INSTITUT NEEL Grenoble

Post-doctoral position

Erbium doped opto-RF platform for quantum transduction

Context :
Rare-earth ions because of their unique 4f electronic configuration form well isolated systems when embedded in solids. They have long coherence time at low temperature making them highly promising qubits for the development of quantum technologies. Their optical transitions can now be used as a support for optical quantum memories and more generally as a fast and versatile element of control on the qubit. Their spins also exhibit long coherence times and can be driven efficiently using RF fields. This remarkable combination of optical and spin properties make them ideal for the development of RF-optical transducers, and to push the performance of optoelectronic devices at the quantum level.
Within the framework of the ANR project *Microwave rare-earth spin interfaces for quantum information processing* – MIRESPIN, involving the Institut de Recherche de Chimie Paris and the Service de physique de l'état condensé (CEA-Saclay), we aim at controlling rare-earth doped ions at low concentration with two objectives: single spin RF control and RF to optical transduction, both involving high Q resonators.

Objectives and means available :
At Institut Néel, in the team *Nanophysics and Semiconductors* (NPSC), we focus on RF to optical transduction based on a good knowledge of the spin and optical transitions of erbium doped samples which are compatible with the fibered telecom range. Appropriate compound and experimental working conditions (spin and optical transitions of interest, magnetic field orientation, temperature …) still need to be investigated to provide an efficient opto-RF converter. The physical design of the resonator with a prime focus on the RF interaction enhancement will be implemented and tested first at moderate cryogenics temperature (1.5-2K) to validate the approach. The proof-of-principle will be a solid basis to adapt the setup for ultralow temperature operation (10-20mK).
Depending on the expectation of the candidate, the project can be oriented toward RF or optical characterizations of the sample, resonator design and implementation, or nanofabrication to anticipate the integration of the next generation RF or photonic circuits. Experimental skills in one of this domains are required.

Possible collaboration and networking :
- Institut de Recherche de Chimie Paris
- Service de physique de l'état condensé (CEA-Saclay)

Application :
The project will be supervised by Thierry CHANELIERE.
Candidates should provide a curriculum vitae (research experience and list of publications) and a brief letter of motivation highlighting the personal skills in one of the domain related to the subject. The application should be sent to Thierry CHANELIERE (thierry.chaneliere@neel.cnrs.fr)

Foreseen start for the position : 2nd semester 2021
Salary : 2648 € brut/month
Duration : The initial appointment is for one year.

Contact : Thierry CHANELIERE
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More information: http://neel.cnrs.fr