Contribution ID: **107**   Type: **not specified**

Solution to Axion Quality Problem by Non-Minimal Gravitational Coupling

Wednesday 28 June 2023 14:20 (20 minutes)

It is expected that any global symmetry is explicitly violated by gravity. In QCD axion models the effective axion potential obtains other terms than QCD contributions due to gravitational violation of the global U(1) Peccei-Quinn (PQ) symmetry and the minimum of the potential is deviated from the CP-conserving points. In general the deviation is large enough to invalidate the PQ solution to the strong CP problem. This is called ?quality problem?. In this talk assuming that the axionic wormhole is the only source of gravitational violation of the PQ symmetry we discuss a novel solution to the quality problem in which a non-minimal gravitational coupling is introduced to suppress the gravitational violation. Moreover we show that the condition to avoid the quality problem is different between the metric and the Palatini formulations.

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Session Classification: Parallel

Track Classification: Formal/strings