

# AbstractID: 5559 Title: A general software framework for investigations in radiation therapy planning

**Purpose:**

To be able to experiment with various topics in advanced radiation therapy planning using a stand-alone Windows-based software.

**Method and Materials:**

Product code for IMRT planning was merged with research code for adaptive radiation therapy and dose computations. An architecture and graphical user interface tailor-made for representing adaptive treatments was designed. Code for proton dose computation and treatment planning was developed and integrated into the system.

**Results:**

A software package that executes on a standard PC or advanced laptop has been developed. The system is capable of IMRT treatment planning using dose-volume based functions, EUD, Poisson-LQ and LKB biological models, both as objectives and hard constraints. Pencil beam and heterogeneity corrected collapsed cone dose computations can be used. The system can optimize every relevant combination of pencil beam weights, SMLC segments, gantry, couch and collimator angles. It is possible to perform intensity modulated proton therapy planning. Models for tumor repopulation and repair are included and irregularities in the fractionation scheme can be compensated for by allowing the dose to vary between fractions during optimization. The system exhibits a comprehensive GUI and functionality for simulation and evaluation of adaptive/IGRT treatments with algorithms for deformable dose accumulation based on information from portal imaging and 3D imaging modalities such as onboard CT scanners. Errors due to patient setup and organ motion can be counteracted and compensated for by couch shift and on- and offline IMRT replanning.

**Conclusion:**

A software environment suitable for studying various advanced topics in modern radiation therapy has been developed. The system has proven useful in research and development in IMRT optimization, biological models, proton therapy and adaptive radiation therapy.

**Conflict of Interest:**

The authors are employees and stock owners of the submitting company.