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Monte Carlo study of photon dose distributions produced by saturne 43 linear accelerator

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BEAMnrc is a Monte Carlo (MC) code for simulation of photon and electron transport in the radiotherapy field. The purpose of this paper was to develop a technique to derive best estimates for the energy and intensity distribution of the incident electron beam by comparing calculated and measured values for the linear accelerator (linac) Saturne 43 machine. We varied the initial electron energy and full width half maximum (FWHM) of the radius of the electron beam incident on the tungsten target to find the percentage depth dose (PDD), dose profile (DP) curves, the tissue-phantom ratio $TPR_{20/10,}$ the energy fluence distribution and angular distribution for a square field size 10×10 cm2. It is found that our results are quantitatively in good agreement with experimental PDD and lateral profile at 10 cm depth. The TPR20/10 agreed well with the literature publisher works. Furthermore, we can reduce the discrepancy between measured and calculated data photon dose distributions to 1.5%/1 mm in the gamma index method for the energy 11.8 MeV and FWHM=0.17 cm. MC simulation of the treatment head of the Saturne 43 machine was successfully done changing the initial properties of electron source in the MC BEAMnrc code.

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Possibility of using near infrared irradiation for prostate cancer imaging and its early diagnosis

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Prostate cancer is the second cause of cancer death in men worldwide. The existing methods of prostate cancer imaging are magnetic resonance imaging (MRI) and positron emission tomography (PET). However, main drawback of these methods is that they are not able to detect small volumes of cancerous outgrowths. Besides, these methods are highly complicated and partially invasive. This circumstance resulted in searching of a simpler, non-invasive method for the detection of prostate cancer at early stage of its development when tumor dimensions are small. In the present work, we show that near-infrared irradiation (NIR) can be used for visualization and diagnosis of cancer outgrowth in the prostate *in vitro*. Experiments were carried out on the prostates derived from radical prostatectomy. After operation, a prostate was examined by the use of infrared rays and trans-illumination images were obtained. For this purpose, prostate was illuminated with near infrared radiation (NIR) by the means of light emitting diodes (850-920 nm). NIR passing through the prostate was captured by charge-coupled device (CCD camera) which in turn was connected to PC. Intensity of near infrared light passing through the noncancerous prostate tissue is nearly homogeneous. Intensity of near infrared light passing through the cancerous outgrowth is lower than the intensity passing through the non-cancerous tissue of the same prostate; thereby cancerous formations are differentiated as the dark areas in the relatively white background. Specially developed software analyzes and processes a distribution of intensities of the grayscale images, measures the ratios of their strength and determines the rate of prostate malignancy.

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