ABSTRACT

Monte Carlo based treatment planning is rapidly evolving towards clinical use with several groups actively developing treatment planning simulation systems. This study seeks to build upon previous work and provide a standard framework for converting Monte Carlo phase space distributions into the necessary information for conventional treatment planning. In particular we present the conventional mathematical description for converting the three-dimensional position of the emitted particle as a function of the gantry, table, or collimator rotation and a translational shift associated with table or patient movement. We also present a simple extension to calculate the direction cosines of the emitted particle as a function of the three-dimensional rotation or translation. The discussion is presented with respect to the Monte Carlo code MCNP4B and its integration with a conventional treatment planning system. The standard MCNP code package has previously been modified to calculate the dose from realistic linear accelerator photon beams in a high resolution, 3-D cartesian coordinate geometry system. Clinical treatment planning comparisons are presented including dose-volume histogram analysis.