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Simulations of Photonic Band Gap Resonators for HAYSTAC[1]
MIRELYS CARCANA BARBOSA, SAMANTHA M. LEWIS, KARL VAN BIBBER, University of California, Berkeley, HAYSTAC COLLABORATION — The Haloscope at Yale Sensitive to Axion CDM (HAYSTAC) searches for the axion, a promising dark matter candidate, using a microwave resonator in a magnetic field to convert the axions into detectable photons. To search for axions, we tune the detector to a specific frequency in an attempt to match the electromagnetic cavity mode with the mass of the axion. The operating mode is the TM010. However, many cavity modes are supported, leading to mode crossings that reduce our ability to collect data. As a result, the useful tuning range of the cavity is limited. We are developing a tunable Photonic Band Gap (PBG) resonator to eliminate these mode crossings. PBGs consist of rods arranged in a lattice that allow us to isolate particular modes at desired frequencies while not supporting unwanted modes. This work will provide an overview of PBG development for HAYSTAC and give an update on the testing of the prototype design.

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