2nd NICE COLLOQUIUM ON ANALOGUE GRAVITY
University of Nice Sophia-Antipolis
17-18 JUNE 2010

Stephen W. Hawking argued in the 1970s that black holes are not truly black; they emit a quantum glow of thermal radiation. But his analysis had a problem. According to relativity theory, waves starting at a black hole horizon will be stretched by an infinite amount as they propagate away. Therefore, Hawking's radiation must emerge from an infinitely small region of space, where the unknown effects of quantum gravity take over. Physicists have grappled with this problem by studying black hole analogues in fluid systems.

THURSDAY 17th JUNE
SCIENTIFIC COLLOQUIUM

9h00-10h30 : *William Unruh*, University of British Columbia, Canada.

Experimental detection of white hole "Hawking Radiation" via Stimulated emission.

Abstract:

Our experiment to detect the conversion of positive norm incoming radiation to a mixture of positive and negative norm "outgoing" radiation in a flume tank with obstacle will be described.

10h30-11h : Coffee Break

11h-12h30 : *Renaud Parentani*, University of Orsay, France.

Black hole lasers in Bose Einstein condensates

Abstract:

Being the end of the gravitation evolution, black holes should be stable objects. However, under specific conditions, they are subject to various types of instabilities. Some of them are also found when considering analogue black holes, and a neat example is provided by the "black hole laser" in Bose Einstein condensates. When the condensate crosses twice the speed of sound, the phonon spectrum possesses a discrete and finite set of complex frequency modes.
In classical terms, these encode a dynamical instability. At the quantum level, they engender a laser effect. In terms of the gravitational analogy, this effect can be conceived as a self-amplified Hawking radiation. This is verified by comparing the phonon flux at early time with the standard black hole radiation.

12h30-14h30 : Lunch

14h30-16h : *Gil Jannes*, CNRS Nice, France.

The two faces of quantum sound

Abstract:

Fluctuations around a Bose-Einstein condensate can be described by means of Bogolubov theory leading to the notion of quasiparticle and antiquasiparticle familiar to non-relativistic condensed matter practitioners. On the other hand, in the long wavelength approximation, the evolution of these perturbations obeys a relativistic Klein-Gordon equation. I will discuss the relation between both formalisms and the associated concepts of quasiparticles and antiquasiparticles. I will also discuss how the dispersive character of the Bogolubov theory leads to the existence of several possible choices of a regular vacuum state, including a regular generalization of the Boulware vacuum. Issues such as (analogue) Hawking radiation crucially depend on this vacuum choice.

16h-16h30 : Coffee Break

16h30-17h : Lab Visit

FRIDAY 18th JUNE
SCIENTIFIC COLLOQUIUM

9h00-10h30 : *Germain Rousseaux*, CNRS Nice, France.

Horizon effects of surface waves on moving water

Abstract:

The lecture introduces the experiments carried out in Nice to probe the physics of dispersive horizons and provides theoretical guidelines to observe a stimulated Hawking Radiation.

10h30-11h : Coffee Break

11h-12h30 : *Ulf Leonhardt*, University of Saint Andrews, Scotland.

Optical analogue of the event horizon

Abstract:

The lecture discusses optical analogues of the event horizons and the experimental and theoretical issues for generating Hawking radiation with such systems.

12h30-14h30 : Lunch

14h30-16h : *Daniele Faccio*, University of Como, Italy.

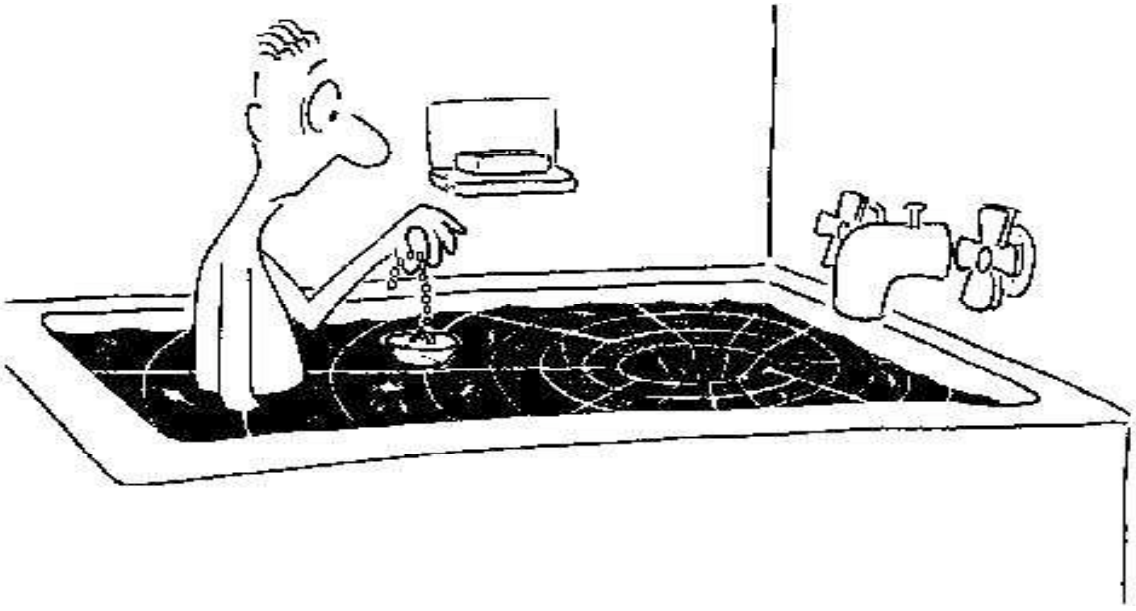
Hawking radiation from ultrashort laser pulse filaments

Abstract:

We show how ultrashort laser pulse filaments excited in transparent dielectric media can give rise to refractive index perturbations traveling with a controllable velocity. These may be then used to excite Hawking radiaton. We present experimental results in different filament propagation regimes that highlight spontaneous emission of photons that bear clear Hawking-like features.

16h-16h30 : **Round-Table** : Discussions, Conclusions and Perspectives.

17h : **Cocktail**



Contact : Germain.Rousseaux@unice.fr