

PhD Position Opening in Photonics, Metz (France)

LINEAR AND NONLINEAR OPTICAL TAILORING OF UNCONVENTIONAL VECTOR BEAMS

The *Photonics team* of the 'Laboratoire Matériaux Optiques, Photonique et Systèmes' (LMOPS) of the University of Lorraine and CentraleSupélec in Metz (France) has an opening for a PhD position starting in **September 2019**. The thesis is financed in the framework of the initiative "Lorraine, Université d'Excellence" (LUE) for which high-level international candidates are highly welcomed.

Topic

The tailoring of laser beams with specific characteristics has become an important field of research both for fundamental and applied purposes that include industrial or medical applications, singular optics, quantum optics and quantum information, or optical trapping and tweezers. Among various type of unconventional beams, vector beams represent a particularly important category. Such beams exhibit an inhomogeneous spatial distribution of the light polarization.

The Photonics team has been active in the study of various types of unconventional light beams since about a decade. The present fundamental research thesis will build on the recently started investigations involving vector beams produced naturally by the conical diffraction phenomenon in biaxial birefringent crystals. The PhD student will investigate various linear and nonlinear optical approaches in order to modify statically or dynamically the structure of the resulting vector-type beam. Configurations using a single anisotropic crystals or, alternatively, a number of crystals put in cascade will be studied. The work foresees both theoretical modeling (analytical and numerical) as well as experimental realization. It should lead to fully new kinds of structured light useful for numerous applications (particle trapping, information processing, metrology, ...).

Candidate profile

We expect outstanding candidates with a master degree in physics or a very closely related field. The candidates should be highly skilled in the setting-up and alignment of precision optical set-ups. Since a large body of work in the thesis will be theoretical, the candidates should have a very solid knowledge in classical optics (Fourier optics, crystal optics, ...) and nonlinear optics. Numerical skills and good knowledge of mathematical and numerical software (Mathematica, Matlab, ...) are highly welcomed.

The candidates should submit their CV, a motivation letter for this thesis and copy of the grades in the whole university curriculum as well as diplomas. Recommendation letters are optional, references and indications on the ranking of the student are welcomed.

Thesis supervisors

Prof. Germano Montemezzani (germano.montemezzani@univ-lorraine.fr); +33 3 72 74 88 12
Ass. Prof. Nicolas Marsal (nicolas.marsal@centralesupelec.fr); +33 3 87 76 47 83

Working place: Metz (France)

Application deadline: Complete applications should be sent by e-mail to the supervisors by **March 31, 2019**

Web page: doctorat.univ-lorraine.fr/fr/les-ecoles-doctorales/c2mp/offres-de-these/linear-and-nonlinear-optical-tailoring-unconventional

