

AbstractID: 9515 Title: Evidence with ultra-high resolution film dosimetry of dose enhancement due to backscattered Sr-90 beta radiation from a stent

Monte Carlo calculations have been reported that predict high-Z stent struts embedded in the vessel wall in an in-stent restenosis model cause dose enhancement to the peri-stent tissues due to backscattered radiation. This work provides evidence of such a dose enhancement for a Sr-90 source using ultra-high resolution readout of GafChromic HD810 films. Two phantom configurations were designed, one for film alone and the other one for film with stent. We used a Sr-90 planar source to irradiate the films with the same exposure time using the same source-film geometry. A Palmaz-Schatz PS153 steel stent was flattened and positioned in the phantom, with the film emulsion layer (7 μ m) in contact with the stent struts. After irradiation, films were read with a Photoelectron Corporation (PeC) microdensitometer with ultra-high resolution of 12 μ m per pixel, to image the narrow strut width (about 100 μ m). For the film irradiated without the stent, an average net optical density (NOD) value of 0.673 over a uniform area was obtained. The stent factor was obtained as the ratio of the NOD for the film with stent to the average NOD of 0.673. The profiles of NOD and stent factors along a few lines across the stent struts were plotted, demonstrating variation consistent with the positions of the struts. Above the struts, the enhancement was up to about 10%. We have demonstrated the capability of using a microdensitometer with ultra-high resolution of about 10 μ m to read GafChromic HD810 film to verify the dose enhancement due to stent.