

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

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Squeezed light to beat quantum limits in optomechanical systems

Technological advancements over the last quarter-century have led to interferometric experiments nearly reaching the quantum radiation-pressure noise (QRPN) limit. These experiments have achieved the most sensitive displacement measurements to date, in both table-top interferometers and large-scale gravitational-wave interferometers, such as the LIGO and Virgo instruments.

In such experiments, even if classical noise has been reduced, two quantum-noise sources are still present: quantum phase noise and QRPN. For a given optical power, these two noises result in a limit to displacement sensitivity that one can achieve with a coherent laser beam: the standard quantum limit (SQL). Quantum noise can however be surpassed using quantum squeezed states of light: the application of appropriate squeezing can theoretically reduce QRPN and quantum shot noise simultaneously, thus surpassing the SQL.

The quest to observe the SQL is of keen interest to the field of optomechanics. A number of small-scale experiments have recently been performed, seeing QRPN effects and reaching the quantum mechanical ground state of an optomechanical resonator. The application of squeezed states to an SQL resonator would, for example, be a macroscopic test of quantum measurement theory. The SQL and the application of squeezed states to surpass the SQL are also of keen interest for gravitational-wave interferometers. The current generation is limited by quantum phase noise at high frequency, and the second-generation (Advanced LIGO and Advanced Virgo) are also expected to be limited by QRPN at low frequency. The goal of this project is to develop the hardware, techniques and expertise to experimentally realise these scientific goals, working in collaboration with a group at the Australian National University in Canberra.

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : YES

Si oui, financement de thèse envisagé/ financial support for the PhD: Graduate School EDPIF

Lasers, Optique, Matière	<input checked="" type="checkbox"/>	Lumière, Matière, Interactions	
Plasmas : de l'espace au laboratoire			

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>