

Labex INTERACTIFS (<https://labex-interactifs.pprime.fr/>)

2023 Projet Proposition d'un module de cours à destination des doctorants

I. Informations générales :

Employeur de l'intervenant <i>Employer</i>	☐ UP ☐ ENSMA ☒ CNRS
TITRE du cours en français <i>French title</i>	PHÉNOMÈNES DE LA GRAVITATION ANALOGUE EN HYDRODYNAMIQUE INTERFACIALE
TITRE du cours en anglais <i>English title</i>	ANALOGUE GRAVITY PHENOMENA IN INTERFACIAL HYDRODYNAMICS
Adéquation avec les thèmes du Labex <i>Adequacy with Labex Research project topics</i>	☐ 1 - COUPLAGE ENTRE LES MATÉRIAUX ET DES CONDITIONS SPÉCIFIQUES D'ENVIRONNEMENT ☐ 2 - FONCTIONNALISATION DES SURFACES ☐ 3- FLUIDES ET PHÉNOMÈNES ÉLECTRIQUES AUX INTERFACES
Enseignant <i>Teacher</i>	Nom : Robertson Prénom : Scott Tel : 05 49 49 69 30 Email : scott.james.robertson@univ-poitiers.fr
Modalités <i>Terms and conditions</i>	Date limite de candidature : Envoi du formulaire à l'adresse : labex.interactifs@univ-poitiers.fr Prendre contact avec les responsables de thèmes: Cf tableau ci dessous*

II. Brève description du cours proposé, objectifs et plan

This course will continue from the base established in a previous course, "Theoretical Introduction to Analogue Gravity in Interfacial Hydrodynamics". In that course, the description of surface wave propagation using an effective field theory and the analogy between inhomogeneous flows and curved spacetimes was established. Some key concepts, particularly the existence of negative-energy waves in supercritical regions, were introduced, and finally the analogue of the Hawking effect as an instance of anomalous scattering was derived.

In this course, we will aim to consolidate the concepts and further explore their consequences. The idea will be to focus on three Analogue Gravity phenomena as applications of the formalism. These are: 1) the Hawking effect, which will be re-derived as a form of review, with a more complete discussion of its meaning and its implications; 2) super-radiance, which is similar to the Hawking effect but which occurs specifically in rotating flows and is related to the existence of an ergoregion rather than a horizon; and 3) the "black hole laser" effect, which occurs when waves are trapped between two horizons via conversion to dispersive waves, and where they undergo continual amplification via partial conversion to negative-energy waves, leading to a dynamical instability. We will also review the main experimental studies of each phenomenon performed so far, with emphasis (where applicable) on water wave systems.

III. Calendrier

Jours	Horaire	Salle
04/04/25	10h-12h	175/177 H2 Futuroscope
11/04/25	10h-12h	175/177 H2 Futuroscope
17/04/25	14h-16h	175/177 H2 Futuroscope
07/05/25	10h-12h	175/177 H2 Futuroscope
16/05/25	10h-12h	175/177 H2 Futuroscope
23/05/25	10h-12h	175/177 H2 Futuroscope

Pour la **Salle** nous nous occupons de faire les réservations. Mais vous pouvez, si vous le souhaitez, le faire vous-même.