

# Phenomenology 2021 Symposium



Contribution ID: 1189

Type: Axions & ALPs

## Challenges for an axion explanation of the muon $g-2$ measurement

Monday, 24 May 2021 17:15 (15 minutes)

The discrepancy between the muon  $g-2$  measurement and the Standard Model prediction points to new physics around or below the weak scale. It is tantalizing to consider the loop effects of a heavy axion (in the general sense, also known as an axion-like particle) coupling to leptons and photons as an explanation for this discrepancy. We provide an updated analysis of the necessary couplings, including two-loop contributions, and find that the new physics operators point to an axion decay constant on the order of 10s of GeV. This poses major problems for such an explanation, as the axion couplings to leptons and photons must be generated at low scales. We outline some possibilities for how such couplings can arise, and find that these scenarios predict new charged matter at or below the weak scale and new scalars can mix with the Higgs boson, raising numerous phenomenological challenges. These scenarios also all predict additional contributions to the muon  $g-2$  itself, calling the initial application of the axion effective theory into question. We conclude that there is little reason to favor an axion explanation of the muon  $g-2$  measurement relative to other models postulating new weak-scale matter.

### Summary

**Primary authors:** BUEN-ABAD, Manuel (Brown University); FAN, JiJi (Brown University); REECE, Matthew (Harvard University); Dr SUN, Chen (Brown University/ CAS-ITP)

**Presenter:** Dr SUN, Chen (Brown University/ CAS-ITP)

**Session Classification:** Axions & ALPs II