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Measurement of the temperature dependence of the Casimir-Polder force through collective excitations of a Bose-Einstein condensate¹ JOHN OBRECHT, ROBERT WILD, DAVID HARBER, COLLEEN GILLESPIE, ERIC CORNELL, JILA, NIST, UNIV. OF COLORADO DEPT. OF PHYSICS TEAM, LASP, UNIV. OF COLORADO AT BOULDER TEAM — A Rb-87 Bose-Einstein condensate is positioned microns from a dielectric surface and resonantly excited into a mechanical dipole oscillation. Changes in the collective oscillation frequency of the magnetically trapped condensate result from spatial variations in the atom-surface force [1,2]. Recent theoretical work has characterized the temperature dependence of non-equilibrium Casimir-Polder forces [3] in which the temperature of the dielectric surface is different from the temperature of free-space. In our experiment a dielectric surface is heated to 600K while the surrounding environment is kept near room temperature (310K). The magnitude of the Casimir-Polder force is measured in both this non-equilibrium configuration and also in a room temperature equilibrium configuration. Both measurements agree with theoretical predictions, marking the first demonstration of the temperature dependence of the Casimir-Polder force. [1] M. Antezza, L. P. Pitaevskii and S. Stringari, Phys. Rev. A 70, 053619 (2004). [2] D. M. Harber, J. M. Obrecht, J. M. McGuirk and E. A. Cornell, Phys. Rev. A 72, 033610 (2005). [3] M. Antezza, L. P. Pitaevskii and S. Stringari, Phys. Rev. Lett. 95, 113202 (2005).

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