static means.*

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics:	YES	Soft Matter and Biological Physics:	NO
Quantum Physics:	YES	Theoretical Physics:	NO