AbstractID: 12660 Title: Development of a coincidence detection spectrometry system to electronically filter the bremsstrahlung continuum from a ⁹⁰Y gamma spectrum

Purpose: To demonstrate the ability of a newly constructed coincidence detection spectrometry system to better resolve the 511 keV peak present in a ^{90}Y gamma spectrum due to the internal pair production (IPP) component of ^{90}Y decay by electronically filtering out the bremsstrahlung continuum. **Method and Materials:** A recently determined low-uncertainty branching ratio for the IPP component of ^{90}Y decay provides the potential to spectroscopically assay the activity of ^{90}Y by measuring the resulting 511 keV peak. However, the use of a single spectrometer to accomplish this is plagued by the presence of a large bremsstrahlung continuum. In this work, a coincidence detection system was constructed that paired a HPGe detector with a large NaI detector. A series of NIM electronics were tuned to gate the energy signal of the HPGe detector by the coincidence signal. A ^{90}Sr /^{90}Y source was measured for 4 h. The energy spectrum gated by coincidence, the non-gated energy spectrum, and the energy spectrum gated by random coincidence were all collected concurrently. Environmental background (EBG) (i.e. no source present) was measured for 12 h. Canberra Genie^{TM} 2000 software was used to analyze the spectra. **Results:** The EBG measured with the gated method was found to be negligible with no counts in the peak area. The EBG of the non-gated method was subtracted from the non-gated ^{90}Sr /^{90}Y spectrum. Genie^{TM} 2000 was used to determine the 511 keV peak area and uncertainty. The uncertainty was 1.7% for the gated spectrum and 7.9% for the non-gated spectrum. **Conclusion:** The ability of this detection system to electronically filter the bremsstrahlung continuum from the 511 keV peak-of-interest has been demonstrated. This method results in a reduced uncertainty in the peak area compared to measurement with a single detector.