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ALP contribution to the Strong CP problem

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We compute the one-loop contribution to the $\bar{\theta}$ -parameter of an axion-like particle (ALP) with CP-odd derivative couplings. Its contribution to the neutron electric dipole moment is shown to be orders of magnitude larger than that stemming from the one-loop ALP contributions to the up- and down-quark electric and chromoelectric dipole moments. This strongly improves existing bounds on ALP-fermion CP-odd interactions, and also sets limits on previously unconstrained couplings. The case of a general singlet scalar is analyzed as well. In addition, we explore how the bounds are modified in the presence of a Peccei-Quinn symmetry.

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