

Clinical implementation of technologically sophisticated treatment planning and delivery techniques, such as intensity-modulated radiotherapy, has created a demand for accurate 3-D dose verification of planned dose distributions. Polymer gel dosimetry is a promising technique for executing the required verification, as many recent publications have demonstrated. Irradiation of the gel causes radiation-induced polymerization of acrylic monomers, leading to an increase in R_2 , the transverse or spin-spin relaxation rate, of water protons in proximity to the polymers. The R_2 distribution may be visualized using MRI. The dose distribution may then be determined, as R_2 is a linear function of dose. The radiation dose-dependent formation of polymer particles in the polymer gel also causes light attenuation by Rayleigh scattering, therefore the optical density per unit length can be calibrated to dose. Optical tomographic scanning of the gel produces a 3D data set of the dose distribution. In this study the translate-rotate 3D OCT-OPUSTM scanner manufactured by MGS Research, Inc. (Madison, CT) is used. It utilizes a single He-Ne laser beam that is translated across a rotating gel. A single photodetector collects the transmitted light and the planar image is reconstructed from multiple angular projections via filtered back projection. Automatic selection enables scanning the entire gel volume with an adjustable resolution, down to sub-millimeter pixel size. The two methods of extracting the dose distribution from the polymer gel (MRI and optical CT) will be compared, with the emphasis on the spatial resolution, ease of execution and ability to analyze different ranges of absorbed dose.