Scaling up matter-wave interferometry: Toward next-generation quantum sensors

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Atom interferometry has emerged as a powerful tool for quantum sensing. It enables precise measurements of inertial effects and has applications in geophysics, navigation, and determining fundamental constants such as the fine structure constant and Newton's gravitational constant.

In this talk, I will present a new method based on stroboscopic stabilization in accelerated optical lattices. This method sets a new standard for large-momentum-transfer interferometry. Using this technique, we achieved a momentum separation of 600 photon recoils, $\hbar$k, in just two milliseconds. This paves the way for atom interferometers with meter-scale arm separation and enhanced quantum sensing performance. This new class of atom interferometers could be used for gravitational wave detection and fundamental physics tests.

Séminaire SFP

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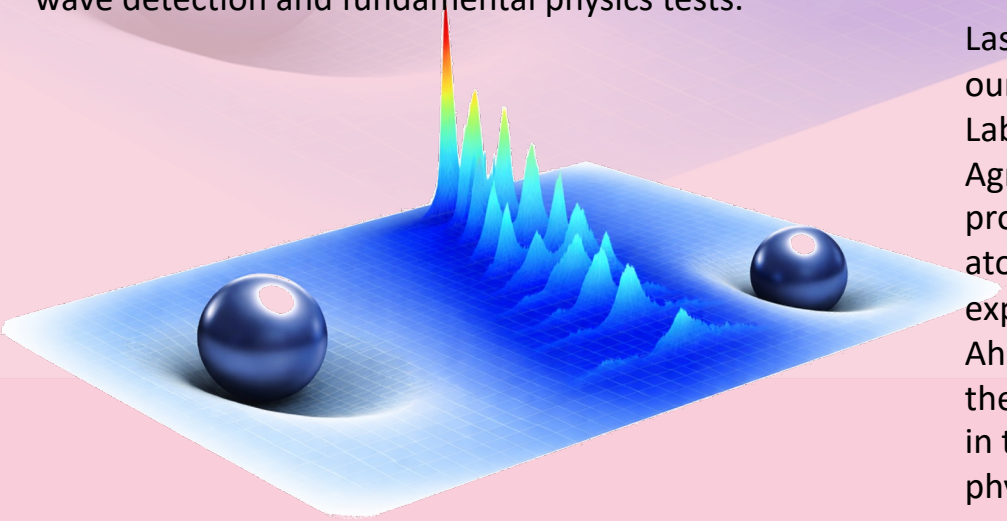

Lastly, I will briefly discuss our ongoing project at the Laboratoire Collisions Agrégats Réactivité. The project involves a large-scale atom interferometer that explores analogues of Aharonov-Bohm effects and their potential applications in testing fundamental physics principles.