

## AbstractID: 2966 Title: TomoTherapy HI-ART heterogeneity calculations

**Purpose:** To examine the accuracy of the TomoTherapy HI-ART<sup>®</sup> treatment planning system's dose heterogeneity algorithm.

**Method and Materials:** The TomoTherapy HI-ART<sup>®</sup> treatment planning system uses the superposition/convolution dose algorithm for calculating heterogeneous dose distributions. To evaluate the combined delivery and dose calculation of this system, a series of treatment plans and corresponding measurements were made with: (1) calibrated CT density plugs and embedded TLD (2) film phantom and calibrated CT density plugs, (3) anthropomorphic phantoms containing TLD and film, and (4) different phantom materials with chamber inserts. Treatment plans were delineated with one cylindrical target calculated with homogeneous dose distributions at 60 Gy (1 Gy/fx, S.D. < 0.7).

**Results:** The film studies using the film phantom show that the predictions are within 5-10 % along the interface and within the heterogeneity materials. TLD values using embedded plugs in various phantoms indicate comparable agreement. Phantoms with slab materials, composed of electron densities within 10% of water, are within 5% between calculations and ion chamber measurements. The lung phantom indicates that the readings agree with predictions to within 4%.

**Conclusion:** The heterogeneity calculations agree with measurements to within 10%. Film measurements demonstrate more variability and discrepancy than the other measurements. The interface measurements demonstrate the largest disagreement where the dose gradient is approximately 10% for a uniform dose calculation between two different electron density materials.