AbstractID: 9199 Title: On technical aspects of the implementation of a new respiratory gating system with the option of three-dimensional tracking of a surrogate's motion via a wall-mounted camera

Purpose: To optimize performance of a new respiratory gating system with 3D tracking of a surrogate and to evaluate the performance of the system in clinical conditions.

Method and Materials: An accuracy of the system was checked by calibrating the system using water parallel surface and then locating a surrogate at different positions on the surface and detecting its position. A clinically representative bending profile of a couch was found. While respecting restrictions resulting from the calibration procedure, three points on the profile that ensure the profile's optimal linear fit were selected. The system was recalibrated by positioning a surrogate into the found positions and the system's performance was checked. The longitudinal speed and the AP position of a surrogate were recorded simultaneously to quantify observed artifacts when the surrogate was moving in the longitudinal direction.

Results: The values of the AP position of a surrogate on the leveled plane change less than ±1 mm (SD of a readout is 0.18 mm). The measured bending profiles exhibit non-linearity and changes in the AP position are up to 8 mm (weight of 60 kg). After the proposed calibration, couch induced changes in the AP position during a CT acquisition are less than ±1 mm. The AP position readout varies linearly with the longitudinal speed of a surrogate (approx. 0.6 mm change at the speed of 10 mm/s).

Conclusion: The new system enables an accurate readout of a surrogate's position. However, its accuracy is limited by the presumption that the surrogate's motion induced by a couch happens within a plane. A mean how to bring the model closest to the clinical conditions was proposed. Dependence of the AP position readout on the surrogate's longitudinal speed is an inconvenient property of the system, which has a little impact in clinical conditions though.