



Postdoctoral position

Mathematics Research Institute of Rennes /
Institut de Recherche Mathématiques de Rennes
<http://irmar.univ-rennes1.fr>

Mathematical and numerical investigations of Schrödinger-type equations in optics

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T : 02-23-23-66-70
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Keywords : Schrödinger equation, Lugiato-Lefever equation,
non-linear optics, Fabry–Perot resonator,
numerical analysis, computer simulation

A 12 months postdoctoral position (starting at the beginning of the year 2022) is available at the Mathematics Research Institute of Rennes (IRMAR). The postdoctoral researcher will join a 36 months project that started in 2021 supported by ANR (French National Agency for Research) and DGA (French Government Defense Technology Agency) and involving IRMAR, one industrial partner and two academic research laboratories in optics. The aim of the project is to develop fiber Fabry-Perot resonators dedicated to optical frequency synthesis through Kerr frequency comb generation and low-phase noise microwave synthesis with opto-electronic oscillator architectures. The task devoted to IRMAR in the project is the mathematical modeling of Kerr–nonlinear effects in a Fabry–Perot resonator composed of a centimeter long nonlinear optical fiber whose ends consists in two Bragg mirrors (a type of mirror composed of multiple thin layers of dielectric material).

The team project at IRMAR is made up of three permanent researchers belonging to the Numerical Analysis group that the postdoctoral researcher will join. A general mathematical model emerging for a Kerr–nonlinear Fabry–Perot resonator consists in two bidirectional propagation equations of Schrödinger type coupled through a non-linear term and through the end mirrors boundary conditions. A simplification of this bidirectional model could lead to a Lugiato-Lefever equation. Our aim, once the model fully specified in connection with our physicist partners will be to investigate its mathematical features and to develop a numerical approach to solve it. A numerical software will be elaborated based on these investigations and will be used to help build the Fabry–Perot resonator meeting the criteria laid down in the framework of the project.

The qualified candidate must have a PhD degree in mathematics with a major in numerical analysis. She / He must have a real interest for applications of mathematics in physics and programming skills (C++ / Matlab). Due to the project funding by DGA, the applicant must have the nationality of one of the EU Member States or Europe Associated Countries.

Host organization : The [Mathematics Research Institute of Rennes](#) (IRMAR, Institut de Recherche Mathématique de Rennes) is cosponsored by CNRS (UMR 6625) and [Université de Rennes 1](#). It is partner of [Labex Centre Henri Lebesgue](#) and includes 230 researchers in mathematics divided in 10 research groups. The [Numerical Analysis group](#) is composed of 30 permanent researchers covering a broad spectrum of numerical analysis techniques and has a long experience and knowledge in the study of mathematical problems in optics.

Information and application : Applicants should provide a detailed curriculum vitae, a description of research experience and interests, and when possible professional references to:

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