Contribution ID: **13** Type: **not specified**

The Dawn of Nuclear Supremacy: First Bounds on Ultralight Dark Matter from the Thorium Isomer Transition

Wednesday 23 April 2025 17:16 (22 minutes)

The recent laser excitation of the low-lying Th-229 isomer transition is starting a revolution in ultralight dark matter searches. The enhanced sensitivity of this transition to the large class of dark matter models dominantly coupling to quarks and gluons will ultimately allow us to probe coupling strengths eight orders of magnitude smaller than the current bounds from optical atomic clocks, which are mainly sensitive to dark matter couplings to electrons and photons. We argue that, with increasing precision, observations of the Th-229 excitation spectrum will soon give world-leading constraints. Using data from the pioneering laser excitation of Th-229 by Tiedau et al. [Phys. Rev. Lett. 132, 182501 (2024)], we present a first dark matter search in the excitation spectrum. While the exclusion limits of our detailed study of the lineshape are still below the sensitivity of currently operating clock experiments, we project the measurement of Zhang et al. [Phys. Rev. Lett. 133, 013201 (2024)] to surpass it.

Author: Dr MADGE PIMENTEL, Eric (IFT-UAM/CSIC)

Presenter: Dr MADGE PIMENTEL, Eric (IFT-UAM/CSIC)

Session Classification: Early universe

Track Classification: Plenary talk