Topics for a master thesis

I - Quantum Nano-optics

- Quantum electrodynamics effects near an interface

The project focuses on studying the photophysics of single silicon-vacancy color centers in diamond nanomembranes, and the corresponding spectral signatures associated with modification of the local density of states near an interface

- Plasmon-assisted photodynamics of color centers in diamond

The project focuses on studying the modification in the photophysics of color centers in diamonds due to near-field coupling to resonant structures

- Strong coupling at room temperature (Theory/Experiment)

This project aims at defining conditions for the experimental realization of strong coupling between quantum dots and nanocavity photons at ambient conditions by using a well-controlled coupling strength. This project will be performed in close collaboration with the theoretical quantum optics group

- Charge-state manipulation of color centers in diamond

This project aims at developing an experimental technique to control the charge states of color centers in diamond for quantum optics and sensing applications

- Photophysics of electrically driven photon sources

This project aims at developing a spectroscopy approach for studying photon statistics of electrically driven photon sources based on color centers in diamond

II - Nanospectrosocpy

- Quantum cooperativity using coupled color centers in diamond

The project focuses on developing theoretical and experimental approaches to study the collective photon-dynamics of an ensemble of silicon-vacancy color centers mediated by resonant structures

- Ultrafast photon detection

The project focuses on developing an experimental approach using nonlinear optical techniques to detect ultrafast photons with sub-ps resolution

III - Nanosensing

- Wide-field Vector magnetometry

The project focuses on an experimental approach to develop wide-field vector magnetometry based on polarimetric optically detected magnetic resonances (ODMR)

- Nano-thermometry/magnetometry in one platform

The project focuses on developing spectroscopy-based nanoscale quantum sensors that can measure temperature and magnetic field at the same time with high sensitivity and spatial resolution

- Planar antenna

The project focuses on developing a spectroscopy approach to improve single-molecule detection for sensing and quantum applications