

The Monte Carlo code EGS4/DOSXYZ was used to calculate the heterogeneity correction factors (defined as the ratio of dose in heterogeneous material to dose in water) for bone and lung in layered and mediastinum geometries for 4 to 18-MV clinical photon beams. The code EGS4/BEAM was used to obtain the full phase-space data for the photon beams, which were consistent with the measured beam data to within 2%. The dose calculations were performed on a Cartesian grid that simulated the geometry and construction of the measurement phantoms. Calculations were performed on a network of 22 Pentium Pro 200MHz computers each of which took one to two hours of computation time for 1% statistical uncertainty on the correction factors. The ionization chamber measurements were scaled using ionization to dose conversion factors where necessary to obtain the heterogeneity correction factors. The Monte Carlo calculated correction factors, varying from 0.9 to 1.2 for the materials studied, agreed with the measured values to within 1% for points in regions proximally, laterally or distally displaced from the heterogeneities and within the heterogeneities, including the interface regions, for all the field sizes and phantoms. The Monte Carlo calculations adequately accounted for the dose deposition events (in particular photon scattering and electron fluence perturbation at the interface) that depended in a complex way on the interplay between the beam characteristics and the geometric regions of interest in the phantoms that were studied.

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