Superposition algorithms currently represent the best practical approach for accurate photon dose calculations in heterogeneous tissues; however, execution typically requires minutes per beam. Dose calculations proceed point-by-point, ray-tracing in spherical coordinates, and either collecting or distributing energy released in tissue according to energy distribution "kernels." Kernel representations can be varied in ways that affect calculation times. Using a superposition algorithm, we calculated dose in a 40 cm cubic phantom for two machine energies (6 and 18 MV), three square field sizes (4, 10, 30 cm), and various numbers and arrangements of kernel rays and ray lengths in homogeneous and heterogeneous phantoms. We recorded execution times, and compared doses to "standard" calculations that used 48 zenith angles and 16 azimuth angles and a ray length of 40 cm. The results were complex in terms of accuracy. Limiting the number of rays, in general, lowered dose inside the beam, and raised it outside of the beam and at the edges. Shortening ray length (13 cm), in general, decreased dose outside of the beam for smaller field sizes, and decreased dose inside and at depth for larger field sizes. Calculation times increased with beam size (up to 2.7 times) and decreased with energy (down to 0.81 times). We also compared superposition doses to measurements, Monte Carlo calculations, and FFT convolution. The convolution comparison is unique, since our superposition and convolution algorithms use the same "TERMA" calculation. Methods will be presented for optimizing speed/accuracy tradeoffs.

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