

Upstream MLC leaf position detection in complex radiotherapy fields

Monday, September 13, 2021 5:25 PM (15 minutes)

Multileaf collimators (MLC) are an integral component in modern radiotherapy as they dynamically shape the MV photon treatment field and therefore need to be closely monitored to ensure correct treatment delivery. Currently, MLC leaves are calibrated to ± 1 mm every 3 months, however leaves can drift beyond this during calibration dates and treatment verification only occurs post-treatment. MAPS detectors are radiation hard for photon and electron irradiation, have high readout speeds and low attenuation which makes them ideal upstream radiation detectors. Previously, we reported on leaf position reconstruction for single leaves using the Lassena, a 12x4 cm², three side buttable MAPS suitable for clinical deployment. Sobel filter-based methods were used for edge reconstruction. It was shown that correspondence between reconstructed and set leaf position was excellent and resolutions ranged between 60.6 ± 8 and 109 ± 12 μm for a single central leaf with leaf extensions ranging from 1 to 35 mm using 0.3 sec of treatment beam time. Here, we report on leaf edge reconstruction using Sobel filter-based methods in complex leaf configurations, as in clinical use with extensions ranging up to 120 mm. The Lassena detector was placed in the treatment field of an Elekta Agility LINAC with MLC leaves of width 0.5 cm extended into the field creating various leaf configurations. Results show that leaf positions can be reconstructed with resolutions between 78 ± 7 and 149 ± 14 μm at the iso-centre using 0.15 sec long treatment segments. These resolutions significantly exceed current calibration standards.

Title

Mr

Your name

Jordan Pritchard

Institute

University of Bristol

email

Jordan.Pritchard@bris.ac.uk

Nationality

British

Primary authors: Mr PRITCHARD, Jordan (University of Bristol); Dr VELTHUIS, Jaap (University of Bristol); Dr BECK, Lana (University of Bristol); Ms LI, Yutong (University of Bristol); Dr DE SIO, Chiara (University of Bristol); Dr HUGTENBURG, Richard (University of Bristol)

Presenter: Mr PRITCHARD, Jordan (University of Bristol)

Session Classification: Medical Applications of Position Sensitive Detectors 1

Track Classification: Medical Applications of Position Sensitive Detectors