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The electron-EDM in the decoupling limit of the aligned 2HDM

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We discuss model-independent contributions to the electron-EDM, focusing on those contributions emerging from a heavy scalar sector linearly realized. To provide a concrete new physics realization, we investigate the aligned 2HDM in the decoupling limit. We point out that logarithmically enhanced contributions generated from Barr-Zee diagrams with a fermion loop are present in the aligned 2HDM, an effect encoded in the decoupling limit by effective operators of dimension-6, through the mixing of four-fermion into dipole operators. The same large logarithms are absent in alternative 2HDMs where a Z_2 symmetry is enforced, which thus controls the basis of effective operators relevant for calculating new physics contributions to EDMs. In the aligned 2HDM these contributions are proportional to sources of CP violation that are potentially large, which are absent in presence of the Z_2 symmetry. We also discuss the role of non-dipole contact interactions in setting phenomenological constraints on the allowed amount of CP violation.

Abstract

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