Mobility of NanoX tenured Scientists

Respecter le format du template SVP

Name	**URBASZEK Bernhard**
Position	DR2
NEXT/NanoX affiliation	LPCNO Quantum Optoelectronics Group
Host laboratory	Harvard University
Country of host lab.	US
Inviting contact (name and e-mail)	Prof. Hongkun Park
Dates of stay	From 1. Nov 2019 to 1. Dec 2019

Brief Description of the host lab

The Park Group is affiliated with the Department of Chemistry and Chemical Biology and the Department of Physics at Harvard University. The group focuses on fundamental studies of nanoscale electrical, optical, and plasmonic devices that operate based upon quantum mechanical principles as well as the development of new nano- and microelectronic tools that can interface with living cells, cell networks, and organisms. The goal of our quantum optoelectronics effort is to develop solid-state photonic, optoelectronic, and plasmonic devices that work all the way down to the single quantum level, thus paving the way for all-optical computing and solid-state quantum information processing.
https://hongkunparklab.com/

Research project during the stay

Descriptive Title *Tailoring light-matter interaction in atomically thin semiconductors*

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TMD monolayers can be combined with other layered materials such as insulating hexagonal boron nitride (hBN) and graphene to form van der Waals heterostructures. Using graphene as an electrode and hBN as a tunnel barrier, TMD MLs can be embedded in charge tunable structures, controlling the doping level (n-,p-type or neutral). This allows for electrical control of optical properties as exciton resonances can be switched ON and OFF. In addition the atomically sharp interfaces of the van der Waals device act as a complex cavity structure, and the radiative lifetime of the excitons and also the reflection/absorption coefficient of the TMD MLs can be controlled. In samples with tunable mirrors we aim to investigate the different regimes of exciton-light coupling. The target is to control the emission time, energy, polarization and directionality and possibly the strong coupling regime of exciton-photon modes (polaritons), all in compact and tunable devices. The focus point of this collaboration is to probe the tunable light-matter coupling in the spectral domain (spectral width of optical transitions) and in the time domain (rise and decay time of exciton emission) for different TMD materials, tuning resonances in external electric and magnetic fields.

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