MASTER DE PHYSIQUE ET APPLICATIONS - 2ème année
Spécialité Sciences des Matériaux et Nano-objets
International Nanomat Master Program

Internship proposal 2009-2010

Laboratory : Digital Signal Processing, Multimedia, and Optical Communications Laboratory.

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Design of Bragg and Photonic Crystal filters for fiber optics communications

Scientific project :

Photonic Band-Gap (PBG) structures are periodic dielectric materials that control the propagation of electromagnetic waves, in the same way as a semiconductor crystal influences the motion of electrons, introducing forbidden electronic energy bands. One dimensional photonic crystals, in the form of thin-films or Bragg gratings are already in widespread use with a large number of applications. 2-dimensional photonic crystals are of great interest for both fundamental and applied research, exspecially in the fiber optics fields, since they allow us to fabricate compact low-loss passive filters, multiplexers, slow-light devices..,

The project is devoted to investigate the characteristic of PBG materials with irregular periodicity interruptions. Evanescent modes are localized in the points of the structure where defects are placed; they can be trapped at a stop-band frequency where, in absence of periodicity interruptions, no transmission appeared. This property allows us to create filters of different sharpness, or switches if a parameter of the defect, such as its thickness or its refractive index, is changed. In some applications, a multiband frequency response of a filtering PBG can be required.

By using commercial an custom software, project will focus on the design of a 1D of 2D PBG structure that is able to synthesize a given finite or infinite impulse response filter.

Techniques in use :

The Lab is equipped with commercial software to design PhC structures: RSoft BandSolve, Fullwave, BeamProp and custom software.

Applicant skills :

Knowledge of basic programming languages, MatLab.

Granted internship : yes
C'nano IdF laboratory (France only) : yes / no
Possibility for a thesis : yes , financial support possible after selection according to national rules.
Amount of the grant: approximately 13640 €/year (previdential contribution shall be deducted).