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Probing dark energy with an atom interferometer in an optical cavity MATTHEW JAFFE, PHILIPP HASLINGER, Univ of California - Berkeley, PAUL HAMILTON, Univ of California - Los Angeles, HOLGER MUELLER, Univ of California - Berkeley, JUSTIN KHOURY, BENJAMIN ELDER, Univ of Pennsylvania — If dark energy — which drives the accelerated expansion of the universe — consists of a light scalar field, it might be detectable as a "fifth force" between normal-matter objects, in potential conflict with precision tests of gravity. Chameleon fields and other theories with screening mechanisms can evade such tests by suppressing this force in regions of high density, such as the laboratory. Our experiments constrain these dark energy models using atoms in an ultrahigh-vacuum chamber[1] as probes to expose the screened fields. Using a cesium matter wave interferometer in an optical cavity, we set stringent bounds on coupling screened theories to matter[2]. A further 4 to 5 orders of magnitude would completely rule out chameleon and f(R) theories. I will describe this first tabletop dark energy search, and present the hundredfold boost in sensitivity we have since achieved. [1] – *C Burrage, E Copeland, E Hinds,* **Journal of Cosmology and Astroparticle Physics** *2015, 03* [2] – *P Hamilton, M Jaffe, P Haslinger, Q Simmons, H Müller, J Khoury*, **Science** *349, 6250 (2015)*

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