ID de Contribution: **37** Type: **Contribution orale**

ANALOGUE QUANTUM SIMULATION OF ROTATING BLACK HOLES IN POLARITONS

lundi 3 juillet 2023 18:25 (20 minutes)

Since their discovery, black holes have motivated many theoretical works in the framework of general relativity, where the curvature of spacetime and trajectory of particles are of particular interest. Furthermore, they have also driven the theoretical study of quantum field effects such as Hawking radiation or rotational superradiance, although these remain unobserved due to their very weak signal. Our project aims to experimentally simulate these effects using the optical platform of excitons-polaritons. These form a two-dimensional quantum fluid whose phase and density we fully control optically. We engineer a draining bathtub (vortex) flow in which fluid excitations behave as though they were on a rotating black hole geometry. We investigate the dynamics of solitons (massive excitations of the quantum fluid) in this flow. We find that they follow geodesics of the rotating geometry across the horizon and the ergosurface. Such trajectories are precursors of dynamical instabilities of the quantum field. Our work thus constitutes a first step towards the study of such exotic phenomena typical of rotating black holes.

Affiliation de l'auteur principal

Laboratoire Kastler Brossel, Sorbonne Université, ENS-Université PSL, Collège de France, CNRS

Auteurs principaux: M. BRAMATI, Alberto (Laboratoire Kastler Brossel); Mlle GIACOBINO, Elisabeth (Laboratoire Kastler Brossel); GUERRERO-FEUILLET, Killian (Laboratoire Kastler Brossel); M. FALQUE, Kévin (Laboratoire Kastler Brossel); M. JACQUET, Maxime (Laboratoire Kastler Brossel); M. GLORIEUX, Quentin (Laboratoire Kastler Brossel)

Orateur: GUERRERO-FEUILLET, Killian (Laboratoire Kastler Brossel)

Classification de Session: Mini-colloques: MC08 Dernières avancées dans le domaine des technologies quantiques

Classification de thématique: MC8 Dernières avancées dans le domaine des technologies quantiques