AbstractID: 3784 Title: Characterization of a new 3D dosimetric material "PRESAGE" TM

Purpose: A pressing goal of modern radiation dosimetry is the development of effective and convenient three-dimensional (3D) dosimetry systems that can measure and verify complex dose distributions. 3D dosimetry materials do exist but improvements would be valuable especially with regards to stability, uniformity, ease of handling and re-usability. In this work we investigate and characterize the dosimetric properties of a promising novel material PRESAGE™.

Method and Materials: A series of experiments were conducted to investigate the dose response, linearity, stability, reproducibility and dose rate dependency of PRESAGE™. To facilitate efficient evaluation of a wide range of parameters the experiments were performed on small samples of PRESAGE™ contained in optical cuvettes (1cmx1cmx5cm). A laser scanning system was developed that enabled pre-and post irradiation scanning of the profile of optical-density with depth along the central path of individual cuvettes at 633 nm. Cuvettes were also scanned in a spectrophotometer to detect spectral absorption.

Results: The PRESAGE™ was found to be robust in regards to handling and exposure to laboratory environment. Linear relationship of optical response with dose was observed (within 3%) in cuvettes that had been handled and exposed to lab environment for significant periods. Good stability of optical contrast was observed up to 13 days post irradiation and the optical response had little dependency (within 3%) on dose rate. The dose response is significantly less than that observed with polymer gel dosimeters but PRESAGE™ formulations with enhanced sensitivity (0.16Gy/cm) have not yet been fully characterized.

Conclusion: These evaluations of small samples of PRESAGE™ indicate a dosimeter that is highly practical and with good dosimetric properties. Of particular importance is PRESAGE's robustness in terms of exposure to air and materials, high stability of response with time post irradiation, and its high optical clarity.