AbstractID: 5599 Title: Dosimetry audit for Tomotherapy using alanine/EPR

**Purpose:** To provide an audit of ion chamber-based dosimetry for IMRT delivered by helical tomotherapy.

**Method and Materials:** Three treatment plans were selected from the commissioning of a TomoTherapy Hi-Art II machine using a 30 cm diameter cylindrical Virtual Water ("cheese") phantom. For each plan, measurements were made at 6 points: two in the target volume, two in the steep dose-gradient region just outside the target volume, and two in the low-dose region far from the target volume, which was a 6 cm diameter cylinder. Absorbed dose was measured using two independent alanine/EPR dosimetry systems and two Exradin A1SL ion chambers. The planned dose in the target volume was 2 Gy per fraction, and 9 or 10 fractions were delivered to the phantom loaded with alanine dosimeters. The ion chambers had been calibrated in a $^{60}$Co beam at Ghent University Dosimetry Laboratory, and correction factors were applied for beam quality and ion recombination as recommended by TomoTherapy Inc. Four or five alanine dosimeter pellets were used per measurement position. The NPL alanine dosimeters were read out using a Bruker EMX spectrometer, and the ZNA-Middelheim alanine dosimeters were read out using a desktop Bruker EMS-104 spectrometer.

**Results:** In the target volume, ion chamber and alanine doses agreed to better than 2%. The statistical uncertainty in absorbed dose measured using a single alanine pellet was 0.06 Gy at NPL and 0.3 Gy using the desktop spectrometer. On average, absorbed dose measured using the ZNA-Middelheim alanine system was 3% higher than the dose measured using the NPL alanine system.

**Conclusions:** Dosimetry audit of IMRT delivered by helical tomotherapy using alanine/EPR is both convenient and independent of the assumptions made in analysing ion chamber measurements.