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Evaluation of absorbed fractions for beta-gamma radionuclides in ellipsoidal volumes of soft tissue through Geant4

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An analytical relationship between absorbed fraction and a "generalized radius"is introduced, and the dependence of its parameters rho0 and s from average electron or photon energy is discussed. A generalization for the estimation of absorbed fractions for other radionuclides is also proposed. Such results can be useful to improve accuracy and easiness of calculation in dosimetry of beta-gamma emitting radionuclides.

Summary

We developed a simulation in Geant4 to calculate the absorbed fractions for monoenergetic and beta electrons emitted by 199Au, 177Lu, 131I, 153Sm, 186Re and 90Y and for photons between 10 keV and 1 MeV, emitted by sources uniformly distributed in ellipsoidal volumes of soft tissue. Code validation results with respect to reference data for doses, ranges and absorbed fractions in spheres are presented. We discuss the influence Monte Carlo parameters on average energy deposition for the three physics packages available.
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