

AbstractID: 3723 Title: A Monte Carlo-based IMRT plan re-calculator

Purpose: IMRT QA currently is currently a time consuming activity. We hypothesize that IMRT QA labor would significantly decrease if a software tool were available which conveniently re-checked IMRT treatment plans by independently re-computing the expected dose distribution based on the leaf-instructions generated by the treatment planning system. Such a system should have the capability to make detailed comparisons with the original treatment plan.

Methods: Our research treatment planning system CERR (Computational Environment for Radiotherapy Research) was modified and extended to include the capability of recomputing dose based on leaf-sequences received via DICOM. Three dose computation algorithms have been implemented: (1) a simple pencil beam model which corrects for changes in central axis attenuation, but includes realistic scatter tails, (2) the Monte Carlo code VMC++, and (3) the open source Monte Carlo code DPM (dose planning method). GUI tools were developed to allow for side-by-side dose comparisons and comparative profile dose plots, in addition to DVH comparisons. Initial tests were performed using data generated via the Varian Helios planning system. Comparisons were made beam-by-beam in a simplified QA geometry as well as for total dose.

Results: Initial results indicate reasonable agreement between the Helios planning system dose distributions and the pencil beam method. Differences with Monte Carlo results were greater, but energy spectral effects have not yet been added to the model.

Conclusions: CERR provides a powerful and convenient environment to develop an IMRT plan re-calculator. Initial results indicate the basic correctness of data being used for the dose recalculation. We expect to fully develop this system as a helpful tool for IMRT QA.

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