

Microwave Resonator R&D in Support of the HAYSTAC Experiment

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The axion is a leading cold dark matter (CDM) candidate and may be detected by its resonant conversion to a monochromatic RF signal in a tunable microwave cavity permeated by a strong magnetic field. The Haloscope At Yale Sensitive To Axion CDM (HAYSTAC) experiment is both a test bed for innovative cavity and amplifier concepts and a data pathfinder for the 5-25 GHz range. This poster will highlight several innovations that help resolve the challenges posed by microwave cavities in the 5-25 GHz range. These include using distributed Bragg reflectors to maximize the Figure-of-Merit QC^2 in higher-harmonic cavity modes and employing photonic band gap resonators or slotted cavities to eliminate the forest of TE modes, particularly problematic in higher-harmonic mode operation at high frequencies. This work was supported by NSF Grants PHY-1306729 and PHY-1362305, and Heising-Simons Foundation Grant 2014-182. M. Simanovskaia is supported by the NSF Graduate Research Fellowship Grant DGE-1106400 and the Berkeley Fellowship.

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