Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **2207** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

High-Precision Branching Ratio Measurement for the Superallowed Fermi Beta Emitter 22Mg

Wednesday 13 June 2018 14:00 (15 minutes)

High-precision measurements of the ft values for superallowed Fermi beta decays between 0^+ isobaric analogue states have provided invaluable probes of the Standard Model (SM) description of the electroweak interaction. These measurements confirm the CVC hypothesis to 1.2 parts in 10^4, set the tightest experimental limits on the existence of scalar currents in the electroweak interaction (under the assumptions of time-reversal invariance and maximum parity violation also common to vector currents), and set a strict upper limit on the existence of induced scalar currents.

To provide these stringent tests, theoretical corrections must be applied to the experimentally determined ft values obtained from precise measurements of the half-lives, branching ratios, and Q values of the decays. Of particular interest is the isospin symmetry-breaking correction (δ_C), which is model-dependent; several theoretical approaches can and have been used to calculate these corrections. In the most recent world survey of the superallowed Fermi β emitters [1] the choice of δ_C correction used depended, at least in part, almost entirely with four of the least precisely determined corrected-ft values of the well-determined cases, ^{22}Mg, ^{38}Ca, ^{62}Ga, and ^{74}Rb.

In light of this, we have performed both a half-life and branching ratio measurement for ^{22}Mg to improve the precision of the ^{22}Mg ft value by a factor of 2. These results will play a major role in discriminating between different theoretical approaches to the δ_C corrections in superallowed decays.

The goal of the experiment performed at TRIUMF's ISAC facility in 2017 using the GRIFFIN spectrometer was to measure the ^{22}Mg branching ratio to a precision of $\pm$0.15%. Taking advantage of GRIFFIN's very high γ-detection efficiency allows us to measure the branching ratio using a novel technique based on γ-γ coincidences that eliminates the need for high-precision efficiency calibrations that plagued previous measurements.

This presentation will discuss preliminary branching ratio results for ^{22}Mg as well as comparing these results to previous measurements.

[1] J.C. Hardy and I.S. Towner, Phys. Rev. C 91, 025501 (2015).

*Work supported by the Natural Sciences and Engineering Research Council of Canada and the National Research Council of Canada.

Author: LAFFOLEY, Alex (University of Guelph (CA))

Co-authors: ANDREOIU, C. (Simon Fraser University); BALL, G. C. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); BERNIER, N. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); BIDAMAN, H. (Department of Physics, University of Guelph, Guelph, Ontario); BILDSTEIN, V. (Department of Physics, University of Guelph, Guelph, Ontario); BOWRY, M. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); BURBADGE, C. (University of Guelph); Dr CABALLERO-FOLCH, R. (Triumf); DIAZ VARELA, A. (University of Guelph); DUNLOP, M. R. (University of Guelph); DUNLOP, R. (University of Guelph); GARNSWORTHY, A. B. (Physical Sciences Division,

TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); GARRETT, P. E. (Department of Physics, University of Guelph, Guelph, Ontario); HACKMAN, G. (TRIUMF); JIGMEDDORJ, B. (Department of Physics, University of Guelph, Guelph, Ontario); LEACH, K. G. (Colorado School of Mines); LESLIE, J. R. (Queen's University, Kingston, Ontario, K7L 3N6, Canada); MACLEAN, A. D. (Department of Physics, University of Guelph, Guelph, Ontario); MEASURES, J. (TRIUMF); NATZKE, C. (Colorado School of Mines); OLAIZOLA, B. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); SAITO, Y. (Physical Sciences Division, TRIUMF, 4004 Wesbrook Mall, Vancouver, British Columbia); SMITH, J. K. (Reed College); SVENSSON, C. E. (Department of Physics, University of Guelph, Guelph, Ontario); TURKO, J. (Department of Physics, University of Guelph, Guelph, Ontario); ZIDAR, T. (Department of Physics, University of Guelph, Guelph, Ontario)

Presenter: LAFFOLEY, Alex (University of Guelph (CA))

Session Classification: W3-8 Nuclear Structure II (DNP) | Structure nucléaire II (DPN)

Track Classification: Nuclear Physics / Physique nucléaire (DNP-DPN)