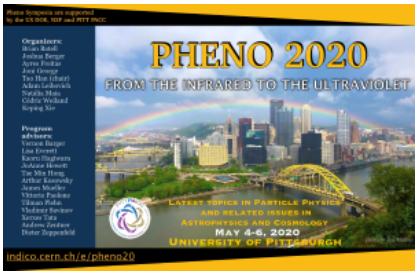

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Dynamical axion misalignment with small instantons

Tuesday 5 May 2020 17:30 (15 minutes)

We present a new mechanism to relax the initial misalignment angle of the QCD axion and raise the cosmological bound on the axion decay constant. The QCD axion receives a contribution from small UV instantons during inflation, which raises its mass to the inflationary Hubble scale. This makes the axion start rolling down its potential early on. In the scenario, the standard model Yukawa couplings of quarks are dynamical, being of order one during the inflationary era and reducing to their standard model values once it ends. This means that after inflation the contribution of the small instantons is suppressed, and the axion potential reduces to the standard one from the usual IR instantons. As a result, when the axion starts to oscillate again after inflation, the initial misalignment angle is suppressed due to the dynamics during inflation. While the general idea of dynamical axion misalignment has been discussed in the literature before, we present in detail the major bottleneck on the mismatching between the minima of the axion potentials during and after inflation, and how it is circumvented in our scenario via the Froggatt-Nielsen mechanism. Taking into account of all the constraints, we find that the axion decay constant could be raised to the GUT scale, 10^{15} GeV, in our scenario.

Summary

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