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## The Beehive Haloscope: A Strongly Coupled, Phase-Coherent Cavity Array for Axion Detection

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We present the first experimental study of the “beehive” haloscope recently proposed in [<https://arxiv.org/pdf/2404.06627>]. Extending the haloscope detection technique toward the post-inflationary mass range ( $> 4$  GHz) suffers from the  $d\nu/dt \propto \nu^{-6}$  scaling. The proposed array geometry evades the sensitivity degradation by employing an arbitrary number of overlapping cylindrical cells. Strong coupling between the cells significantly relaxes manufacturing and assembly tolerances and eliminates the need for phase-locking and readout chain proliferation inherent in other cavity array proposals. In this work, results from a first 5-7 GHz room temperature prototype will be discussed. The beehive design is part of a focused program “ADMX-VERA” that targets the cm-wavelengths. The geometry inherits many appealing properties from the conventional coaxial cavity: high  $Q$ , compatibility with a solenoid magnet, and simple tuning. This novel and yet simple design has excellent prospects of scaling up to a detector volume greater than several hundred  $\lambda^3$ .

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