AbstractID: 13732 Title: A superfluence approach for EPID-guided 3D dose verification

Purpose: Several methods exist for tracking tumors on EPID images acquired during treatment. Utilizing the tumor tracks, the planned fluence can be averaged to create a "superfluence" that reflects the delivered dose. We investigated the feasibility of 3D dose verification using the superfluence.
Method and Materials: The CIRS dynamic phantom was used with 15 MOSFETs inserted in a soft resin tumor model created from a real patient tumor segmented on a CT scan. A real patient breathing pattern with 1.5cm amplitude was set and a 4D CT was acquired. The PTV was obtained by expanding the ITV uniformly by 5mm as typically done in lung SBRT treatments. A 7-field plan was created with the same coverage as is clinically required. The phantom was irradiated with the tumor static and moving with several amplitudes and set up errors. EPID images were recorded throughout these deliveries and the tumor was tracked post-treatment with in-house developed software. The planned fluence was blurred according to the motion tracks to obtain a superfluence from which the delivered dose was calculated. The estimated delivered dose was compared to the dose directly measured by the MOSFETs.
Results: The calculation of delivered dose with the superfluence method was in good agreement with the MOSFET measurements. The difference varied on average from 0.8% to 8.3% depending on the proximity of a dose gradient.
Conclusions: A novel method is presented for 3D dose verification based on the superfluence concept. The only requirements are the acquisition of EPID images during treatment and a tracking algorithm to obtain the tumor motion. The excellent agreement between the measured and calculated dose indicates the validity of the method.