AbstractID: 9019 Title: Development of a programmable moving phantom for the verification of 4D dose delivery

Purpose: To develop a programmable moving phantom to simulate internal organ motion and investigate the impact of the respiratory motion on dose delivery by comparison with phantom measurements. **Method and Materials:** A moving phantom system was constructed to simulate internal organ motion. The system consists of a motion system and an acrylic phantom. A mechanical cam is responsible for the motion in the anterior-posterior direction. A worm gear allows 1-D linear motion in the superior-inferior direction. The acrylic phantom has lung and prostate inserts including a film cassette and an ion chamber. The motion control system was composed of two AC servo motors, a controller and a PC-based motion program. The motion control program was implemented to move the phantom insert with a non-linear (sinusoidal or irregular) motion according to a user-defined motion profile. The user-defined motion profile can be generated in a spreadsheet either by calculation using an analytic model or by acquisition of real patient data. An external stereo camera was used to acquire the motion data for verification. **Results:** User-defined motion trajectory can be produced using the programmable moving phantom with an accuracy of 0.5 mm. Although a period for motion update is 10ms, camera measurement result indicates that the resulting motion profile was smooth enough to simulate internal organ motion with the help of an interpolator in the motion controller. **Conclusions:** This work indicates the prospect for 4D patient specific QA using the programmable phantom with a patient internal organ motion data. Real 4D dose verification could be achieved with independent 3-axis moving mechanics. **Conflict of Interest (only if applicable):** This work was supported by a grant of Seoul R&BD Program (10550).