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Characterization of a tunable higher-frequency cavity for HAYSTAC[1] MARIA SIMANOVSKAIA, UC Berkeley, HAYSTAC COLLABORATION — HAYSTAC [1] is a dark matter detector that searches for an axion-induced power excess spectrally coincident with the resonance of a microwave cavity immersed in a strong magnetic field. The current HAYSTAC cavity achieves frequency tunability over the 3.6 - 5.8 GHz window via its single, off-center tuning rod. Probing higher frequencies, however, introduces unique challenges. In particular, smaller volumes, lower quality factors, and higher densities of intruder modes decrease sensitivity and increase operational complexity. Through electromagnetic simulations, we found that a seven-rod design will allow HAYSTAC to probe higher axion masses while maintaining axion sensitivity greater than that of the standard single-rod design for the cavity frequency range 5.5 - 7.4 GHz. We present the characterization of this constructed seven-rod cavity. This cavity will allow HAYSTAC to probe a well-motivated frequency range [2]. [1] B. M. Brubaker et al., First Results from a Microwave Cavity Axion Search at 24 micro-eV, PRL 118, 061392 (2017). [2] V. B. Klaer and G. D. Moore, The dark-matter axion mass, JCAP 11, 049 (2017).

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Maria Simanovskaia
University of California, Berkeley

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