

## **Project title: Magnetic Domain Fluctuations**

UCL Lead department: Physics and Astronomy

Lead Supervisor: Ian Robinson

Project Summary:

Small blocks of quantum materials often contain one or more structural antiferromagnetic domains, which can fluctuate in ways that can be applied in quantum computing applications. Fluctuations can be driven by lasers into superposed domain structures which evolve in time. This project will use coherent X-ray diffraction methods, for example at the Diamond Light Source, to image these domains to understand their excitations and how they can be applied. The UCL group is world-leading in establishing powerful methods for inverting the coherent diffraction into images.

The Research Team and Research Project

The successful candidate will work with the group of Ian Robinson in the CMMP group of Physics and Astronomy. Recently published examples of our magnetic domain imaging can be found here:

DOI: [10.1103/PhysRevLett.127.275301](https://doi.org/10.1103/PhysRevLett.127.275301) on  $\text{La}_{2-x}\text{Sr}_x\text{NiO}_4$

DOI: [10.1103/PhysRevB.108.L020403](https://doi.org/10.1103/PhysRevB.108.L020403) on  $\text{Sr}_2\text{IrO}_4$

For the domain imaging applications, and to predict their dynamics, there are opportunities to use AI and machine learning methods. Future experiments are planned to look at laser excitation of these quantum materials using the European X-ray Free Electron Laser Facility.

Who we are looking for

This project suits a talented and ambitious student with an interest in theoretical or experimental condensed matter physics. The student will be trained in coherent X-ray diffraction imaging of quantum materials and will interact with the doctoral training cohort at UCL. Opportunities for placements and training at X-ray research facilities will be available in addition to a wide range of well-organised conferences.