Minicolloque n° 10 **X Oral** **☐ Poster**

Non-linear Processes and Stimulated Hawking Radiation in Hydrodynamics for Decelerating Sub-critical Flows

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In [1] the authors have ``*conducted experiments in order to verify the thermal nature of the stimulated Hawking process at a white hole horizon in a fluid analogue gravity system*" namely the linear mode conversion giving rise to negative energy waves *i.e.* the classical ingredient at the root of the Hawking effect in astrophysics. However, here we show that these experiments in Vancouver operated in a non-linear regime that obscure them as was the case for the seminal experiments in Nice [2]. We finally shed light on these matters by demonstrating that the linear conversion of water waves on a counter-current takes place with or without dispersive white hole horizon as anticipated in the Nice experiment no matter the frequency is conserved within the entire process provided the absence of wave breaking during the wave-current interaction. The main novelty is the role of free harmonics generation in the interpretation of both Nice and Vancouver experiments. Unfortunately, the thermality of the spectrum is not demonstrated either in the Vancouver experiments or its Poitiers reproduction.

[1] S. Weinfurtner, E. W. Tedford, M. C. J. Penrice, W. G. Unruh and G. A. Lawrence, Measurement of Stimulated Hawking Emission in an Analogue System, Phys. Rev. Lett., 106, 021302 (2011)

[2] G. Rousseaux, C. Mathis, P. Maïssa, P. Coullet, T. G. Philbin and U. Leonhardt, Observation of negative phase velocity waves in a water tank: A classical analogue to the Hawking effect?, New J. Phys., 10, 053015 (2008)

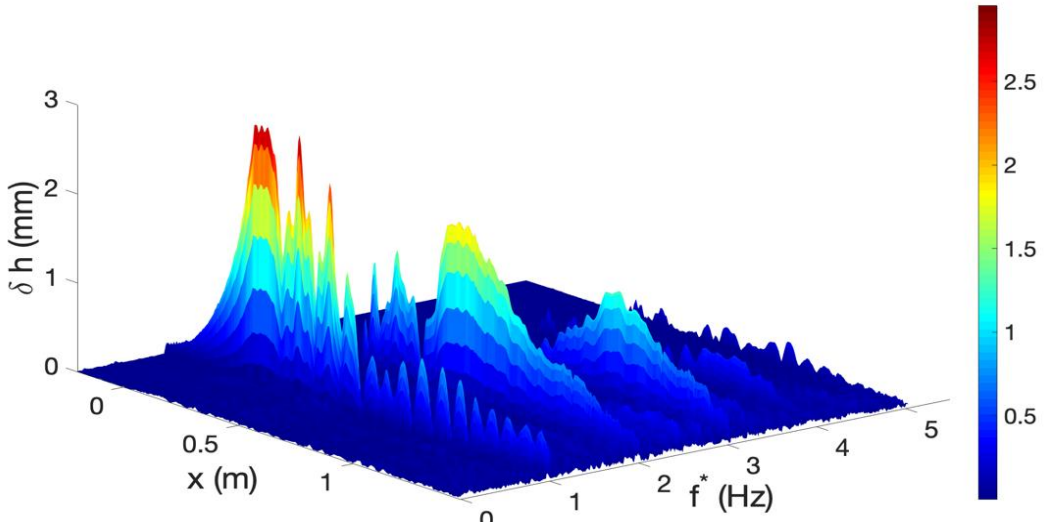

Figure 1: Harmonics generation in wave-current interaction: a 3D plot of the wave amplitudes as a function of the position x along the water channel and reduced frequencies f* (frequency of the wave divided by the wave-maker frequency).