

Plan of Knowledge Dissemination: Quantum Optics in 2D semiconductors

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Quantum technologies is becoming increasingly important for communication, computers and sensors. As an example, quantum key distribution (QKD) is already being used by the United States Department of Defense, through the Defense Advanced Research Projects Agency (DARPA). Recently, a videoconference between Vienna and Beijing also used QKD through the China's Micius quantum-communications satellite. This is a game changing for the protection of data. The adventum of quantum computers will make the classical encryption schemes obsolete, and therefore quantum communication is a route to establish a safe network.

To develop and understand quantum technologies, we will need a new class of engineers that are proficient in quantum sciences. As this project is written, ITA does not have any course or minicourse on quantum science or quantum technology, except for traditional quantum mechanics courses offered in the PPG-FIS. The goal is to make a small step to spark the interest of the students and the faculty of ITA to research quantum science and quantum technologies. The focus will be on the research activities of the project, i.e., the usage of 2D materials as a platform to do quantum optics.

The knowledge adquired in the research activities at the International Iberian Nanotechnology Laboratory (INL) will be used for:

- Research activities: As a member of the Group of Semiconductor Materials and Nanotechnology (GMSN), the knowledge adquired will be useful for new projects focused in the use of 2D materials in quantum optics.
- Minicourse on quantum semiconductor optics.
- A new course for the PPG-FIS focusing on quantum semiconductor optics emphasizing 2D materials.
- Research seminar: To be given to the GMSN and other researchers with the results of the research activities performed at INL.

- Department seminar: To be given for the students (both undergrad. and grad.) and professors focusing in the general area of quantum semiconductor optics.
- The results of the research project will be published as papers in selective journals, thus available for the scientific community.