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Expanding the Axion Field Range via Mixings

Monday 4 May 2015 15:45 (15 minutes)

In this talk, we will propose a mechanism to widen the axion field range in theories where the intrinsic axion field range is limited. We will point out that kinetic and Stueckelberg mixings that are generically present in the low energy effective action of axions can significantly widen the window of axion decay constants. We will show that an effective super-Planckian decay constant can be obtained even when the axion kinetic matrix has only sub-Planckian entries. In contrast to previous approaches, the axion field range enhancement is not tied to the number of degrees of freedom in the theory, and thus a 2-axion system with a single $U(1)$ gauge field and a single gauge instanton serves as a minimal setup to achieve a super-Planckian excursion. We will also see a desired axion decay constant within the range of axion dark matter window can be obtained by tuning the continuous parameters that control the amount of mixings. Finally we will briefly discuss how to implement our mechanism in string theory.

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