Development of a Liquid Scintillation Detector for External Beam Dosimetry

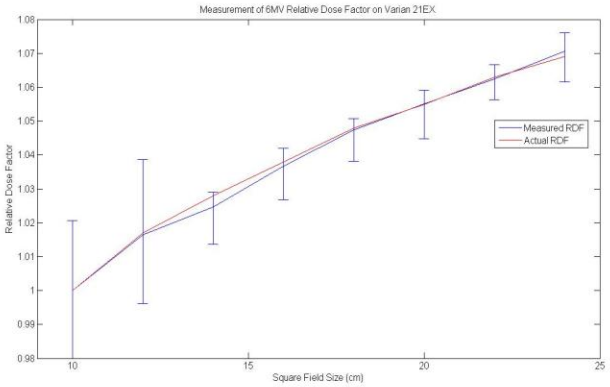

Figure 1 Measurement of 6MV RDF

The light produced in the scintillator is transported via an optical fiber to the CCD face where it is measured. At the same time, a reference fiber transmits Cerenkov photons to a different part of the CCD. Cerenkov radiation is the production of photons in the visible spectrum whenever a particle travels greater than the speed of light in a medium. It has been shown (A.S. Beddar, 1992) that reduction of Cerenkov noise is necessary for accurate dosimetry.

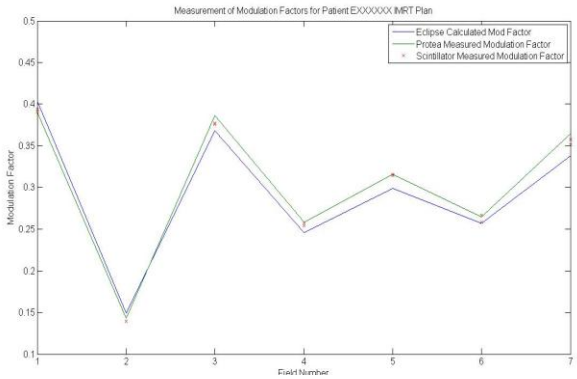

Figure 2 Measurement of IMRT modulation factor

Measurements with small amounts of Cerenkov radiation, or measurements with constant amounts of Cerenkov radiation have small uncertainties. Measurements with varying field sizes, such as IMRT treatments are more problematic as the removal of Cerenkov radiation has to be more precise. The more problematic measurements have been displayed in Figures 1 and 2. The discrepancy between the Eclipse calculated modulation factors and those measured by the detectors is due to the fact that the measurements were taken at d_{max}, instead of the reference depth. Figure 3 displays the comparison of values for water's TMR as determined by the scintillator detector and an ion chamber.

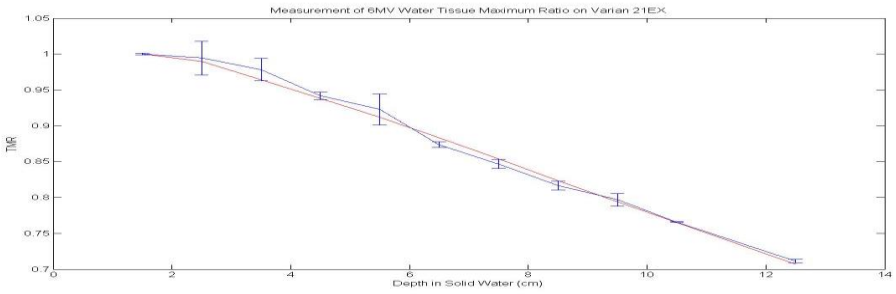

Figure 1 Measurement of TMR

Bibliography

A.S. Beddar, T. M. (1992). Cerenkov light generated in optical fibres and other light pipes irradiated by electron beams. *Physics in medicine and biology* , 925-935.