

## AbstractID: 3369 Title: BART (Breathing Adapted RadioTherapy) using modern gating technologies

**Purpose:** The aim of this study was to evaluate the impact of the Varian RPM-gating™ System for gated treatment of breast cancer/thoracic wall cancer as well as Varian On-Board Imager™ (OBI) Fluoroscopic Pretreatment Setup Verification for gated treatment of lung cancers/upper intestinal tract cancers.

**Method and Materials:** A passive, infrared light reflecting marker is placed on the patient's chest wall over the xiphoid process. The vertical motion of the marker, i.e. the breathing excursion, is tracked by an infrared sensitive video-camera-based hardware. The system is used for acquisition of the CT-Scan (4D-CT) as well as the treatments; for the latter it manages the controlled switching of the radiation beam during a pre-selected specific phase of the respiratory cycle. The additional Fluoroscopic Setup Verification allows a fluoroscopy analysis of inner target movement with regard to a chosen therapeutic window of the RPM Gating system just prior to treatment.

**Results:** Varian RPM-gating technology optimizes the dose delivery to regions with respiration-induced movements of the target. Safety margins and thereby irradiated critical volumes can be significantly reduced for breast cancer with RPM-gating as well as lung cancer with the OBI Fluoroscopic Pretreatment Setup Verification.

**Conclusion:** Gating offers the possibility to apply doses with higher accuracy. As typical duty cycles are around 50% or even 10%, the overall beam-on time is prolonged by a factor of up to 4. In order to compensate for this effect, a dose rate change from 300 to 600 MU/min when using enhanced dynamic wedges was chosen; in case of electronic compensation a dose rate change is not needed. The additional fluoroscopy mode offers for the very first time the possibility to verify patient positioning with regard to the moving target, which - for most cases - shows a phase shift relative to the RPM marker box movement.