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Current Status of ALPHA's Search for Dark Matter Axions Between 10-20GHz

Haloscopes are experiments searching for QCD axions, one of the most compelling dark matter candidates due to their ability to solve the strong CP problem. Haloscopes consist of a tunable cavity resonator in a strong B-field. The B-field couples with the axion field, producing a signal photon that is resonantly enhanced by the cavity. Post-inflationary QCD axion searches are challenged by the frequency-volume scaling of traditional microwave cavities, requiring small cavities resulting in degraded signal power. The Axion Longitudinal Plasma Haloscope (ALPHA), which is in the beginning phases of construction at Yale University, will search for axions in the 40 - 80μeV (10-20GHz) range using a metamaterial resonator in lieu of a traditional cavity to decouple frequency from volume. The ALPHA cavity will contain a tunable 3D-array of wires that together compose a metamaterial whose resonant "plasma frequency"is set by the relative positions of the wires, independent of volume. In this poster, I will discuss the progress that has been made towards building ALPHA at Yale, as well as the collaboration's plans for it's first data-taking run in ˜4 years.

Author: LAFFAN, Claire

Presenter: LAFFAN, Claire