

# AbstractID: 4986 Title: Automation of Monte Carlo Simulations For A Proton Therapy System

**Purpose:**

To develop a code system to automate the processes associated with Monte Carlo simulations of a clinical proton therapy system.

**Method and Materials:**

A software system was developed that accepts a clinical prescription (beam range, range modulation, and field size) and generates a complete Monte Carlo simulation input file that includes all major components in the M. D. Anderson passively scattered treatment head plus one of several user-selectable phantoms. The simulations are automatically submitted to a 130 dual-CPU cluster. Post processing scripts were also developed to analyze the simulation results and generate required configuration data for the Varian Eclipse treatment planning system. Quality assurance procedures, such as design inspection, unit test, incremental integration test, regression test, and integration test, were performed to ensure the code system produces correct results. The code system was written in mainly C language, with some shell scripts, and it runs on the LINUX operating system.

**Results:**

A code system has been developed to automatically generate MCNPX input files, run simulations and perform post-processing of simulation results for a proton therapy system. The code system has been used to simulate dose profiles and generate required data for commissioning the M. D. Anderson proton therapy system. Over one thousand dose profiles were generated for different beam configurations by the code system in two months. Example beam data will be presented.

**Conclusion:**

The automated Monte Carlo code system has proved to be a useful tool for simulations of clinical applications in proton therapy. It allows for rapid modeling of proton therapy systems and the results of this study suggest that data from Monte Carlo simulations will play an increasingly prominent role in proton therapy projects, i.e., pre-clinical design, commissioning studies and routine clinical tasks.

**Conflict of Interest (only if applicable):**