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OSI: A Prototype Microstrip Dosimeter for Characterisation of Medical Radiotherapy and Radiosurgery Systems

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The treatment of cancer using radiotherapy is rapidly advancing; particularly with the advent of Intensity Modulated Radiotherapy (IMRT) which allows dynamic shaping of the dose delivered to the patient. This makes possible the treatment of tumours close to critical areas of the body eg. the spine. To allow the full potential of this powerful technique to be realised requires matching advances in techniques to characterise the dose distributions of radiotherapy systems for quality assurance so that accurate IMRT models can be implemented in treatment planning systems. This requires detailed knowledge of the dose distribution in high gradient regions with submilimetre spatial resolution, easy deployment in a hospital environment and rapid characterization to minimise the downtime of these valuable and busy facilities. The measurement of precise, film-like, dose distributions on-line is particularly valuable for dynamic IMRT as well as for Stereotactic Radio-Surgery (SRS), which uses small beams of the order of 1cm. The goal of the OSI project is to develop a prototype multichannel dosimeter based on well established Si micro-strip technology and multi-channel readout electronics, and demonstrate its operation in a hospital radiotherapy system. An IMRT prototype composed of a 0.25 mm pitch, 128 channel pixel array from Micron and read-out by one XDAS board has been tested in a clinical LINAC and shown to measure the penumbra with an accuracy comparable to film (figure 1 above). A 512 channels (4 XDAS boards) version of the previous detector, covering a field of view of 128 mm, is being assembled. A 2d pixel detector intended both for SRS and IMRT has been designed. It has 22x22 channels with 1 mm pitch and 0.9 mm x 0.9 mm pixel size (0.2 mm x 0.2 mm for IMRT), and will use the same 4 XDAS read-out system as the 512 channels pixel array. In this paper we will decribe the prototypes and report on beam tests using a Weston Park Hospital clinical LINAC.

Author: Dr REDONDO-FERNANDEZ, Ignacio (Department of Radiotherapy Physics, Weston Park Hospital)

Co-author: BUTTAR, C (Department of Radiotherapy Physics, Weston Park Hospital)

Presenter: Dr REDONDO-FERNANDEZ, Ignacio (Department of Radiotherapy Physics, Weston Park Hospital)

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