

Sensitivity calibration procedures in optical-CT scanning of polymer gel dosimeters

In optical-CT scanning of gel dosimeters, the understanding of the dose response of a dosimeter is important for both the determination of the final dose distributions and the optimal utilization of the dynamic range of a scanning system. In this work we compare the performances of three different dose sensitivity calibration methods using the BANG3 polymer gels (MGS Research, Inc., Madison, CT): a) spectrophotometer measurement of a series of glass test tubes irradiated with graded doses; b) optical-CT (OCT) scanning of gel phantoms irradiated to graded doses with multiple small fields; c) percent depth dose (Pdd) comparison between the OCT scans and ion chamber measurements for simple electron and photon fields. We observed that the gel sensitivities in test tubes could be different from those in bulk volumes by as much as a factor of 2, depending on the difference in the temperature environments during which the gels were formed. The multiple-beam irradiation and the Pdd matching methods are more stable and give a linear dose response for the BANG3 gel studied. Dose distributions obtained using these calibration methods are compared with those from planning system and film measurements for several static and IMRT plans.

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