

Abstract Submitted
for the APR10 Meeting of
The American Physical Society

Antimatter Gravity Experiment at Fermilab YAOFU ZHOU, Illinois Institute of Technology — While General Relativity predicts that antimatter and matter feel identical gravitational forces, this prediction has never been tested directly by experiment. The Antimatter Gravity Experiment (AGE) at Fermilab aims to make the first direct measurement of the gravitational acceleration due to the earth on antimatter, directly testing both the equivalence principle for antimatter and the prediction of General Relativity that matter and antimatter behave identically in the gravitational field of the earth. The proposal is to decelerate antiprotons in the Main Injector and transfer them into an antihydrogen-production Penning trap. The antihydrogen will emerge from the trap in a low-velocity beam. Initially this beam will be passed through an atomic Mach-Zehnder interferometer where the gravitational deflection will be measured with an expected precision of 0.01% of local gravity. In a second phase antihydrogen will be slowed and trapped using magnetic field gradients. This will enable a measurement using a laser-based Raman interferometer that has the potential to achieve an ultimate precision better than 10^{-9} of local gravity. With this precision the measurement will be sensitive to a possible “fifth force” significantly weaker than gravity.

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Date submitted: 27 Oct 2009

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