

Opportunities for graduate students in Quantum Optics and Device Engineering

If you want to pursue a career as a quantum engineer and get trained to become a future leader in academia or work at major companies in the industry please read below.

Atom-like defects in solids have seen exceptional progress the last few years and now set the state of the art in several key quantum technologies, ranging from quantum memories, computation and communication to nanoscale quantum sensing. Prof. Laraoui at the University of Nebraska-Lincoln is hiring graduate students to join the [Quantum Sensing & Defect Discovery and Spectroscopy Lab](#). His primary research focuses on developing new quantum materials based on atomic-defects in diamond, wide bandgap semiconductors, and two-dimensional (2D) materials, for applications in quantum sensing, nanoscale imaging, and quantum information processing.

Four projects are available:

1. Magneto-optical imaging of individual transition-metal nanoparticles using nitrogen vacancy centers in diamond.
2. Hybrid photonics based on coupling single-photon emitters in 2D materials (transition metal dichalcogenide, hexagonal boron nitride) to plasmonic nanostructures.
3. Nanoscale imaging of spin-textures in topological materials using scanning probe microscopy.
4. Exploring magnetic and optical cavities for coupling distant spin-qubits for scalable quantum networks.

These research activities are mainly experimental and involve:

- ❖ designing and building optical setups (fluorescence, pump-probe), magneto-optical microscopes (confocal, far-field), RF/MW electronics circuits, and low-temperatures setups.
- ❖ Quantum protocols: pulse control, optical initialisation and readout, magnetic field control
- ❖ Interfacing equipment: laser, AOM, RF/MW signal generators, CMOS cameras, photodetectors, DAQ for measuring weak signals.
- ❖ device fabrication: E-beam, evaporation, etching, FIB...
- ❖ device characterization: AFM, TEM, SEM, Raman, UV-VIS optical spectroscopy, ...

Motivated students interested to learn new laboratory skills in quantum optics and low dimensional nanomaterials are encouraged to contact Dr. Laraoui at alaraoui2@unl.edu. In your email, please include your academic resume (CV) with a motivation letter. Ideally students should have a Bachelor or Masters in Physics, optics, Materials science, other related fields and background in programming (LabView, Python, Matlab), data analysis (Mathematica, Matlab), design (CAD, solidworks...), MW/RF electronics, PCB design, and performing experiments in optics and magnetism.

More information about his research can be found here:

<https://engineering.unl.edu/mme/faculty/abdelghani-laraoui/>

For information about the application process:

<https://engineering.unl.edu/graduate-programs/phd-materials-engineering/>

A very competitive research assistantship with health-insurance benefits and tuition support are offered.