

## PhD contract offer

# Ultrafast, All-Optical Flip of Magnetic Nanostructures: Application to Information

### General informations

**Workplace:** Nancy

**Type of contract:** PhD contract

**Contract period:** October 2026 – October 2029 (few month flexibility)

**Proportion of work:** Full time

**Desired level of education:** Master's in physics, material science or optics

### Missions / Activities

Join a pioneering project focused on using femtosecond laser pulses to control magnetization in magnetic heterostructures and nanostructures. On groundbreaking work at IJL [1-7] and in collaboration with research laboratories close to magnetic storage applications, you will explore:

- Size-dependent effects in ferrimagnets, addressing scaling factor on all optical switching (AOS)
- AOS in material used in hard drives (HD) to check the ability and efficiency of writing informations using ultrafast single pulses in next-gen HD devices.

This project combines cutting-edge laser pulse generation, advanced material growth and magnetic characterization, from the groups at the University of Lorraine (France) and in laboratories close to applied magnetic storage applications (NIMS, Seagate). The student will be trained on a femtosecond laser bench, and learn extensively about aspects such as spintronics, ultrafast optics, near field microscopy, material growth and clean room sample fabrication.

### References

- [1] Q. Remy, ..., and M. Hehn, Nature Communication 14, 445 (2023).
- [2] Y. Peng, ..., and M. Hehn, Nature Communication 14, 5000 (2023).
- [3] Z. Guo, ..., and M. Hehn, Advanced Materials 2311643 (2024).
- [4] M. Hennecke, ..., M. Hehn and S. Eisebitt, Nature Communications 16, 8233 (2025).
- [5] B. Kunyangyuen, ..., and M. Hehn, Phys. Rev. B 112, 094432 (2025).
- [6] B. Kunyangyuen, ..., and M. Hehn, ACS Materials Lett. 7, 3619 (2025).
- [7] J.-X. Lin, ..., and M. Hehn, Advanced Materials (2026). DOI10.1002/adma.202522886.

### Keywords:

magnetism, spintronics, ferrimagnetism, ultrafast optics, ebeam lithography, magnetic force and NV center microscopy.

## Work content

The PhD student will work under the supervision of Dr. Michel Hehn within the SPIN Team research group at Institut Jean Lamour whose topics range from the material growth of innovative materials for all optical switching, to the development of magnetic sensors and the fundamental study of physical phenomena related to magnetism.

## Expected skills

Knowledge of electromagnetism and solid-state physics, including optics and magnetism is essential. Experience with sample growth and/or clean-room would be ideal.

Knowledge of English (oral and written) is important and knowledge of French would be an advantage. As an enthusiastic researcher you are always trying to understand and learn, you enjoy working in an international team, and have a taste for both experimental and theoretical work.

## About Institut Jean Lamour

The Institute Jean Lamour (IJL) is a joint research unit of CNRS and Université de Lorraine. Focused on materials and processes science and engineering, it covers: materials, metallurgy, plasmas, surfaces, nanomaterials and electronics.

By 2026, IJL has 243 permanent staff (34 researchers, 131 teacher-researchers, 78 IT-BIATSS) and 389 non-permanent staff (146 doctoral students, 43 post-doctoral students / contractual researchers and more than 200 trainees), from some seventy different nationalities.

Partnerships exist with 150 companies and our research groups collaborate with more than 30 countries throughout the world.

Its exceptional instrumental platforms are spread over 4 sites ; the main one is located on Artem campus in Nancy.

## Application

Applicants are invited to submit:

- Curriculum Vitae
- Letter of motivation
- Academic grades for the last couple years
- Scan of passport
- Recommendation letters or contacts (if possible)

Applications will be accepted until 1th of October 2026. Interviews will be carried during the month of October. A decision should be made end of October.

Applicants should have finished their master's degree before the beginning of the expected PhD start date. A diploma will be required to sign the contract.

Send the application to:

- Michel Hehn (Professor at Lorraine University and at Institut Universitaire de France): [michel.hehn@univ-lorraine.fr](mailto:michel.hehn@univ-lorraine.fr)