# MOSFET dosimetry with high spatial resolution in intense synchrotron-generated x-ray microbeams

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Different kinds of dosimeters have been tested experimentally for measuring the dose deposition in synchrotron-generated x-ray microbeams. The high photon flux from the synchrotron, the high spatial resolution required, together with the comparatively low x-ray energies used, prevent dosimetry with detectors used in standard radiotherapy departments. A MOSFET has been used for this study since its sensitive element is a narrow layer (~ 1µm) which is adequate for the beamsizes used. The main application of interest in this work is microbeam radiation therapy (MRT). In MRT, arrays of rectangular micrometer-wide beams of variable height, produced by a multi-slit collimator (MSC), are used to irradiate biological targets.

Dose deposition inside a plastic phantom, produced by x-ray microbeam arrays shaped by two different MSC's, were measured with MOSFET's. Peak and valley doses were subsequently determined in the center of the microbeam arrays and the ratio between these (PVDR's) was evaluated to find out if the quality, *i.e.* regularity in height and sharpness of beam edges, of the microbeams influenced this important parameter. Using Monte Carlo (MC) simulations, the dose deposition in plastic phantoms was calculated for a simplified irradiation geometry and compared with measurements. The MC calculations give estimations of PVDR's that are more than a factor of two higher compared to the ones measured for the smallest microbeams but the agreement is getting better (~50%) as the rectangular microbeams are getting higher (25 µm × 1 cm instead of 25 µm × 500 µm). The PVDR's measured when using the more recently produced MSC, the so called Tecomet MSC, were found to be more similar to MC calculated values compared to when the so called Archer MSC was used. A discussion about the reasons for the large discrepancies is presented.