close window

Print

Submitted Abstract

on April 13, 03:03 AM

for Astro

Abstract Proof

CONTROL ID: 161378

CONTACT (NAME ONLY): Jean-Noel Badel

Abstract Details

PRESENTATION TYPE: Oral or Poster

CATEGORY: Radiation Physics

SUB-CATEGORY: Miscellaneous Cancer

KEYWORDS: EPID, dosimetry, Monte Carlo.

AWARDS:

Abstract

TITLE:

Monte Carlo simulations of the transit dose from amorphous silicon electronic portal images.

AUTHORS (ALL): Badel, Jean-Noel [1, 2]; Ginestet, Chantal [1]; Dufour, Nathalie [1]; Sarrut, David [1, 3].

INSTITUTIONS (ALL): 1. Radiotherapy Department, Leon Berard Anticancer Center, Lyon, France.
2. CREATIS (UMR CNRS 5515, Inserm U 630), INSA , Villeurbanne, France.
3. LIRIS (UMR CNRS 5205), Universite Lumiere Lyon2, Bron, France.

ABSTRACT BODY:

Purpose/Objective: We propose to study the transit dose from amorphous silicon electronic portal images by Monte Carlo (MC) simulations and experiments measures.

Materials/Methods: We compared pixel values of portal image with dose measured from ionization chamber and dose obtained from two MC simulations codes: MCNPX and GATE (based on Geant4).
The ELEKTA iView GT electronic portal imager is mounted on SI-15 accelerator. Several images were acquired in function of field size (5x5, 10x10, 15x15, 20x20 and 25x25 cm^2), attenuator phantom thickness (5, 10 cm of PMMA) and photon beam energy (6 and 10 MV). In the portal image, we extracted the average pixel value (P) in a region of the interest of 1cm^2 centred at beam axis (ROI). In the same conditions, we performed dose measures from an ionization chamber. In MC simulation, the imager has been accurately modelled (according to constructor data) and the energy spectrum of the source beam (for each energy) has been described. To analyse the detector response in function of irradiation parameters, MCNPX and GATE simulations were performed to obtain a photon energy spectrum at four levels in the modelled system (after phantom, before imager, before and after phosphor layer) and to calculate the deposit dose in the ROI within the phosphor layer.

Results: Dose (measured by ionization chamber) and pixel values were found to be linearly correlated with the number of monitor unit (MU) with different slopes depending on field sizes and phantom thickness (correlation coefficient $R^2 > 0.999$).
The relationship between dose and pixel value was linear ($R^2 > 0.997$) and independent of field size and phantom thickness (Fig. 1.a).
In the same conditions, we compared the dose values normalized by field size of 100 cm^2

calculated by MCNPX (DMCNPX) and GATE (DGate) with the corresponding average pixel value (P). The ratios P/ DMCNPX and P/ DGate were constant in function of the field sizes with a relative standard deviation of ~1.4% for MCNPX and ~2.6% for GATE (Fig. 1.b).

Conclusions: The dosimetric abilities of the iView GT and the good agreement between the simulations and the experiments allow to compare the portal transit dose with the simulated transit dose in order to perform the treatment control. Works are ongoing to study the spectral components of the beam obtained at the fours levels to understand the influence of each elements in the imager.

(No Table Selected)