Australian Synchrotron
USER MEETING 2014
20 – 21 November
National Centre for Synchrotron Science

Contribution ID : **44** Type : **Oral**

A high resolution in-beam monitor for microbeam radiotherapy

Friday, 21 November 2014 13:45 (30)

Due to the very high dose rates (kGy/s) used in microbeam radiotherapy (MRT), rigorous fluence monitoring is necessary both for pre-treatment verification, and during therapy. We propose an in-beam monitoring system comprised of a 50 μm film of polyethylene terephthalate (PET) metalised with Aluminium positioned in the beam, coupled with a CMOS imaging system for the collection of fluorescence optical photons emitted from the film. We show that such a system has the potential for high spatial and temporal resolution, thereby enabling on-line beam monitoring and treatment verification for MRT.

We position a sample of the film at a 30 degree angle to the beam path in a light tight and shielded enclosure. A CMOS PCO Edge camera with a sensor size of 2560×2160 pixels and a pixel size of 6.5 μm, along with a 105 mm Nikkor macro-lens was nominally positioned at 400 mm to the imaging sensor, and perpendicular to the beam for direct imaging of the fluoresce photons.

The signal to noise ratio for the system was found to be 18.9, and its temporal capabilities were found to be sufficient for detecting beam defining slits in motion, with the MRT beam spectrum at IMBL with a nominal mean energy of 100 keV, and a 1×5 mm field. The proposed imaging system will be a valuable aide in treatment setup, including multi-slit collimator alignment and pre-treatment verification.

Keywords or phrases (comma separated)

beam monitoring, microbeam radiotherapy, optical fluorescence, radiotherapy

Summary

Primary author(s) : Dr POOLE, Christopher (University of Melbourne)

Co-author(s) : Dr STEVENSON, Andrew (Australian Synchrotron/ CSIRO); Dr HALL, Christopher (Australian Synchrotron); Dr CORNELIUS, Iwan (Imaging and Medical Beamline, Australian Synchrotron, Australia., Centre for Medical Radiation Physics, University of Wollongong, Australia); Mr SMITH, Trent (Imaging and Medical Beamline, Australian Synchrotron, Australia.)

Presenter(s) : Dr POOLE, Christopher (University of Melbourne)

Session Classification : Radiotherapy and Radiobiology

Track Classification : Radiotherapy and Radiobiology