AbstractID: 2006 Title: Energy dependence of the sensitivity of MD55-2 radiochromic film for brachytherapy dosimetry.

The high dose gradients and the high dose magnitude in the immediate vicinity of brachytherapy sources create a challenging environment for dosimetry, especially for intravascular brachytherapy dosimetry, for which distances in the mm range are critical. Radiochromic film has been widely used for the characterization of intravascular brachytherapy sources because of its wide dynamic range and other properties. A key issue that remains controversial is the energy dependence of the film sensitivity. We present here a systematic study investigating the response using ISO standard x-ray beams with mean energies of 19.2, 32.1, 64.1, 119.2, and 216.2 keV, and with Cs-137 gamma rays at PTB and orthovoltage and megavoltage x-ray beams at Yale with nominal energies of 38, 62 and 103 keV, and 6, 10, and 18 MV. In addition, two research beams were set up to simulate Pd-103 and I-125 sources and used in this study. Electron irradiations were performed using Sr-90/Y-90 beta rays at PTB and with 6, 12 and 20 MeV accelerator beams at Yale. The dose-rate dependence of the response was investigated using the Yale Cs-137 irradiator at dose rates of 0.024, 0.28, 1.7 and 11.8 Gy/min. Our results compare reasonably well with most of the published data , but we also observe differences of up to 20% near photon energies around 100 keV. We present here a detailed comparison and critique of all available data and present our recommendation for the energy response of MD55-2 radiochromic film.