

# AbstractID: 4763 Title: Derivation of Diagnostic X-Ray Spectra Using an Interpolation Program with Calculated and Measured Input Parameters

**Purpose:**

To determine diagnostic x-ray photon spectra using simple transmission measurements.

**Method and Materials:**

A database of measured and calculated x-ray photon spectra values from the Catalogue of Spectral Data for Diagnostic X-rays, R. Birch, M. Marshall and G.M. Ardran, Diagnostic Topic Group of the Hospital Physicists' Association, England, 1979 was collected and used to form a multidimensional interpolation matrix. These researchers measured x-ray spectra using a Ge(Li) detector for various x-ray systems in the diagnostic energy range and derived a calculation method to calculate x-ray spectra which agreed closely with measured spectra for different conditions. X-ray spectra for tungsten targets and different inherent filtration in Al and Cu were coded in relative number of photons per mm<sup>2</sup> per keV for kVps ranging from 30 to 140 kVp at 10 kVp intervals. Other parameters were given such as mean photon energy in keV, photon flux at 0.75 m in photons-mA<sup>-1</sup>-s<sup>-1</sup>-mm<sup>2</sup>, output in micro Gy-mA<sup>-1</sup>-s<sup>-1</sup> and exposure in mR-mA<sup>-1</sup>-s<sup>-1</sup> and 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> half-value layer (HVL) in mm Al. Most spectra were derived for constant potential units but some with ripple were also derived. Target angles included 10, 17, 20 and 22 degrees.

**Results:**

From this input, interpolation curves were derived which enables one to interpolate between the 10 kVp intervals and to derive the inherent filtration for a particular unit in Al equivalent from simple transmission measurements in Al and mR/mAs at a particular distance. The kVp of the unit was also derived from the transmission measurements by comparison with the calculated curves.

**Conclusion:**

With some additional data, this method could be used to derive the x-ray spectra for any unit in this energy range, 30 to 140 kVp for different parameters.

**Conflict of Interest (only if applicable):**