

## AbstractID: 5326 Title: Respiratory gating with gantry mounted fluoroscopic imaging

**Purpose:** To perform respiratory-gated treatment based on the position of implanted markers in fluoroscopy using a gantry mounted x-ray imaging system.

**Method and Material:** We have designed hardware and software capable of gated treatment using the position of implanted markers. The system tracks the position of the marker in real-time using fluoroscopic imaging. Tracking can be done in a single image, for 2D position information, or can be done simultaneously in a pair of orthogonal images, for 3D position information. When the marker is in the treatment window, the linear accelerator is signaled to deliver the beam. A live display of the fluoroscopy is used to initiate tracking, and to verify tracking and gating operation.

**Results:** Gated treatment was performed on a moving phantom, with 3 cm peak-to-peak motion and a 4 mm gating window for internal motion. Fluoroscopy was acquired at a rate of 7.5 frames per second. The system latency from image acquisition to gating was roughly estimated to be approximately 50 ms. Gating operation was tested by delivering 4x4 cm open fields, and tracking the position of a 2mm steel marker in fluoroscopy. This initial position of the marker was assigned interactively. Treatment was delivered successfully for each field, despite some image degradation due to scatter from the MV treatment beam. The dosimetry of the gated treatment was measured in film, and compares well with the non-gated treatment of a static phantom.

**Conclusions:** Respiratory-gated radiation treatment has great potential to increase dose conformality for patients with large intrafractional tumor motion. When implanted markers are present, the position of the internal anatomy can be tracked precisely and reliably, which improves our confidence in the gating treatment.

**Conflict of Interest:** Research sponsored by Varian Medical Systems.