

PerAPS MERCOLEDÌ 2025 5 NOVEMBRE



A.D. 1308

unipg

DIPARTIMENTO
DI FISICA E GEOLOGIA



ORE 15:00 - AULA A

The QCD Axion A Fresh Theoretical Perspective The Good, the Bad, and the Experimental Federico Mescia



The established theory of strong interactions, Quantum Chromodynamics (QCD), lacks a convincing explanation for why it does not measurably violate charge-parity (CP) symmetry. An elegant solution to this conundrum, proposed by Roberto Peccei and Helen Quinn, predicts the existence of a new particle: the axion.

Although axions have been the subject of experimental searches since their theoretical introduction, recent years have witnessed a surge in global interest in this field. After reviewing the axion-based solution to the strong-CP problem and the current experimental progress in axion searches, I will delve into some recent advancements in axion model building —highlighting the good, the bad, and the ugly—that challenge conventional assumptions and significantly expand the viable parameter space for the QCD axion. These insights carry important implications for astrophysical constraints and the design of future detection strategies. In particular, I will discuss the new generation of axion searches scheduled at the National Laboratories of Frascati (LNF), such as the QUAX experiment, which employs haloscopes to detect axions through their coupling to photons or electrons, and the FLASH experiment, which aims to explore the mass range of cosmic axions using a superconducting magnet from the FINUDA experiment.