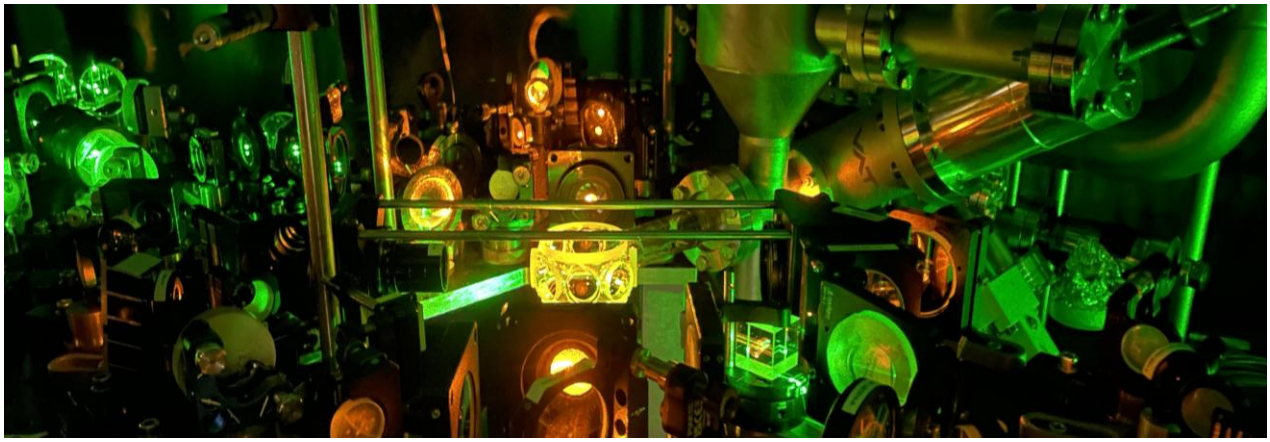
QFIELBS: Quantum fields in and out of equilibrium via spinor Bose-Einstein condensates

Tabletop Universes: Exploring Quantum Field Theories with Ultracold Atoms

2026, November 18 – 14:00, Room A103 – Polo Ferrari 1



Prof. Gabriele Ferrari

Department of Physics, University of Trento & Pitaevskii BEC Center

Abstract

Our understanding of the physical world relies on field theories, from General Relativity to the Standard Model. Despite their success, many open questions remain, particularly concerning quantum field dynamics far from equilibrium. A paradigmatic example is False Vacuum Decay (FVD), a non-perturbative process describing the relaxation of a system from a metastable vacuum to a more stable one. Its dynamics is relevant across several fields, from cosmology to particle physics, and involves phenomena such as entanglement generation and topological defect formation. Although theoretical models have provided important insights, experimental observations remain scarce. In this talk, I will present how the Quantum Gas Laboratory aims to experimentally investigate FVD and other challenging quantum field theories, including confinement physics, using ultracold atomic spin mixtures. These systems offer a versatile platform to explore quantum field dynamics in both perturbative and non-perturbative regimes.

Free admission subject to availability.

This project has received funding by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them (ERC-2024-ADG - QFIELBS - GA 101199451).