AbstractID: 3836 Title: The study of the dosimetric properties of 'RadGel', a new dosimeter for three-dimensional gel dosimetry

Purpose: The development of advanced radiation treatment techniques such as IMRT has prompted an immediate need for a dosimetry system that can provide accurate and convenient measurement of complex three-dimensional (3D) dose distributions. Gel dosimetry has proved a promising candidate, but present gel-dosimeters are still not in widespread routine clinical use. In this work we investigate the dosimetric properties of a new 3D dosimetry material, RadGel™, which has potential for application in radiation therapy.

Method and Materials: Samples of RadGel™ contained in optical cuvettes (1cmx1cmx5cm) were irradiated in a series of experiments to determine sensitivity to dose, dose rate, energy, and stability of response with time post-irradiation. Pre and post irradiation measurements were made of the optical-density profile along the long axis of the cuvettes using a custom laser scanning system at 632nm. The radiation induced spectral optical density (OD) change of RadGel™ was also measured by a conventional spectrophotometer.

Results: The spectrophotometric measurements indicated that peak radiation induced OD change occurred at ~600nm (FWHM ~100nm). A linear relationship was observed between OD changes and dose, and negligible dependence on dose rate. OD measurements a week after irradiation revealed significant degradation of optical response compared with scans 24 h post irradiation, but the timescale of these changes is still much improved from existing non-scattering 3D dosimetry materials.

Conclusion: The RadGel™ material has several attractive qualities for 3D dosimetry. In particular RadGel™ is more robust than established non light-scattering 3D dosimeters to exposure to air and water. Together with an improved stability of response with time RadGel™ appears a practical and convenient material. Further tests are required on larger volumes of RadGel™ to determine true potential.