The goal of this work is to evaluate the accuracy of a new commercially-available Sievert Integral model. Our previous one-compartment model consisted of a cylinder centered symmetrically on a radioactive line source, which overestimated oblique filtration effects near the source ends. Our new model retains the 1D line source but includes two cylindrical compartments, the inner one containing active core material and the outer one the encapsulating material. In addition, the line source is no longer constrained to be contiguous or symmetric. We have tested both models against dose distributions derived from Monte Carlo photon transport calculations for both the Amersham CDCS-J and 3M 6500/6D6C ^{137}Cs intracavitary tubes. For the Amersham source, results from the new model differ from Monte Carlo data on average by 0.9%±0.7% (1σ) and at most 3.3%, a significant improvement over the average of 2.1%±4.5% and maximum of 25% for the one-compartment model. Similarly for the 3M source, the average difference improves from 2.4%±4.7% to 1.1%±0.9% and the maximum from 23% to 4.4%. Assuming the radioactivity to be uniformly distributed over the cylindrical active core (requiring 3D integration) rather than constraining it to lie on the source axis improves the average difference by only 0.11% for the Amersham source and 0.45% for the 3M source. Our new Sievert Integral model provides accurate two-dimensional dose rate distributions in all regions around the source while maintaining the calculation efficiency of one-dimensional integration.

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