

Calculation of beta-ray dose distributions from ophthalmic applicators

Beta-ray dose distributions throughout the eye, from three types of ophthalmic applicator, have been calculated using the ACCEPT 3.0, EGS4 and other Monte Carlo codes, for comparison with recent measurements¹. The beta applicators were those used in an international intercomparison¹ – planar applicators of ¹⁰⁶Ru/Rh and ⁹⁰Sr/Y and a concave Ru/Rh applicator. For the Ru/Rh planar source, calculated and experimental results agree within the experimental errors (4-10%) out to a depth of 7 mm. Agreement is significantly better for the concave Ru/Rh source, but somewhat poorer for the Sr/Y planar source. Past attempts have been made to derive dose distributions simply by integrating the appropriate point source dose function over the source. Here, we have investigated the accuracy of this procedure for encapsulated sources, by comparing the results with Monte Carlo calculations. We attempted to allow for the effects of the source window, but no corrections were made for scattering from the source backing. In these circumstances, at 6 mm depth the difference in the two calculations is 14-18% for a planar Ru/Rh applicator and up to 30% for the concave Ru/Rh source. It becomes worse at greater depths. These errors are attributed to changes in the beta spectrum and angular distribution produced by the source encapsulation.

¹C.G. Soares et al, to be published.