# AbstractID: 5721 Title: Feasibility study of mobile target tracking by Breathing Synchronized Delivery (BSD).

**Purpose:** To investigate the feasibility of mobile target tracking by Breathing Synchronized Delivery (BSD).

**Method and Materials:** Target breathing motion compensation by real-time tracking of dynamic multi-leaf collimator (dMLC) is under development. We have used an alternative approach to circumvent this problem. Breathing-delivery phase correlation is set in Breathing Synchronized Delivery (BSD) planning. During treatment the feedback is provided to the patients to maintain the correlation. A retrospectively binned 4D-CT was acquired. The full exhalation (50%) phase images were exported to treatment planning system for planning. Smooth tumor trajectory was obtained using deformable registration algorithm and Fourier filtering. With constant dose rate (300MU/min) and breathing period, a motion incorporated BSD plan was obtained by superimposing instantaneous target motion to the leaf position at corresponding phase. BSD plan was delivered using the dynamic dose mode with a Varian's dMLC. For dosimetric verification, a computer controlled mobile phantom was used to simulate the actual superior-inferior target motion obtained from 4D image registration. Dose was measured at the isocenter of the phantom in the coronal plane using EDR-2 film. Three films were exposed, first for static phantom and conventional plan, second for the moving phantom and conventional plan and third moving phantom with motion compensated BSD plan.

**Results:** The dose distributions in superior-inferior direction were very similar if BSD planning is used on mobile phantom. Underdose and overdose of the order of 20% were observed at the superior-inferior direction if motion is not compensated.

**Conclusion:** Phantom dosimetry results show that BSD planning and delivery method can effectively compensate target motion. For the patients who may maintain reproducible breathing pattern with video or audio instructions, BSD method is a simple alternative to real-time tracking.