Contribution ID: **121** Type: **Talk**

Optimal control of a radiation pressure limited opto-mechanical resonator

Friday 9 September 2022 11:40 (20 minutes)

The proposal of this work is the use of a highly sophisticated mechanical control for an optomechanical resonator, based on Pontryagin's optimal control theory. The optomechanical device is a tabletop suspended interferometer designed to be radiation pressure limited in the frequency band of the ground-based gravitational waves detectors, to provide both a source of squeezed states by ponderomotive effect, for a broadband quantum noise reduction, and a suitable test bench for the optimal control algorithm we propose. The optimal control problem is analysed considering optomechanical interaction models already described in the literature. Indeed, a crucial point for this type of device is the mirror motion due to external mechanical disturbances, such as vibration and acoustic noise, which can bring the interferometer out of its working point. Moreover, the nonlinear optomechanical coupling generates the emergence of spurious frequencies in the reflected light spectrum, with respect to the monochromatic incoming laser spectrum.
The control force on the mirrors, operated by electromagnets, must be effective in reducing the noise and possible nonlinearities. To this aim, we will apply Pontryagin's approach to develop an integro-differential model that can be used to build an adequate and optimized control system, which can be implemented and tested in our small-scale suspended interferometer.

Is this abstract from experiment?

Yes

Name of experiment and experimental site

Suspended Interferometer for Ponderomotive Squeezing

Is the speaker for that presentation defined?

Yes

Details

Ms. Laura Giacoppo, INFN-Roma1 and University of Rome "La Sapienza", Italy

Internet talk

Yes

Author: GIACOPPO, Laura

Co-authors: Prof. CARCATERRA, Antonio (University of Rome "La Sapienza"); MAJORANA, Ettore (INFN - National Institute for Nuclear Physics); DI PACE, Sibilla

Presenter: GIACOPPO, Laura

Session Classification: Quantum Physics, Quantum Optics and Quantum Information