Université Paris-Saclay
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Séminaire de Physique Nucléaire Théorique

Neutrinoless double-beta decay and how to probe it with other observables

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Neutrinoless double-beta decay is a hypothetical weak-interaction process in which two neutrons inside an atomic nucleus simultaneously transform into protons and only two electrons are emitted. Since the electrons are emitted without accompanying antiparticles, the process violates the lepton-number conservation and requires that neutrinos are Majorana particles, hence providing unique vistas in the physics beyond the Standard Model of particle physics. The potential to discover new physics drives ambitious experimental searches around the world. However, extracting interesting physics from the experiments relies on nuclear-theory predictions, which remain a major obstacle.

I will talk about two approaches to tackle this problem. First, I will discuss recent effective-field-theory corrections to the operators and their effect on the theory predictions based on phenomenological nuclear many-body methods. Then, I will discuss alternative ways to probe neutrinoless double-beta decay by using data on other nuclear observables. In particular, I will focus on first-principles calculations of muon capture in light nuclei, which have the potential to shed light on the high-momentum-exchange interactions driving neutrinoless double-beta decay.

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