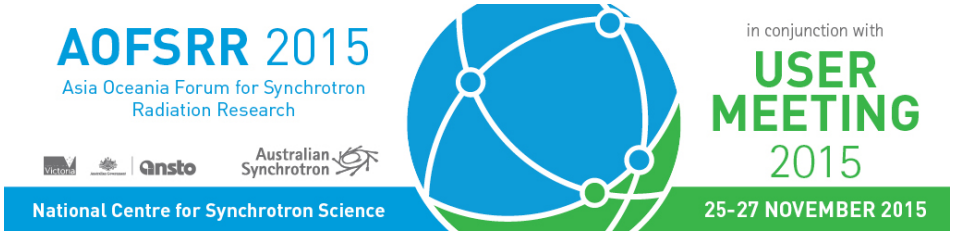

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MRT Dosimetry at the Australian Synchrotron using the X-Tream System

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Microbeam Radiation Therapy (MRT) uses synchrotron-generated X-rays to deliver a treatment dose at a very high dose rate via collimated planar, parallel array of microbeams. The synchrotron X-ray beam on the Imaging and Medical Beamline (IMBL) at the Australian Synchrotron (AS) is spatially fractionated by a tungsten carbide/kapton multislit collimator (MSC) giving beam dimensions of either 25 or 50μm FWHM microbeams with center-to-center spacing of 200μm. Using these beam dimensions the dose volume effect is evident and results in a tissue sparing effect. One consequence of this effect, is healthy tissue sparing whilst maintaining tumor control. Due to the high dose rate and complex structure of the radiation field, current traditional dosimeters are not optimal for dosimetry as they lack the required high spatial resolution, and/or real-time readout. The X-Tream dosimetry system, is a system based on a Silicon Strip Detector (SSD) with real-time readout and high spatial resolution, and has been developed at the Centre of Medical and Radiation Physics (CMRP). Preliminary dosimetric measurements at the AS, for both broad beam and microbeams, were investigated using the X-Tream system and Pinpoint ionization chamber for dose calibration. The Peak-to-Valley-Dose-Ratios (PVDRs), which are vital dosimetry parameters in the Quality Assurance (QA) in MRT, were acquired and evaluated at a variety of depths for both water and solid-water phantoms using a variety of field sizes using both microbeam dimensions.

Keywords

X-Tream Dosimetry IMBL MRT PVDR SSD

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