

**FZU**Institute of Physics
of the Czech
Academy of Sciences

Invitation

to the seminar of Division of Elementary Particle Physics of the
Institute of Physics of the Czech Academy of Sciences

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FZU - Institute of Physics of the Czech
Academy of Sciences

Probing Dark Energy with Black Holes

Abstract: The current acceleration of the Universe is driven by Dark Energy, a mysterious fluid with exotic properties that makes up most of the energy in the cosmos. Under the assumption that a dynamical scalar field is responsible for it, we explore the possibility of probing its physics in black hole merger processes with gravitational-wave interferometers. Remaining agnostic about the microscopic physics, an effective field theory approach is used to describe the scalar dynamics. We investigate the case in which some of the higher derivative operators, that are highly suppressed on cosmological scales, instead become important on typical distances for black holes. Under certain conditions, a non-trivial background profile for the scalar field can be sourced in the surroundings of the black hole, even in the absence of a direct coupling of matter to the scalar field, resulting in a potentially large amount of "hair". In turn, this can induce sizeable modifications to the spacetime geometry or a mixing between the scalar and the gravitational perturbations, leaving an imprint on the gravitational waves produced during the merger process which could be detectable. The presence of deviations from the predictions of General Relativity in current and/or future gravitational-wave observations can therefore serve as a window onto Dark Energy physics.

When: Thursday, November 20, 2025 at 2PM

Where: Dvořák hall, FZU, Pod Vodárenskou věží 1, Prague

For more information, please see <https://indico.fzu.cz/event/316/>