



Contribution ID: 70

Type: **Contributed Oral**

Axion Quality, Clockwork & Extra Dimensions

Monday 1 December 2025 11:45 (15 minutes)

The Strong CP Problem can be solved elegantly and economically by introducing a spontaneously broken, anomalous, global Peccei-Quinn (PQ) symmetry, whose Goldstone boson - the axion - dynamically cancels out the CP-violating phase. However, the global-symmetry-breaking corrections expected to arise from quantum gravity can threaten this perfect cancellation, and need to be either enormously suppressed or otherwise forbidden. In this research, we focus on the former approach, asking: what sorts of axion models can provide a sufficient dynamical suppression of axion-gravity couplings in the effective theory? Rather strikingly, we prove a no-go theorem which rules out any 3+1D model where PQ symmetry arises residually from the spontaneous breaking of some larger (compact, connected) symmetry group. As a relevant application of this result, we explore how the so-called clockwork mechanism, which exponentially localises the axion field to tune certain couplings, fails to provide any relative suppression of quantum gravity corrections. Inspired by the deconstructive interpretation of clockwork, we also provide some clarity on the situation in 4+1D, where additional topological structure and spacetime curvature may offer a way past our 3+1D result.

Author: BEOCANIN, Marko (University of New South Wales)

Co-author: SCHMIDT, Michael (UNSW Sydney)

Presenter: BEOCANIN, Marko (University of New South Wales)

Session Classification: Theoretical Physics

Track Classification: Topical Groups: Theoretical Physics