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Robust bounds on ALP dark matter from dwarf spheroidal galaxies in the optical MUSE-Faint survey

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Nearby dwarf spheroidal galaxies are ideal targets in the search for indirect dark matter (DM) signals. In this work, we analyze MUSE spectroscopic observations of a sample of five galaxies, composed of both classical and ultra-faint dwarf spheroidals. The goal is to search for radiative decays of axion-like particles (ALPs) in the mass range of 2.7-5.3 eV. After taking into account the uncertainties associated with the DM spatial distribution in the galaxies, we derive robust bounds on the effective ALP-two-photon coupling. They lie well below the QCD axion band and are significantly more constraining than limits from other probes, in the relevant mass range. We also test the possible presence of a positive signal, concluding that none of the channels selected for this analysis, i.e., not affected by large background contamination, is exhibiting such evidence.

Auteur principal: TODARELLO, Elisa Maria (Turin University)

Orateur: TODARELLO, Elisa Maria (Turin University)

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