

Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Toward tests of QED and CPT with improved electron and positron g-factor measurements¹ ELISE NOVITSKI, JOSHUA CHARLES DORR, SHANNON FOGWELL HOOGERHEIDE, GERALD GABRIELSE, Harvard University — We describe progress toward improved measurements of the electron and positron g-factors using quantum jump spectroscopy between the lowest quantum states of either particle trapped in a 100 mK cylindrical Penning trap. In a new apparatus—designed for improved stability and a better geometry for cavity-assisted sideband cooling—we have trapped a single electron, driven and observed single cyclotron transitions, and trapped positrons in a loading trap. This should enable measurements of both g-factors with better than the 0.28 ppt precision of the best electron value (the most precise measurement of a fundamental property of an elementary particle), thereby improving the positron value by a factor of more than 15.^{2,3} These measurements, in combination with QED theory relating the electron g-factor to α , will improve on the most precise determination of α , the fine structure constant. The comparison of this value with an independent measurement of α is the most precise test of QED. The comparison of the e^- and e^+ g-factors will improve upon the best test of CPT symmetry in a lepton system.

¹This work is supported by the NSF

²D. Hanneke, S. Fogwell, and G. Gabrielse, PRL 100, 120801 (2008)

³R. S. Van Dyck, Jr., P. B. Schwinberg, and H. G. Dehmelt, PRL 59, 26 (1987)

Elise Novitski
Harvard University

Date submitted: 28 Jan 2013

Electronic form version 1.4