

Small Instanton-induced Flavor Invariants and the Axion Potential

vendredi 9 août 2024 13:30 (20 minutes)

Small instantons which increase the axion mass due to an appropriate modification of QCD at a high energy scale, can also enhance the effect of CP-violating operators to shift the axion potential minimum by an amount induced- θ , which is severely constrained by neutron electric dipole moment experiments. In this talk, focusing on the dimension-six CP-odd operators in the Standard Model Effective Field Theory (SMEFT), we will introduce a new set of determinant-like flavor invariants that naturally arise in the instanton computation of the quantity induced- θ . We will show that these flavor invariants are useful for anticipating how CP-violating SMEFT operators participate in the instanton computations and for classifying the leading effects from the Wilson coefficients. More generally, the flavor invariants, together with an instanton Naive Dimensional Analysis, can be used to more accurately estimate small instanton effects in the axion potential that arise from any SMEFT operator and to conveniently probe the impact of different flavor assumptions on the bounds obtained from induced- θ . Eventually, we will present our recent development on the shift-breaking interactions between axions and SM particles generated by small instanton dynamics. Reference: arXiv: 2402.09361 (<https://arxiv.org/abs/2402.09361>)

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