High-Precision Half-Life Measurement for the Superallowed $\beta^+$ Emitter $^{22}$Mg

MICHELLE DUNLOP, University of Guelph — High precision measurements of the $F_U$ values for superallowed Fermi beta transitions between $0^+$ isobaric analogue states allow for stringent tests of the electroweak interaction. These transitions provide an experimental probe of the Conserved-Vector-Current hypothesis, the most precise determination of the up-down element of the Cabibbo-Kobayashi-Maskawa matrix, and set stringent limits on the existence of scalar currents in the weak interaction. To calculate the $F_U$ values several theoretical corrections must be applied to the experimental data, some of which have large model dependent variations. Precise experimental determinations of the $f t$ values can be used to help constrain the different models. The uncertainty in the $^{22}$Mg superallowed $F_U$ value is dominated by the uncertainty in the experimental $f t$ value. The adopted half-life of $^{22}$Mg is determined from two measurements which disagree with one another, resulting in the inflation of the weighted-average half-life uncertainty by a factor of 2. The $^{22}$Mg half-life was measured with a precision of 0.02% via direct $\beta$ counting at TRIUMF’s ISAC facility, leading to an improvement in the world-average half-life by more than a factor of 3.