

# PHYSICAL MATH SEMINAR

## Echoes Between Horizons: Direct Observation of Hawking Radiation from an Aquatic Analogue



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### **ABSTRACT:**

Hawking radiation is commonly discussed in the context of black holes, but at a deeper level it reflects a universal wave phenomenon: the conversion of modes at a causal horizon in a non-uniform, out-of-equilibrium medium. Such mode conversion processes occur across many areas of physics, from classical fluids and superfluids to nonlinear optics and photonics, yet they are rarely accessible in real space and time.

In this presentation, we report for our experimental realization of a controlled horizon pair in a flowing water system and direct observation of a horizon-induced mode conversion between branches of opposite norm. Using spatio-temporal diagnostics, we visualize the scattering process itself and identify correlated Hawking and partner modes, supported by qualitative agreement with dispersive simulations. Extra Physics is also observed due to the specifics of our experimental platform. The broader significance of this work lies in its demonstration that concepts originally developed in quantum field theory on curved spacetime provide a unifying framework for understanding wave dynamics in dispersive and driven systems. By making this connection experimentally explicit, our results bridge gravitational physics and the general theory of waves far from equilibrium.

This presentation is a joint work with Alexis Bossard (Poitiers University), Ludivine Goncalves (CNRS and Poitiers University) and Scott Robertson (CNRS).

**Tuesday, March 31, 2026**

**2:30 PM – 3:30 PM**

**MIT Building 2, Room 449**