

Abstract Submitted
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Monte Carlo Fast Dose Calculator for Proton Radiotherapy
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- M.D. ANDERSON COLLABORATION — Monte Carlo methods used in proton
radiotherapy are more accurate than commonly used analytical dose calculations,
at the cost of being computationally intense. We intend to show the feasibility of
the Fast Dose Calculator (FDC), a Monte Carlo track-repeating algorithm based
on GEANT4, to perform dose calculations for a clinical proton beam. FDC was
developed to retain the accuracy of the Monte Carlo approach while substantially
decreasing the calculation time required. FDC uses a database of proton trajectories
in water and extrapolates this data in order to calculate the dose in heterogeneous
media by scaling the proton range and scattering angles. FDC has been extended
to include all of the patient-dependent elements of a passive proton scattering treat-
ment unit: aperture, range compensator, and voxelized patient geometry. Improved
database packing provides additional computational efficiency in FDC, which speeds
calculation by more than two orders of magnitude. In addition FDC shows no de-
pendence on calculation times with the number of voxels, unlike GEANT4. The
dosimetric accuracy of the FDC algorithm was validated by comparing the results
with GEANT4.

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