

Purpose:To investigate the impacts of scanning parameters on the characterization of the GafChromic XRQA2 films and eventually on the accuracy of the measured kV doses when both reflection and transmission scanning modes are used. To study some characteristics of this film model.

Methods:GafChromic XR-QA2 (International Specialty Products, Wayne, NJ) films were irradiated in air by the X-ray Volume Imager (XVI) mounted on the Elekta linear accelerator (Elekta, Crawley, UK). They were then scanned using the Epson Expression 10000 XL flat-bed document scanner (Seiko Epson Corporation, Nagano, Japan) and analyzed using ImageJ software (National Institute of Health, Bethesda, MD). The effect of the scanning parameters: scanning reproducibility; scanner non uniformity; scanner resolution (dpi); scanner configuration; region of interest of the analysis; and scanning orientation on the characterization process was investigated. Film characteristics such as post irradiation growth of pixel value were also studied.

Results:The characterization process is sensitive to the scanning parameters. Each parameter could lead to a variation in the mean pixel value (PV), which would eventually affect the uncertainty of the measured doses. The magnitudes of these variations were found to differ from one parameter to another and ranged from 1 % to 5% and even more. The scanner nonuniformity in particular led to a variation from 5% to 15% in the mean PV. Scanner resolution and configuration were also identified as important parameters. Post irradiation growth of PV was observed over the first 24 h (increased by 5%) and leveled off thereafter (< 0.5% change).

Conclusions:The magnitudes of the effect of the different scanning parameters on the PV have been quantified, some of them found to be significantly affecting the PV. Hence, the scanning procedure must be carried out with a great care in order to minimize the uncertainty of the measured doses.