ID de Contribution: **1** Type: **Non spécifié**

Quantum optimal control for atom interferometry in the quasi-Bragg regime

jeudi 17 novembre 2022 11:00 (1h 15m)

ABSTRACT

We develop interferometry-based atomic inertial sensors robust to Doppler-type inhomogeneities by using quantum optimal control.
Efficiency of optical pulses can be drastically improved with this method on both intensity and phase of the lasers pulses to reach the targeted quantum state with the best
possible accuracy. We focus in particular on the importance of optimizing the design of phase-modulated mirror pulses throughout fidelity calculations.
Thanks to an algorithm that uses gradient ascent pulse engineering (GRAPE), the optimized phase profiles can already be experimentally implemented using an electro-optic modulator (EOM)
in the gradiometer experiment. Large momentum transfer beamsplitters in the quasi-Bragg regime are here envisioned.

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