



Low-Energy Photon Emitters

A number of commonly used radionuclides emit relatively abundant characteristic x-rays (low energy peak) in addition to their principal photons. The characteristic x-rays from these radionuclides have energies that fall within the peak and potentially contribute a large component to the ionization current. If the source container is glass, the x-rays may be highly absorbed in the glass wall. If the container is a capsule or plastic syringe, a significant number of the x-rays will penetrate to the sensitive volume of the chamber.

Calibration settings designed for glass vials may give inaccurate results (overestimation) in less attenuating source geometries as the mean effective energy of the photon emissions decreases. Correction factors of 20% to 60% may be required for I-123 and correction factors of 15% to 30% may be required for In-111 solutions, depending on the syringe used.

Thus, low-energy photon sources (i.e., less than approximately 100 keV) may be assayed incorrectly unless care is taken in the selection of the source container. Significant attenuation may occur in the container, the source holder, or the interior wall of the calibrator chamber.

The problem of unequal attenuation of low-energy photons (e.g., in container and chamber walls) is minimized when using a thin copper insert. The copper insert (approximately 0.6 to 1 mm thick) absorbs most of the low-energy photons and a smaller percentage of the higher energy principal photons. Using a traceable reference source, the setting for the radionuclide can be recalibrated with the copper insert in place. Thus, measurements are relatively independent of container and chamber wall effects for the low-energy photons. The use of a copper insert has been recommended especially for use with I-123 and In-111.

Reference: **AAPM REPORT NO. 181; The Selection, Use, Calibration, and Quality Assurance of Radionuclide Calibrators Used in Nuclear Medicine; Report of AAPM Task Group 181, June 2012**

086-243 Copper Dipper, Vial/Syringe

Designed for use with I-123 and In-111, the Copper Vial/Syringe Dipper removes variation in readings caused by attenuation differences from different materials, thicknesses and volumes used in syringes and vials.

Please Note: When a copper dipper is used in the Atomlab 400, 500 and 500 plus for measuring I-123 a dial value of 44.5 should be used. When measuring In-111 using the copper dipper a dial value of 19.2 should be used in the Atomlab 400, 500 and 500 plus.