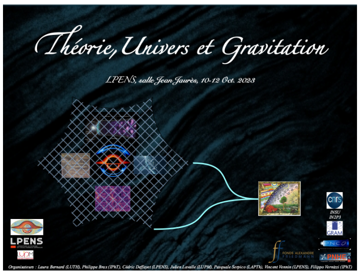
Théorie, Univers et Gravitation – TUG



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Maxime Jacquet (LKB): Measuring entanglement in rotating geometries – experiments and theory

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Relativistic rotating geometries like Kerr black holes are characterised by their horizon and ergosurface (the surface within which waves must co-rotate with the hole), at which vacuum fluctuations of fields yield spontaneous emission: Hawking radiation at the horizon and rotational superradiance at the ergosurface.
In the relativistic context, a far away observer cannot tell the difference between the two fluxes and cannot measure entanglement, preventing the determination of the quantum statistics of the two effects in any realistic black hole geometry.
However, this can be done by quantum simulating the field theory via “analogue gravity”. In this talk, I will explain how we can use a quantum fluid of microcavity polaritons (half-light half-matter bosons) to create a rotating geometry whose properties we can engineer at will. I will show how we can have a horizon and an ergosurface and also present a geometry in which there is an ergosurface without a horizon inside. This rotating geometry permits the investigation of the quantum statistics of rotational superradiance independently from those of Hawking radiation. I will present experimental data including the spectrum of emission. I will also present a full quantum theory of rotational superradiance in this geometry, including new results on entanglement.

Orateur: JACQUET, Maxime (Laboratoire Kastler Brossel, CNRS France)