

# Analogie cosmo/gravity workshop @ LKB

## 8<sup>th</sup> – 9<sup>th</sup> Nov 2023

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Laboratoire Kastler Brossel, Paris

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Pprime institute, Poitiers



GDR COPHY – Lyon 21/05/2024

1.5 day workshop @LKB, Jussieu, Paris  
23 participants from 11 French institutions  
12 oral presentations  
(incl. 5 PhD students)  
Mix of “analogue people” and cosmologists  
State-of-the-art in cosmology by Jérôme Martin



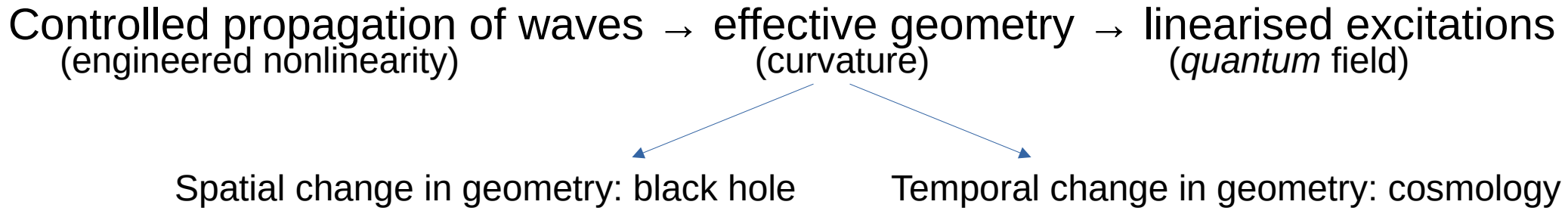
workshop webpage 

The propagation of waves in nonlinear media may be controlled to engineer situations where the waves propagate as though they were on a curved spacetime, like around a black hole or in an inflating universe. This enables the experimental simulation of field theories on curved spacetime.

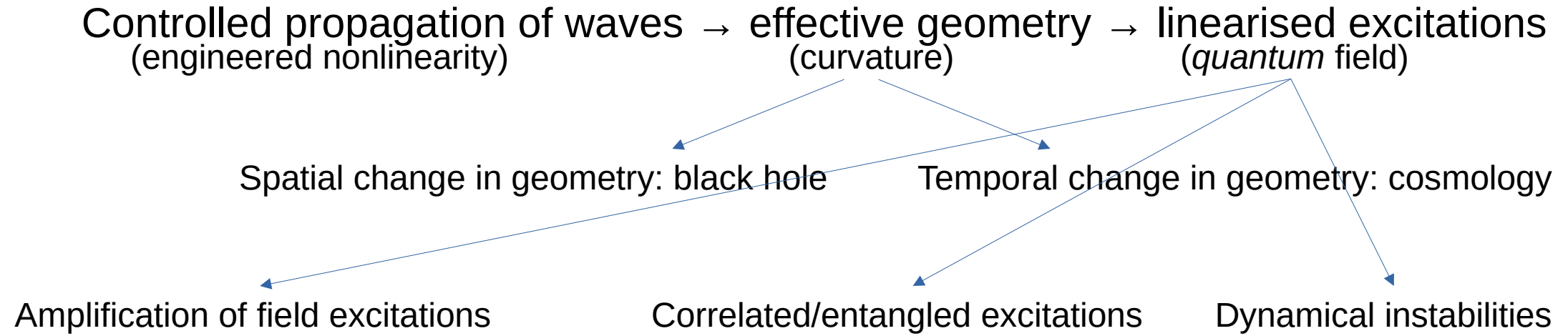
The **propagation of waves in nonlinear media** may be controlled to engineer situations where the waves propagate as though they were on an **effectively curved geometry**, like around a black hole or in an inflating universe. This enables the **experimental study of field theories** on curved geometries.

Controlled propagation of waves  
(engineered nonlinearity) → effective geometry  
(curvature) → linearised excitations  
(quantum field)

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Theory @ Clermont-Ferrand – Dmitry Solnyshkov and Guillaume Malpuech

Theory @ LPTMS Saclay – Nicolas Pavloff

Theory @ Pprime Poitiers – Scott Robertson (CNRS Chair)

Theory @ Lille – Michael Baudoin

Theory @ Nancy – Sébastien Fumeron

Experiments @ Pprime Poitiers – Germain Rousseaux, classical fluids

Experiments @ Inst. Opt., Paris Saclay – Chris Westbrook, quantum fluids

Experiments @ LKB, Paris – Alberto Bramati, quantum fluids

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Experiments @ LKB, Paris – Alberto Bramati, quantum fluids (**SIRTEQ 2022, CNRS 2023**)



- **Experiments:**

- Pprime Poitiers: “horizon laser” – two horizon interactions
- Inst. Opt. Paris Saclay: “preheating” – parametric resonance
- LKB, Paris: Hawking effect and superradiance – interactions between horizon and ergosurface

- **Publications in 2023 – 2024:**

- Experiments: [Rousseaux](#) 2307.11022 “horizon laser”, [LKB](#) 2311.01392 “Hawking effect”
- Theory: [Robertson](#) PRB **106** 214528 “Preheating”, [LKB](#) 2310.16031 (acc. @PRD) “superradiance”, [LKB](#) EPJH **48** 15 “Review”, [LKB](#) PRL **130** 111501 “Hawking effect”, [Pavloff](#) 2402.16497 “Hawking effect”
- Upcoming Comptes-Rendus Académie des Sciences
- Cover articles in wide-audience media, etc.





Winter school in analogue gravity/cosmology in Benasque: 7<sup>th</sup> – 17<sup>th</sup> January 2026!