

A CMB Millikan experiment with cosmic axiverse strings

Thursday 25 June 2020 16:00 (1 hour)

Zoom meeting: <https://cern.zoom.us/j/7930190483> (password: see email)

Format: 40 minutes talk + 20 min discussion

Virtual Axion Institute: The discussion on this talk can be continued in Anson's virtual guest office. <https://mattermost.web.cern.ch/axions/channels/anson-hook>

Abstract: We study axion strings of hyperlight axions coupled to photons. These axions strings produce a distinct quantized polarization rotation of CMB photons which is $O(1\%)$. As the CMB light passes many strings, this polarization rotation converts E-modes to B-modes and adds up like a random walk. Using numerical simulations we show that the expected size of the final result is well within the reach of current and future CMB experiments through the measurement of correlations of CMB B-modes with E- and T-modes. The quantized polarization rotation angle is topological in nature and its value depends only on the anomaly coefficient, independent of other details such as the axion decay constant. Measurement of the anomaly coefficient provides information about the UV theory, such as the quantization of electric charge and the value of the fundamental unit of charge. The presence of axion strings in the universe relies only on a phase transition in the early universe after inflation, after which the string network rapidly approaches an attractor scaling solution. The existence of these strings could also be probed by measuring the relative polarization rotation angle between different images in gravitationally lensed quasar systems.

Presenter: HOOK, Anson (University of Maryland)

Session Classification: Naturalness