AbstractID: 13503 Title: Beam parameters for gated irradiations of moving targets in scanned particle therapy

Purpose: To investigate gating parameters for gated irradiation of moving targets with a scanned ion beam using a 4D motion phantom. **Method and Materials:** For a scanned particle beam the residual motion within the gating window causes interplay which leads to unacceptable under- and overdose. Beam parameters (residual motion, beam spot size, and raster grid spacing) have to be chosen such that the increased overlap (spot size / grid spacing) of neighboring pencil beams mitigates the dosimetric impact of the residual motion. Due to the impossibility of measuring all potential cases that can occur for a given gating parameter set (e.g. different motion amplitudes and starting phases), the optimal parameter set is determined in simulations. The result of the simulations is then validated by a set of representative measurements. We performed experiments with 1D motion and studied the influence of different beam overlaps (spot size vs. grid spacing) with respect to the dosimetric impact of residual motion amplitudes. Films and an array of ionization chambers were used as detectors. As a preparation of measurements with 3D motion, we constructed a thorax-phantom that simulates 3D internal tumor motion using a robotic arm and further allows independent control of surface motion in order to study robustness against e.g. baseline drifts. **Results:** A beam overlap of 6.7 was less sensitive to residual motion than an overlap of 3. The robotic phantom moves reproducible with a spatial precision of < 0.3 mm **Conclusion:** A framework for beam parameter definition for gated treatments with a scanned particle beam has been set up and tested in initial experiments. **Conflict of Interest:** Research sponsored by German Research Foundation (DFG).