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Report:

In the Microbeam Radiation Therapy (MRT) preclinical program at the ESRF, 20-30 µm-wide, 207 µm center-to center, ~10 mm-high parallel microbeams of hard, broad-"white"-spectrum X rays (~50-600 keV) are utilized. The aim of the project is to explore the possibility of the therapeutical use of MRT for the treatment of brain tumors in infants for whom other kinds of radiotherapy are inadequate and/or unsafe.

The microbeams are produced by an Archer-type multislit collimator that produces an array of up to 80 microbeams. Dosimetry at a micron scale is necessary to correlate the biological effects of the irradiation with the dose distribution in the tissues at different depths. Experimental dosimetry in phantoms should validate the Monte-Carlo simulations performed with the PSI-Geant program.

In some feasibility tests performed in 2001, we demonstrated that MOSFET detectors, used in the "edge-on" mode, are suited for MRT because they are able to provide a dosimetric mapping with 1 micron spatial resolution. The full report of these preliminary trials is described in [Rosenfeld, 2001]

In this latest experiment we were able to improve the microdosimetric characterization of the irradiated area, by measuring selected points in the peak and valley regions of a microbeam-irradiated tissue-equivalent phantom. Such irradiation causes minimal damage to normal tissues, possibly because of rapid repair of their microscopic lesions. Radiation damage from an array of parallel microbeams tends to correlate with the range of peak-valley dose ratios (PVDR).

We measured doses in the water like 10x10x10 cm^3 phantom at different depths in the range 2-62 mm, by varying parameters like the distance from the central beam and the total number of microbeams in the array.

We have also fully characterized the size of some selected microbeams (2 microbeams across the central axis and the outer beam in the array) and evaluated the dose distribution around them.

The complete description of the measurements and the comparison with the MonteCarlo simulations are reported in [Bräuer-Krisch, 2003].

A.B. Rosenfeld, M. Lerch, T. Kron, E. Bräuer-Krisch, A. Bravin et al. "Feasibility study of online high-spatial-resolution MOSFET dosimetry in static and pulsed x-ray radiation fields"
IEEE Transactions on Nuclear Science, 48 (6), pp.2061 -2068, 2001

E. Bräuer-Krisch, A. Bravin, M. Lerch, A. Rosenfeld, J. Stepanek, M. Di Michiel, J.A. Laissue, "MOSFET Dosimetry for Microbeam Radiation Therapy at the European Synchrotron Radiation Facility [ESRF]" **Accepted for publication in Medical Physics, 2003.**