

AbstractID: 1269 Title: UW Tomotherapy Benchtop modification: the development of an experimental image guided radiotherapy platform using kVCT and MVCT

An experimental platform for image-guided radiotherapy was developed to confront complexities of combining imaging and MV radiotherapy. A single CT detector system will be used to simultaneously detect both modalities. Since the CT detector position with respect to the MV radiation is not as sensitive as the detector position with respect to kV radiation, the CT detector is focused at the kV source while the LINAC source is skewed. A rotating/elevating stage simulates gantry and couch motion. The position of the stage, radiation sources, and xenon gas CT detector allows for the irradiation and imaging of the same volume. The experimental platform also includes a data-acquisition system and, though yet to be utilized, a binary MLC. A circuit to facilitate the triggering of both radiation sources was designed, built, and tested. The circuit interleaves the radiation sources between adjacent data acquisition cycles while providing a delay to optimize the initiation of the kV pulse. The timing of the kV radiation pulse with respect to the data collection cycle, kV pulse width, and the physical location of the kV source are parameters to optimize the kV data acquisition. Following the kV triggering optimization, synchronous profiles were obtained and kV/MVCT data was acquired for several phantoms. The kV/MVCT data was reconstructed into respective kVCT and MVCT images, proving intended application. Further work will translate MVCT data into information used for treatment verification.

This work was partially supported by a grant from the NIH (PO1 CA088960) and a contract from TomoTherapy Inc.