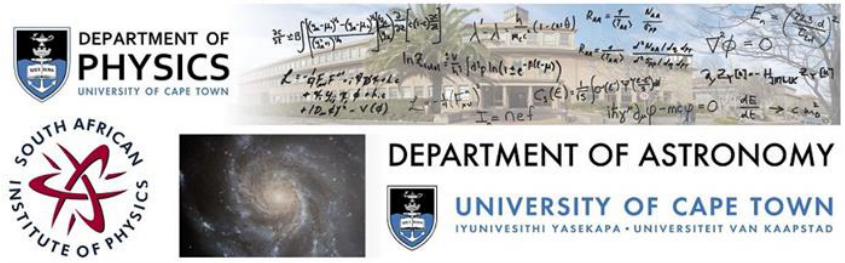

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Dose perturbation effects of unilateral Ti prosthesis in the dosimetry of 6 MV photon beam

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Abstract content
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During irradiation of malignancies in the hip region with external megavoltage photon beams, the presence of metallic prostheses could partially shield the beam at the target and alter the dose distribution. This may cause a dramatic difference in treatment outcome. This study investigates the magnitude of 6 MV photon beam dose perturbations caused by unilateral titanium prosthesis and were measured with Gafchromic EBT2 film in a pelvic phantom made out of nylon slices. Dose perturbations were measured and compared using dose maps and beam profiles for a range of field sizes between 3×3 and 10×10 cmˆ2. The magnitude of these perturbations were quantified as dose correction factors, DCFs which is defined as the ratio of the dose influenced by the prosthesis and the unaltered beam. A DCF of unity marks the margin between dose enhancement (where DCF > 1.0) and dose reduction (where DCF < 1.0). DCFs above unity were observed on the proximal (beam entry) side of the prosthesis while DCFs below unity occurred in the distal region (behind the prosthesis). For the studied field sizes maximum DCFs ranged between 1.251±0.003 and 1.283±0.019. Minimum DCFs ranged between 0.746±0.010 and 0.810±0.014. The DCFs on the proximal side of the prosthesis drop off rapidly with distance from the proximal prosthesis-nylon interface. The results of the study indicate that at the nylon-prosthesis interface, about 25% of dose enhancement is due to electron backscatter from the prosthesis and at least 19% of dose reduction behind the prosthesis is due to photon attenuation.

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Dr Freek Du Plessis <DuPlessisFCP@ufs.ac.za>
University of the Free State,Bloemfontein

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Primary author: Dr ADE, Nicholas (Medical Physics Department, University of the Free State, Bloemfontein)

Co-author: Dr DU PLESSIS, Freek (Medical Physics Department, University of the Free State, Bloemfontein)

Presenter: Dr ADE, Nicholas (Medical Physics Department, University of the Free State, Bloemfontein)

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