Calibration and use of a superconducting beta spectrometer

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Our group has constructed a Wu-type superconducting beta spectrometer. This spectrometer will be used to investigate the properties of nuclear beta decay, starting with a measurement of the ^{14}O ground state spectrum. To prepare for the ^{14}O measurement, we have calibrated the spectrometer through careful examination of conversion electron spectra from ^{212}Pb and ^{207}Bi sources, and with measurements of the ^{42}K beta decay spectrum.

Additionally, we have treated the ground state beta decay of ^{66}Ga as the test case for the future ^{14}O experiment. Experiments to find the ^{66}Ga half-life, decay energy, and spectrum shape resulted in the highest precision measurements of those properties to date. In making these measurements, we have found that a high-precision measurement of the ^{14}O shape factor is possible with our spectrometer.