

AbstractID: 7827 Title: Multiple X-ray energy attenuation coefficient derivation with a Ge detector and a multichannel analyzer system.

A small constant potential x-ray unit, a Ge detector and multi-channel analyzer were assembled into a multi-energy spectrometer system. Pinhole lead collimators backed with aluminum were used to collimate the x-ray beam enough to keep the dead time of the multichannel analyzer below 2% for in air measurements. X-ray beams of 80-85 kVp were used to measure attenuation coefficients for photon energies ranging from 15 to 80 keV. Materials included pure aluminum, soft tissue phantom material, adipose phantom material, bone phantom material and water. The values derived for the attenuation coefficients were highly inaccurate for energies below 30 keV. Within the energy band 30 to 80 keV, the agreement of the measured attenuation coefficients was within 1.3% of the table values. The spectrometer was calibrated at 1 keV per channel, i.e. channel 10 measured photons from 9 to 10 keV. The table values were derived at mid-channel values i.e. 9.5 keV for channel 10. The measured values were usually a little lower than the table values. Using the propagation of errors the typical uncertainty is approximately 0.002 cm²/g for energy channel from 30 to 80 keV for the material thickness utilized in the study.