

# ALP-EFTs for additionally gauged $U(1)$ symmetries

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We construct an effective theory (EFT) of an axion-like particle (ALP) for an additionally gauged  $U(1)$  symmetry. The  $Z'$  is associated to a global current of the Standard Model (SM), such as baryon ( $B$ ) or lepton ( $L_i$ ) numbers. In order to fulfill anomaly conditions as well as a trace condition, new fermions have to be introduced. Integrating out these fermions induces a kinetic mixing between the  $\gamma$ ,  $Z$  and  $Z'$  bosons as well as the operators in the ALP-EFT. The matching conditions for the corresponding Wilson coefficients are determined by general calculations in which we allow all couplings to be flavor violating. We find new operators which are not covered by standard ALP-EFTs.

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