

Abstract Submitted  
for the DNP15 Meeting of  
The American Physical Society

**Precise Penning trap measurements of double  $\beta$ -decay Q-values<sup>1</sup>**

M. REDSHAW, Central Michigan University, M. BRODEUR, University of Notre Dame, G. BOLLEN, S. BUSTABAD, M. EIBACH, K. GULYUZ, C. IZZO, D.L. LINCOLN, S.J. NOVARIO, R. RINGLE, R. SANDLER, S. SCHWARZ, A.A. VALVERDE, Michigan State University — The double  $\beta$ -decay ( $\beta\beta$ -decay) Q-value, defined as the mass difference between parent and daughter atoms, is an important parameter for both two-neutrino  $\beta\beta$ -decay ( $2\nu\beta\beta$ ) and neutrinoless  $\beta\beta$ -decay ( $0\nu\beta\beta$ ) experiments. The Q-value enters into the calculation of the phase space factors, which relate the measured  $\beta\beta$ -decay half-life to the nuclear matrix element and, in the case of  $0\nu\beta\beta$ , the effective Majorana mass of the neutrino. In addition, the Q-value defines the total kinetic energy of the two electrons emitted in  $0\nu\beta\beta$ , corresponding to the location of the single peak that is the sought after signature of  $0\nu\beta\beta$ . Hence, it is essential to have a precise and accurate Q-value determination. Over the last decade, the Penning trap mass spectrometry community has made a significant effort to provide precise  $\beta\beta$ -decay Q-value determinations. Here we report on recent measurements with the Low Energy Beam and Ion Trap (LEBIT) facility at the National Superconducting Cyclotron Laboratory (NSCL) of the <sup>48</sup>Ca, <sup>82</sup>Se, and <sup>96</sup>Zr Q-values. These measurements complete the determination of  $\beta\beta$ -decay Q-values for the 11 “best” candidates (those with Q >2 MeV). We also report on a measurement of the <sup>78</sup>Kr double electron capture (2EC) Q-value and discuss ongoing Penning trap measurements relating to  $\beta\beta$ -decay and 2EC.

<sup>1</sup>Support from NSF Contract No. PHY-1102511, and DOE Grant No. 03ER-41268

Matthew Redshaw  
Central Michigan University

Date submitted: 01 Jul 2015

Electronic form version 1.4