

## **Novel cosmological bounds on thermally-produced axion-like particles**

*Wednesday, September 28, 2022 5:30 PM (20 minutes)*

Cosmological observations represent a powerful probe to test the presence of new light species beyond the Standard Model (SM) of particle physics. In this talk I will focus on thermal axion-like particles (which I will simply refer to as axions), that can arise from various extensions of the SM and include, as a special case, the QCD axion. Thermal axions can be produced in the early Universe from scatterings involving particles belonging to the primordial thermal bath, at temperatures much larger than the axion mass (i.e., when axions are relativistic). Considering both the possibilities that axions are produced via axion-photon or axion-gluon processes, I will show and discuss the constraints on the axion couplings obtained using the latest CMB and BAO data. The bounds on the axion-gluon coupling are the most stringent ones in the mass range considered ( $10^{-4} - 100$  eV). The constraints on the axion-photon coupling are competitive with the results from the CAST collaboration for axion masses larger than 3 eV. Finally, I will briefly comment on the forecast reaches that will be available given the sensitivity of future CMB-S4 missions.

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