

AbstractID: 4796 Title: Radiation shielding calculations and measurement for a Helical TomoTherapy unit in an existing treatment room

**Purpose:** To quantitatively evaluate the appropriateness of an existing LINAC treatment room shielding for a Helical TomoTherapy (HT) (TomoTherapy Inc., Madison, WI, USA) unit operating under typical radiation oncology department workload.

**Methods and Materials:** A treatment room previously designed for a Varian Clinac 600C LINAC was considered for housing a HT unit. Shielding calculations for primary and secondary radiations (leakage and scatter) were performed to evaluate whether additional shielding was needed. A typical radiation oncology patient load (40,000 rem/wk) was used. Use factors were derived and calculated based on unique HT rotational beam delivery. Leakage and scatter was included in the calculation based on corresponding measurements as documented by TomoTherapy Inc. After installation of the HT unit, a radiation survey was performed to verify calculation results.

**Results:** Calculations showed that a typical 600C shielding design is generally sufficient for a HT unit for typical workloads. However, in our situation, additional shielding was required for a small area of one wall due to positioning of the HT unit isocenter. The radiation survey carried out after HT installation showed all barrier calculation locations satisfied radiation safety requirements.

**Conclusions:** It is recognized that leakage radiation levels for IMRT treatments on HT are increased significantly due to increased beam-on time to deliver modulated fields. This investigation showed that a typical 6 MV room design provides adequate shielding barriers for a HT unit operating under typical radiation oncology workload in most cases. Under some circumstances, such as placement of unit in the room away from original isocenter design, extra shielding materials may be required. A caution is thus needed for institutions considering installing new HT unit within an existing LINAC treatment room.