

SYNERGIES TOWARDS THE FUTURE STANDARD MODEL

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A weak effective theory approach to probing ALPs in B-decays

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Rare decays like $B \rightarrow Ka$ offer a sensitive window to search for axion-like particles (ALPs), especially for heavier ALPs with masses in the range of MeV to a few GeV. We present a detailed study of these decays within the framework of weak effective theory. We show that to consistently include ALPs in this framework, one must extend the usual set of effective operators by introducing new ones. We focus on the case where ALP couplings to SM fermions are flavor-diagonal, so that flavor-changing effects are induced through effective weak interactions. We explore how this setup affects bounds on ALP couplings and compare it to scenarios where ALPs have explicit flavor-changing interactions: first in a model-independent way, and then by studying how the picture changes when the low-energy couplings are generated from UV models with flavor-universal ALP couplings at the high energy scale.

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