

Phenomenology 2021 Symposium



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An even lighter QCD axion

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We explore whether the axion which solves the strong CP problem can naturally be much lighter than the canonical QCD axion. The Z_N symmetry proposed by Hook, with N mirror and degenerate worlds coexisting in Nature and linked by the axion field, is considered and the associated phenomenology is studied in detail. On a second step, we show that dark matter can be accounted for by this extremely light axion. This includes the first proposal of a “fuzzy dark matter” QCD axion. A novel misalignment mechanism occurs – trapped misalignment– due to the peculiar temperature dependence of the Z_N axion potential, which in some cases can also dynamically source the recently proposed kinetic misalignment mechanism.

The resulting universal enhancement of all axion interactions relative to those of the canonical QCD axion has a strong impact on the prospects of ALP experiments such as ALPS II, IAXO and many others. For instance, even Phase I of Casper Electric could discover this axion.

Based on 2102.00012 and 2102.01082.

Summary

Primary authors: Dr QUILEZ LASANTA, Pablo (DESY); RINGWALD, Andreas (Deutsches Elektronen-Synchrotron DESY); GAVELA LEGAZPI, Belen (Universidad Autonoma de Madrid (ES)); DI LUZIO, Luca (Deutsches Elektronen-Synchrotron DESY)

Presenter: Dr QUILEZ LASANTA, Pablo (DESY)

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