Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Dupont | Given names : Samuel

Status (prof., assistant prof., …) : professor

Laboratory : iemn | Website address : https://www.iemn.fr/

Institution : INSA Hauts-de-France | Website address : https://www.insa-hautsdefrance.fr/

Scientific competence of the supervisor:

Professor Dupont recieved the M.S. in Physics from Physics department, University of Lille (1996), France and PhD in optoelectronics (2000) from the same university. During the academic years 2000-2003, he was an acting assistant professor of Electrical engineering successfully at Polytech'Lille and Telecom Lille, both engineering schools. During 2003-05 he was a group leader in the telecom department of Multitel ASBL, Mons, Belgium. He joined the university of Valenciennes in 2005 to develop acousto-optic research activity. His research interests are: acoustics, photonics, acoustooptics, modeling of acoustic and optical waves in anisotropic materials such as elastooptic crystals.

Two major publications in the field proposed for the PhD :

1. Xu, W. J., Zhang, J. Y., Wu, X. M., Cheng, Q., & Dupont, S. (2024, September). Angular spectrum method for acoustic beam in anisotropic media and structures. In Journal of Physics: Conference Series (Vol. 2822, No. 1,
2. El Soussi, A., Gazalet, J., Dupont, S., & al. (2019). Evaluation of second order optomechanical coupling strength in photonic crystal cavities including the case of degenerated modes. Journal of Optics, 21(4), 045103.

Website address of the personal page :

Supervisor's email : samuel.dupont@uphf.fr

Description of the research work proposed for a PhD | ***Topic # (see list) :*** IV-6

Title : Development of a 3D semi-analytic method for inverse problems of the elastic wave propagation in anisotropic media

Subject :

Modelling the propagation of elastic waves in anisotropic media has many applications. With traditional approaches such as the Finite Element Method, the resolution process requires substantial memory ressources and is highly time-consuming, especially for anisotropic materials. Using a new elegant semi-analytical method based on angular spectrum, the goal is to determine the generation conditions required to get a target sound field in anisotropic crystals. The waves are generated by a planar source located on a the surface of a solid, then the question is reduced to a back propagation problem, and the angular spectrum method would be a very efficient way to solve the wave back propagation in anisotropic materials. Based on this principle, the research works consist in: adapting the plane wave angular spectrum method; programming a computation software permitting the definition of the source geometry necessary to obtain the target sound field distribution, and enabling 3D elastic field visualization and analysis. To valid the developments, experimental works will be conducted in anisotropic materials such as paratellurite.

Keywords :

Acoustic waves, ultrasound, diffraction, analytical methods, numerical methods, angular spectrum, anisotropic material, back-propagation problem, optimisation.

Expected collaborations :

Background required from the applicant :

Master in Engineering with a good background in applied mathematics for elastic wave propagation in anisotropic media. Matlab, Python.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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