

**Electric field measurement by second harmonic generation of laser light
(E-FISH) for aerospace applications**

Laboratory name: Laboratoire de Physique des Plasmas

CNRS identification code: UMR7648

Internship director's surname: STARIKOVSKAIA and ELIAS

e-mail: svetlana.starikovskaia@lpp.polytechnique.fr

Phone number:

Web page: www.lpp.fr

Internship location: PALAISEAU (ONERA and Ecole Polytechnique)

Thesis possibility after internship: **YES/NO**

Funding: to get If YES, which type of funding: by Doctoral School competition, 50%
ONERA, 50% IPP

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In situ electric field strength determination in transient plasmas and gases in vicinity of plasma objects is extremely important. Recently, a new laser diagnostic technique, called EFISH (Electric Field Induced Second Harmonic generation), has been proposed in order to measure the electric field in gas or plasma in a non-intrusive way. It is based on the generation of second harmonic generation of laser radiation using a pulsed (typically picosecond) laser. The generation of second harmonic of laser radiation by the electric field (E-FISH) is a nonlinear optical phenomenon due to the asymmetry of the polarizability induced by the applied electric field. This allows the generation of the harmonic, otherwise forbidden in homogeneous media. However, to be applied more widely on aerospace devices, several issues remain: insufficient resolution for some electrostatic configurations, sensitivity to the field distribution, feasibility of a remote measurement. This PhD thesis, devoted to the development of a remote electric field measurement technique by laser detection, aims to examine and propose solutions to these issues. It is part of a collaborative project, developed between the Institut Polytechnique de Paris (IPP), the Office National d'Etudes et de Recherches Aérospatiales (ONERA) and the National University of Singapore (NUS). The Master Thesis will be co-supervised by two French supervisors, one from the IPP and the other from ONERA, and a co-supervisor from Singapore, NUS.

The supervisors:

NUS: Prof. Tat Loon CHNG,

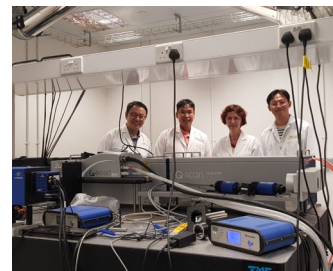
https://scholar.google.com/citations?user=_pbLwzwAAAAJ&hl=en

ONERA: Dr. Paul-Quentin ELIAS,

<https://www.researchgate.net/profile/Paul-Quentin-Elias>

IPP: Dr., Prof. Svetlana STARIKOVSKAIA,

https://scholar.google.com/citations?view_op=list_works&hl=fr&user=T-x1JN4AAAAJ



The selection criteria for students are as follows: excellent knowledge of physics, intellectual capacity, ability to generate ideas to solve problems, ability to make decisions, interest in experimental work, basic programming skills, English at B2 level, integrity and sense of responsibility. Access to ONERA requires obtaining an authorization issued by the General Delegation for Armament

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES/NO

Soft Matter and Biological Physics: YES/NO

Quantum Physics: YES/NO

Theoretical Physics: YES/NO