

Half-life of the superallowed β -emitter ^{46}V

H. I. Park, J. C. Hardy, V. E. Jacob, L. Chen, J. Goodwin, V. Horvat, N. Nica,
E. Simmons, L. Trache, and R. E. Tribble

After making concerted efforts over several years to develop a useful ^{47}Ti beam [1], we completed a successful measurement of the half-life of ^{46}V with up to 50 nA of beam in June 2009. We used the $^1\text{H}(^{47}\text{Ti}, 2n)^{46}\text{V}$ reaction at a primary beam energy of 32A MeV. Our experimental arrangement was the same as described before [1].

The main contaminant for this measurement was ^{42}Sc , another superallowed β -emitter with $t_{1/2} = 680.72$ ms, which is rather similar to the 422.50 ms half-life of ^{46}V . Because of this potentially serious problem, we carefully adjusted the distribution of implanted ^{46}V in the mylar tape by setting the thickness of Al degraders to minimize the number of ^{42}Sc ions stopping in the tape; and then we routinely measured the purity of the beam with a position-sensitive silicon detector inserted at the focal plane of the Momentum Achromat Recoil Separator (MARS) on a daily basis throughout the whole experiment. Finally, the subsequent data analysis has included a detailed impurity analysis based on the range differences among all possible impurities, including ^{42}Sc , in the collected ^{46}V samples. The amount of ^{42}Sc present in the samples relative to that of ^{46}V was determined to be 0.1%, an amount for which we can satisfactorily correct.

Approximately 95 million β events were recorded under the various combinations of different bias voltages for the 4π proportional gas counter, discriminator thresholds, and dominant dead times. Currently, we are finalizing our analysis to extract the precise half-life for ^{46}V with an associated error budget.

[1] H.I. Park *et al.*, *Progress in Research*, Cyclotron Institute, Texas A&M University (2008-2009), p. I-34.