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(I) The Axiverse of Dark QCD

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Axions and axion-like particles (ALPs) are a prominent dark matter candidate, drawing motivation in part from the axiverse of string theory. However, the string axiverse is not the only game in town: In this talk I will discuss axion-like particles that emerge as pions of a QCD-like dark sector. In a dark Standard Model (SM) wherein all 6 quark flavours are light while the photon is massive —one finds a rich low-energy spectrum of stable ultralight particles, in the form of neutral and charged dark pions, and complex neutral scalars analogous to the SM kaon, with mass splittings determined by the mass and charge of the dark quarks. Dark matter can be a mixture of all these ultralight bosonic degrees of freedom, and exhibit both parity-even and parity-odd interactions, making the theory testable at a wide variety of experiments. In context of dark QCD with N_f flavours of light quarks, this scenario predicts $N_f^2 - 1$ ultralight axion-like particles —effectively an axiverse from dark QCD. This axiverse is consistent with but makes no recourse to string theory. Accounting for the full spectrum of the theory, it can also include a superheavy (“WIMPzilla”) dark matter component, whose mass is connected to the axiverse by the confinement scale of the dark QCD.

Keyword-1

axions

Keyword-2

dark matter

Keyword-3

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