1-DAY QEAGE WORKSHOP, JULY 1st.
LPT – Orsay Campus – Bât. 210 – Salle des séminaires (1st floor)

TENTATIVE TIME TABLE (Talks : 40 min + 10 min questions)

9h15 – Welcome + coffee
- 9h30 - Bill Unurh (UBC – Vancouver) : ***"Analogies and Black Holes"***
- 10h20 - Alberto Amo (LPN - Marcousis) :
"Realisation of an acoustic black hole in a polariton fluid"

11h10 – Coffee break
- 11h25 - Denis Boiron (Institut d'Optique - Palaiseau): ***"An atomic Hong-Ou-Mandel experiment"***

12h15 – 13h30 : Lunch
- 13h30 - Ivar Zapata (Univ. C - Madrid) : ***"Signatures of spontaneous Hawking Radiation in flowing atom condensates"***
- 14h20 – Nicolas Pavloff (LPTMS- Orsay) : ***"Quantum signature of analog Hawking radiation in momentum space"***

15h10 – Coffee break
- 15h25 – ***Yves Aurégan*** (LAUM- Le Mans) ***: "Slow Sound" in a lined duct with flow: effective transonic flows and analogue black holes"***
- 16h15 – Florent Michel (LPT – Orsay) : ***"Scattering of water waves: a few theoretical aspects"***
- 17h05 - Discussions and prospects

ABSTRACTS

W. Unruh : ***"Analogies and Black Holes"***
Hawking showed that black holes are not black, but radiate due to a quantum instability. While the experimental tests of black holes are quite difficult, the power of analogies perhaps will allow to observe this radiation in other systems.

I. Zapata ***: « Signatures of spontaneous Hawking Radiation in flowing atom condensates »***
We consider a sonic black-hole scenario where an atom condensate flows through a subsonic supersonic interface. We discuss several criteria that reveal the existence of nonclassical correlations resulting from the quantum character of the spontaneous Hawking radiation. We unify previous general work as applied to Hawking radiation analogs. We investigate the measurability of the various indicators and conclude that, within a class of detection schemes, only the violation of quadratic Cauchy-Schwarz (CS) inequalities can be discerned. We also analyze the case in which quartic (hence quadratic) CS violation can be observed by direct atom counting in a time-of-flight experiment.

N. Pavloff ***"Quantum signature of analog Hawking radiation in momentum space"***
We consider a sonic analog of a black hole realized in the one-dimensional flow of a Bose-Einstein condensate. Our theoretical analysis demonstrates that one- and two-body momentum distributions accessible by present day experimental techniques provide clear direct evidences (i) of the occurrence of a sonic horizon, (ii) of the associated acoustic Hawking radiation and (iii) of the quantum nature of the Hawking process. Interestingly, the signature of the quantum behavior persists even at temperature larger than the chemical potential.

Y. Aurégan ***"Slow Sound in a lined duct with flow: effective transonic flows and analogue black holes"***
We propose a new system suitable for studying analogue gravity effects. It consists of a duct with a compliant wall where air is flowing. Effective transonic flows are obtained from flows, with a mean velocity much smaller that the sound velocity in free space, through the reduction of the effective speed of sound induced by the wall compliance. We perform a one-dimensional reduction consistent with the classical

formulation. In a weak dispersive regime, the spectrum emitted from a sonic horizon is numerically shown to be Planckian, and with a temperature fixed by the analogue surface gravity. The experimental perspectives of this new type of analogy will be presented.

F. Michel ***"Scattering of water waves: a few theoretical aspects"***
Among the various systems which have been proposed to perform experiments on analogue Hawking radiation, water waves seem to be particularly promising. Being classical, they do not require working at low temperature. Moreover, the possibility to obtain analogue horizons in a subsonic flow should in principle make it easier to obtain a stable coniguration, although important experimental difficulties remain. In this talk, I will briefly review the theoretical description of water waves on ideal background flows. I will then present numerical results showing the regime in which the spectrum is Planckian. Finally, I will turn to non-linear aspect and show the paths they open for future experiments.