

## DRF: Thesis SL-DRF-17-1114

### TITLE

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Development of Perovskite Quantum Dots for All-Optical Quantum Information Technology

### ABSTRACT

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Context:

Halide perovskite CsPbX<sub>3</sub> (X=Cl,Br,I) quantum dots (QDs) have drawn significant research interest in the past three years due to their outstanding optical properties [1]: narrow photoluminescence (PL) band (10-40 nm FWHM) with room temperature quantum yield (QY) as high as 90%, and tunability of PL peak from 400 to 700 nm by varying either the halide composition and/or by playing with the quantum confinement effect. Interestingly, doping of CsPbX<sub>3</sub> QDs with Mn<sup>2+</sup> ions has also recently been reported, opening up the potentiality of combining magnetic and semiconductor properties at the nanoscale.

Description of the PhD project:

The PhD project is part of a local collaborative research project aiming at developing CsPbX<sub>3</sub> QDs as versatile building blocks for the all-optical Quantum Information Technology, involving two research institutes (CEA – INAC and CNRS – Institut Néel) and industrial partners (to be defined). The PhD candidate will explore two device applications using perovskite QDs as:

- Quantum emitters in solid-state single photon sources. This demands synthesis of high quality QDs featuring high PL QY at room temperature and their deterministic positioning in photonic structures.
- Spin quantum bits. This necessitates the controlled doping of perovskite QDs with transition metal ions down to the single dopant level per QD.

The candidate will carry out chemical synthesis of perovskite QDs and their structural and optical characterization in CEA – INAC. In CNRS – Institut Néel, he will participate in the study of the QD physical properties using advanced spectroscopy (measurements of PL dynamics, applied magnetic field effects, quantum optics, ...) and in clean room processing (deterministic positioning of QDs on solid substrate, integration of single QDs in single photon source structures). This PhD project includes as well a 6-month internship in industrial environment.

This PhD is part of the Lanef 2017 PhD program GreQue (<http://grenoble-lanef.fr/spip.php?article66>)

To be eligible according to the Marie Skłodowska Curie Action rules, applicants should not have spent more than one year in France during the last three years (between 5 October 2014 and 5 October 2017).

Deadline of application: Sept 25, 2017

### LOCATION

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Institut nanosciences et cryogénie  
SYstèmes Moléculaires et nanoMatériaux pour l'Énergie et la Santé

Synthèse, Structure et Propriétés de Matériaux Fonctionnels

Place: Marcoule

Start date of the thesis: 01/01/2018

## CONTACT PERSON

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Peter REISS

CEA

DRF/INAC/SyMMES/STEP

CEA/Grenoble

17 rue des Martyrs

38054 Grenoble cedex 9

Phone number: +33 4 38 78 97 19

Email: [peter.reiss@cea.fr](mailto:peter.reiss@cea.fr)

## UNIVERSITY / GRADUATE SCHOOL

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Université Grenoble Alpes

Ecole Doctorale de Physique de Grenoble

## FIND OUT MORE

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<http://inac.cea.fr/Pisp/peter.reiss/>

## THESIS SUPERVISOR

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Gilles NOGUES

CNRS/Institut NEEL

PLUM/Nano-Physique et Semi-Conducteurs

Institut NEEL

CNRS/UGA UPR2940

25 rue des Martyrs BP 166

38042 Grenoble cedex 9