

Abstract Submitted  
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**First Data and Operations of HAYSTAC Phase 2, Squeezed State Receiver Run**<sup>1</sup> KELLY BACKES, Yale University — The Haloscope at Yale Sensitive to Axion Cold dark matter (HAYSTAC) [1] is the first dark matter detector to have implemented and operated a squeezed state receiver. We are now taking data with noise levels below the standard quantum limit, increasing the rate at which we can scan axion parameter space by two-fold. The squeezed state receiver [2] is comprised of two Josephson parametric amplifiers operating in a phase-sensitive mode. In this mode, the noise is "squeezed," while the axion-sensitive signal is amplified. The use of this technology brings together the fields of quantum metrology and axion dark matter in an unprecedented way. In this talk, I will give an overview of the operations of Phase 2 of the HAYSTAC experiment, focusing on the protocol we use for Phase 2 operation and the data covering 4.11 - 4.18 GHz, currently being collected and analyzed. [1] B. M. Brubaker et al, First Results from a Microwave Cavity Axion Search at 24 eV, Phys. Rev. Lett. 118, 061392 (2017). [2] M. Malnou, D. A. Palken, B. M. Brubaker, Leila R. Vale, Gene C. Hilton, and K. W. Lehnert, Squeezed Vacuum Used to Accelerate the Search for a Weak Classical Signal, Phys. Rev. X 9, 021023 (2019).

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