AbstractID: 8730 Title: An Independent QA procedure for the Tomotherapy delivery process

Purpose: IMRT treatment using a helical technique such as Tomotherapy is a complicated process where the risk of misalignment of the planned radiation beam and the target volume exists, due to various factors, such as set-up errors, or hardware/software failures, leading to couch, gantry, leaf misalignment, etc. Built-in interlocks are usually monitored carefully by the linac system. However, an independent method to guard against these catastrophic errors, as well as confirming correct patient positioning, provides an additional level of quality assurance for these highly complex techniques.

Method and Materials: The method is based on the detection of radiation at specific locations at predicted times as determined from the treatment plan. Individual detectors (diodes or MOSFETs) whose signals are read out in real-time, are placed at pre-determined positions on the treatment couch. When the treatment couch is indexed to the patient, the fixed geometric relationship allows a verification of the presence or absence of radiation at pre-calculated times and provides an independent monitoring of the integrity of the delivery process.

Results: A procedure has been developed to extract information from the planned sinogram (MLC leaf patterns and beam delivery times) for the determination of the placement of detectors on the treatment couch. For pilot testing, a matrix detector is used and phantom measurement is carried out. Preliminary results indicated the capability of the system to report the presence or absence of radiation signal predicted from the treatment plan. Limitations of the system in terms of the quantitative value of the signal with respect to differentiating a false positive or negative result are being evaluated.

Conclusion: An independent system to verify geometric integrity of the delivery process is being developed. The objective is to monitor any catastrophic errors such as misalignment between the planned radiation beams and the treatment target.