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CP-Violating Invariants in the SMEFT

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In the Standard Model, CP violation in the Electroweak sector is parametrized by the Jarlskog Invariant. This is the flavor invariant sensitive to CP violation with the least number of Yukawa matrices that can be built. When higher dimensional operators are allowed, and the Standard Model Effective Field Theory is constructed, numerous new sources for CP violation can appear. However, the description of CP violation as a collective effect, present in the SM, is inherited by its Effective extension. Here, I will discuss how such a behaviour can be consistently captured, at dimension 6, by flavor invariant, CP violating objects, linear in the Wilson coefficients. Such a description ensures that CP violation in the SMEFT is treated in a basis independent manner. In particular, I claim these are the objects that have to vanish, together with the SM Jarlskog Invariant, for CP to be conserved, and viceversa. The scaling properties of these invariants demonstrates that, while CP is not an accidental symmetry of the Standard Model, its breaking is accidentally small at the renormalizable level. Implications for specific flavor models, such as MFV, will be addressed.

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