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Technology transfer of microstrip detectors; from medical applications to synchrotrons

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The microstrip detector is the workhorse of position sensitive detectors for tracking in particle physics experiments. Spatial resolution of a few μm is easily achieved at read-out rates of few MHz. Utilising modern fabrication techniques (photolithography and ion implantation) provides with reliable and versatile devices with designs that can be tailored to meet the demands of different and diverse applications where PSD's are in demand, ranging from medical dosimetry to beam line monitoring in synchrotrons. To that extend we build a silicon microstrip detector around the XCHP ROIC originally developed for SR experiments. This comprises of a series of charge sensitive preamplifiers (128 of) working on integrating mode with on chip multiplexing and correlated double sampling (CDS). Now commercially available by ETL as part of XDAS, it provides with a complete, versatile and low cost PC based DAQ system. The use of multileaf collimators (MLC) in modern radiotherapy techniques like IMRT requires dynamic measurements in the presence of high dose gradients. This requires a dynamic range dosimeter with sub-millimetre spatial resolution as well as high linearity. In addition, real time measurements will be beneficial to the QA procedures of modern LINACs. Preliminary trials of our prototype microstrip detector at the Weston Park Hospital in Sheffield (UK) produced very encouraging results showing a film like penumbra (Figure 1). Further results of the detector's evaluation as PS dosimeter for IMRT and from experiments with other radiotherapy modalities, like the synchrotron based Microbeam Radiation Therapy (MRT) will be presented.

In addition, results will be presented with its use as beam position monitoring device in synchrotron experiments. This is very important with the ever decrease in sample and beam size accordingly, which imposes severe constrain in beam focus and stability especially for measurements that require long acquisition times, as any drift will be detrimental or at worst catastrophic for the data quality.

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