

AbstractID: 13873 Title: System Integration and Preliminary Dose Verification of Dynamic TomoTherapy Delivery

Purpose:

Integrate dynamic delivery techniques with TomoTherapy[®] treatment system and make preliminary dose verification with film and ion chamber measurements.

Method and Materials:

Dynamic delivery techniques utilize variable jaw width and variable couch speed to reduce beam-on time and to improve longitudinal dose conformity. Several dynamic delivery techniques have been implemented in TomoTherapy[®] TPS, including Running Start and Stop (RSS), Dynamic Jaw with Dynamic Couch Speed (DJDC), with/without symmetric jaw constraint. With RSS, the back jaw follows the target's superior border as it enters the radiation field and the front follows the target's inferior border as it moves out of the field. With DJDC, jaws can move at any time during the treatment and the couch moves as fast as possible to speed up the treatment as long as the intended fluence is delivered. New hardware for jaws and couch subsystems is integrated into the delivery system. New casting, encoders and actuators for the jaws have higher accuracy and reliability.

A simple cylindrical target and avoidance structure were used for planning and measurements. Radiation beams were delivered with RSS and preliminary film and ion chamber measurements were taken in a cheese phantom.

Results:

Film measurement taken with RSS 5.0 cm is compared to that with regular 5.0 cm and the penumbra is significantly reduced. The cheese phantom measurement shows good agreement between the calculated and measured dose. With the 2% -2 mm criterion, 83% of the area where dose is higher than 20% of D_{max} has a γ index <1 . The point dose ion chamber measurement shows a discrepancy as little as 0.14% between the calculation and measurement.

Conclusion:

The preliminary results demonstrate that integration of the dynamic TomoTherapy[®] delivery system is successful and the dynamic jaw model of TomoTherapySM beam model can generate satisfactory results for treatment planning.