AbstractID: 11305 Title: Gated Breathing Synchronizer (GBS) for Respiratory Motion Management in Radiotherapy

Purpose: Respiratory motion during radiotherapy can be managed by either respiratory gating (e.g. RPM by Varian) or some form of breath hold (e.g. ABC by Elekta). In respiratory gating the duty cycle is limited when a narrow window is used to reduce residual motion. For longer treatment fields, IMRT or IMAT, the breath-hold method may take many breath holds to complete a field and each breath hold induces extra stress on the patient. We are developing a hybrid method of respiratory motion management with a relatively high duty cycle and at the same time the patient can potentially tolerate an un-limited number of breathing cycles repeatedly with little motion during treatment delivery. **Method and Materials:** The Gated Breathing Synchronizer (GBS) coaches the patient to breathe with a period of breath hold in every breathing cycle. It monitors the patient with sensors such as mass-flow sensor and respiratory belts. It can close a valve to induce breath hold which can be overridden by the patient for safety. It can also send a beam-hold signal to synchronize the linac with the breathing pattern of the patient. We have implemented a mode of GBS to enter breath hold at end-exhalation (EE mode). The algorithm increases the breath hold duration starting from 3 seconds per cycle until the respiration rate (RR) is reduced to a target value. It then maintains the RR at that value. **Results:** We have tested the EE mode of GBS on a group of healthy volunteers. Detail results on the duty cycle, RR, and the duration that the subjects can maintain the target RR will be presented. **Conclusion:** We have implemented the EE mode of GBS and it is well tolerated by healthy volunteers. Supported in part by NIH P01-CA59827.