Purpose: This work takes advantage of a newly-determined, low-uncertainty branching ratio of the internal pair production component of Y-90 decay to spectroscopically assay the activity of a Y-90 microsphere sample with a coincidence detection system (CDS).

Methods: The CDS pairs a HPGe detector with a large NaI detector. The system is able to electronically filter the bremsstrahlung continuum from the photon spectrum by gating the energy signal from the HPGe with the coincidence signal. This reduces the uncertainty in the spectra measurement compared to measurements with a single HPGe detector. A series of pulsers were used to correct for counting losses. A geometric characterization was completed to find the optimal source position for measurements. An efficiency calibration of the CDS was completed using a Na-22 standard source. To validate the measurement accuracy of the CDS, the activity of a Y-90 standard activity solution from the NIST SRM program was determined and compared to the value given by NIST. The CDS was then used to determine the activity of a Y-90 microsphere sample. This value was compared to the 3.0 GBq value given by the manufacturer.

Results: The activity determined with the CDS was within 2.6% from the given activity of the NIST SRM source, which is within the expanded uncertainty associated with the CDS measurement. The activity of the Y-90 microsphere sample was determined to be 3.72 GBq +/- 1.9%. This is 19% higher than the manufacturer-stated activity of 3 GBq. This is outside the manufacturer-stated uncertainty of +/-10%.

Conclusions: The ability of CDS to determine the activity of a Y-90 source has been validated with comparison to a NIST Y-90 standard activity solution. The use of the CDS has been extended to determine the activity of a Y-90 microsphere sample.