

The Canadian Penning Trap Mass Spectrometer

J. C. Hardy and V. E. Iacob

The Canadian Penning Trap (CPT) Mass Spectrometer has now been commissioned at the Argonne National Laboratory. The CPT Mass Spectrometer is operated by a collaboration involving scientists from Argonne National Laboratory, the University of Manitoba, McGill University, and Texas A&M.

In its present configuration, the CPT can measure the masses of products of heavy-ion reactions induced by beams from the ATLAS facility on a target located upstream of an Enge split-pole spectrometer. Products recoiling out of the target pass through a quadrupole triplet and a velocity filter and then into the Enge spectrometer. This combination is intended to remove scattered beam and some reaction products, leaving the products of interest to pass through a thin window at the focal plane of the spectrometer. There, the recoils are thermalized in helium gas and transported by gas flow into a three-stage RF quadrupole structure that cools and collects the ions. From here, they are periodically ejected in pulses and transported to the CPT mass spectrometer itself. That spectrometer has been designed [1] to achieve an ultimate precision of $\Delta M/M = 10^{-9}$.

We have just begun a CPT measurement of the masses of ^{22}Mg and its daughter ^{22}Na . With these two masses, we expect to obtain the Q_{EC} -value for the superallowed Ξ -transition of ^{22}Mg to a precision of ~ 0.5 keV as part of our program to probe CKM unitarity via superallowed beta decay [2]. In this measurement, we will use the $^3\text{He} (^{20}\text{Ne}, n) ^{22}\text{Mg}$ reaction with a cooled ^3He gas target. Several technical difficulties prevented our making any mass measurement during our first scheduled beam time at Atlas. Improvements have been made and we expect to make another attempt in the summer.

References

- [1] G. Savard *et al.*, Nucl. Phys. **A626**, 353c (1997).
- [2] J. C. Hardy *et al.*, *Progress in Research, Cyclotron Institute, Texas A&M University* (2001-2002), I-21.