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Speeding up the search for axions with quantum squeezing

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The Haloscope at Yale Sensitive to Axion Cold dark matter (HAYSTAC) has now finished its first data collection run using quantum squeezed states to enhance the search for axions. The squeezed state receiver consists of two Josephson parametric amplifiers. The first squeezes vacuum noise, while the second amplifies a hypothetical axion signal against a background of squeezed noise. This protocol allows HAYSTAC to acquire data with noise levels below the standard quantum limit, increasing the rate at which we can scan axion parameter space by a factor of 2. In this talk, I will give an overview of the operations of the HAYSTAC experiment, and discuss our recent exclusion of axions in the 4.11 - 4.18 GHz range.

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