

The photon radiation spectrum emanating from a Leksell Gamma Knife, model B, was measured between 80 keV and 3.5 MeV with the sources exposed. In order to make the measurements, a 2x2 inch NaI detector was enclosed in a shielded apparatus having a 1/4 inch measurement aperture, thereby reducing the amount of radiation received by the crystal. All measurements were made 1 meter above the floor within a quadrant toward one side of the Gamma Knife couch. Spectra displayed a doublet of photon peaks with both maxima being greater than 1.0 MeV, but shifted to lower energies than the cobalt-60 doublet. These peaks appeared in spectra beginning at angle around 54 to 59 degrees as one proceeds from a point directly lateral to the source enclosure (0 degrees) toward the foot of the couch (90 degrees). The average photon energy of the spectrum shifts to lower values and the doublet decreases in magnitude with increasing angle until almost vanishing at an angle equal to 90 degrees. Inserting the 16 cm sphere phantom, provided with the Gamma Knife, into the radiation beams increases the low energy photon emissions appearing in the spectrum somewhat, especially for measurements at the foot of the couch. Our results impact on the design of the shielding of a room containing the Gamma Knife, Model B. The data is also useful when estimating the radiation exposure to personnel during an emergency procedure in the treatment room with the sources exposed.