

## AbstractID: 1309 Title: Patient-Specific Dose Verification and Synchronization Quality Assurance Tests For Helical Tomotherapy Using Film

Helical tomotherapy has just recently been implemented as a clinical radiotherapy treatment device. It uses a dynamic helical delivery along with intensity modulation to give highly conformal treatments with potentially large dose gradients. For this reason, patient-specific dose verification and synchronization tests are a critical aspect of the quality assurance process for tomotherapy. We have used film to quality assure both the original tomotherapy prototype unit and the new TomoTherapy Hi-Art™ System 2.0. X-Omat V film was used to test the synchronization between the gantry rotation and both the couch motion and multi-leaf opening. Patient-specific dose verification was performed using Kodak EDR2 film irradiated inside a cylindrical solid water phantom. Film analysis, including comparisons between the film measurements and the dose distributions calculated using the tomotherapy planning station, was carried out using in house software coded in LabVIEW™. Acceptability of a measured dose distribution for a given patient was based on dose difference and distance-to-agreement analysis between the film and calculated plan. While performing patient-specific dose verification a “twist” in the measured dose distribution was discovered on a non-clinical gantry period for the original tomotherapy unit and was eventually attributed to a synchronization error between the multi-leaf collimator and gantry. This discovery led to the creation of the synchronization test between the multi-leaf opening and gantry rotation. The twist has shown to be absent on the TomoTherapy Hi-Art System 2.0, whose engineering of the MLC-gantry synchronization is fundamentally different than the original tomotherapy unit.