AbstractID: 7623 Title: Transmission Properties of Aluminum and Brass Used for Solid IMRT Compensators in Megavoltage Photon Beams

Purpose. The design of solid IMRT compensators requires the accurate determination of the linear attenuation coefficient, μ, of the compensating material. For clinical applications, μ is not a single value for a given material. Here we determine μ as a function of beam quality, field size, measurement geometry, and material thickness for two common compensator materials.

Methods. The attenuation of brass and aluminum compensator blanks was measured for ten thicknesses ranging from 6 mm to 51 mm and for eleven field sizes ranging from 3x3 cm^2 to 25x25 cm^2 for each of three photon energies, 6, 10 and 18 MV.

Results. The linear attenuation coefficient decreases with photon energy and is lower for aluminum than for brass. As a function of field size, μ attains a maximum value at intermediate field sizes between 5x5 cm^2 and 10x10 cm^2 and decreases toward smaller and larger field sizes with the lowest values at 25x25 cm^2. The range of μ across the spectrum of field sizes spans 14.8% for aluminum and 17.4% for brass. Beam hardening becomes more pronounced as the metal thickness increases so that greater thickness results in a lower μ; however, this effect is less pronounced than the field size effect and varies up to 7.0% for aluminum and 12.2% for brass over the range of thicknesses studied.

Conclusion. An approach that designs solid metal compensators using linear attenuation coefficients that reflect typical field sizes (and to a lesser extent the average thickness of the compensator material) for various anatomic sites will reduce the variation between calculated and measured doses when performing quality assurance checks on the compensator.