

AbstractID: 9024 Title: Dark current radiation produced in step-and-shoot IMRT on Clinac 21EX linear accelerator

Dark current radiation (DCR) is produced during pause states between IMRT delivery of the MLC segments by spurious electrons present in the waveguide while the waveguide is still powered by the microwave generator. This DCR contributes to the total dose in the treatment field as well as to the whole body dose, but is not usually accounted for in the treatment planning systems. In a recent study<sup>1</sup> the dose due to DCR in Siemens Primus accelerators was reported to be as high as 0.7% of the dose at  $d_{\max}$  for a  $10 \times 10$  cm<sup>2</sup> field in a 15 MV beam. In this work we measure the DCR for Varian Clinac 21EX linear accelerator in a water phantom and investigate the quality and dose rate of DCR as a function of machine MU/min settings for both beam energies. For 400 MU/min setting the DCR dose rates are  $7.4 \pm 2.5$  and  $10.8 \pm 1.6$  ( $\times 10^{-3}$  cGy/s) for 6 MV and 15 MV x-ray beams, respectively. Estimated DCR dose for a typical step-and-shoot IMRT pelvis treatment is found to be 0.34% of the prescribed dose. Because of this small magnitude, DCR is unlikely to have any significant clinical effect in our case. However, DCR measurements are recommended as part of the machine commissioning and QA, as the magnitude of DCR may be manufacturer dependent as well as it may depend on the quality and age of the electron gun.

<sup>1</sup>C Cheng et al Med. Phys. 29 (9), 1974-1979 (2002)