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Renormalization of CP-violating nuclear forces

Electric dipole moments of nuclei, diamagnetic atoms, and certain molecules are induced by CP-violating nuclear forces. Naive dimensional analysis predicts these forces to be dominated by long-range one-pionexchange processes with short-range forces entering only at next-to-next-to-leading order in the chiral expansion. Based on renormalization arguments we argue that a consistent picture of CP-violating nuclear forces requires a leading-order short-distance operator contributing to 1S0 - 3P0 transitions due to the attractive and singular nature of the strong tensor force in the 3P0 channel. The short-distance operator leads to O(1) corrections to static and oscillating, relevant for axion searches, electric dipole moments. We discuss strategies how the finite part of the associated low-energy constant can be determined in the case of CP violation from the QCD θ^- term by the connection to charge-symmetry violation in nuclear systems.

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