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High-frequency Cavity Haloscopes for the ADMX-VERA Program

Post-inflationary axions are predicted to have m_a
$gtrsim16.5$ μeV (4 GHz), a regime where unfavorable volume scaling drastically reduces the sensitivity of conventional cavity-based haloscopes. In this talk, I present on the design and characterization of high-volume (10's of λ^3), high-frequency cavity geometries for the volume-enhanced resonating axion (VERA) program, an R&D effort of the ADMX collaboration. The *single-wedge* design is currently employed in a tabletop dark photon search projected to produce leading limits in its frequency range. A larger single-wedge cavity is currently being lapped to a tight flatness tolerance for optimal form factor, and will be used in a cryogenic search. The *triple-wedge* design, which fits efficiently in a solenoid bore but requires custom flexure stages for the relative alignment of the three wedges, is currently undergoing metrology prior to RF characterization. Finally, the *beehive* resonator will soon be studied using a specially designed metrology rig. I will also discuss the potential advantages of single photon counters over continuous-wave amplification at high frequency. To achieve greater coupling with the novel resonators, an array of slot antennas combined via passive summing tree is under development.

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