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Use of an Optical Microscope method to calculate the PVDR's for Synchrotron MRT

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The radiobiology of microbeam radiation therapy (MRT) is poorly understood and this is confounded by difficulties in measuring the dose-distribution. Our investigation assesses the use of microscopy to determine the peak and valley dose in Synchrotron microbeam radiation therapy (MRT). MRT is performed using the horizontal collimator with arrays of 25 μ m wide x-ray beams with a pitch of 175 μ m. Three types of Gafchromatic films were irradiated due to their differences in dynamic range. In addition, each type of film was imaged on a series of microscopes. Key parameters for imaging the irradiated film were bit depth and spatial resolution of the microscope camera. Greyscale images taken with and without filters and full colour images were all compared. Also considered was the imaging workflow, with the option for automated loading and imaging of samples an important factor in reducing user error. In conclusion, it was found that a greyscale microscope camera with a bit depth of 14 and pixel size of 0.32 μ m at a 20x objective was ideal to capture the characteristic of the microbeams.

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MRT, microscopy

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