

## Clinical Implementation of a Two-Source Model for Calculation of Electron Relative Output Factors

A two-source model has been implemented clinically to calculate the electron relative output factors (ROF) for various treatment conditions, including irregularly shaped fields at any source to surface distance (SSD). The model consists of an effective extended source above the final field defining aperture (i.e. "cutout") plane and a second source that models scattering from the aperture. The parameters in the model (maximum of six) are determined for each electron energy and applicator with a minimum set of ROF measurements made in water for square fields. A computer program using Clarkson type integration was developed to calculate ROFs for any digitized irregular field. The calculations of ROF by the model have been compared with measurements for a wide variety of cutout size, energies, applicators and SSDs for square fields, rectangular fields and circular fields. The agreement between calculations and measurements for these systematic comparisons is generally within 1%. The predictions of ROF by the program have also been compared with many clinical measurements for irregular fields. Most of the clinical measurements agreed with the model within 2%, but there were some measurements outside of this range. This can be attributed to problems in accurately measuring the ROF for small electron cutouts. In conclusion, the two-source model has been implemented clinically to predict electron ROFs accurately, saving the measurement time and avoiding measurement uncertainties inherent in small field electron dosimetry.