

Neutron Contamination in 18 MV Medical Linear Accelerator

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Abstract : Photon radiation therapy used to treat cancer is one of the most important methods. However, photon beam collimator materials in Linear Accelerator (LINAC) head generally contains heavy elements is used and the interaction of bremsstrahlung photon with such heavy nuclei, the neutron can be produced inside the treatment rooms. In radiation therapy, neutron contamination contributes to the risk of secondary malignancies in patients, also physicians working in this field. Since the neutron is more dangerous than photon, it is important to determine neutron dose during radiotherapy treatment. In this study, it is aimed to analyze the effect of field size, distance from axis and depth on the amount of in-field and out-field neutron contamination for ElektaVmat accelerator with 18 MV nominal energy. The photon spectra at the distance of 75, 150, 225, 300 cm from target and on the isocenter of beam were scored for 5x5, 10x10, 20x20, 30x30 and 40x40 cm² fields. Results demonstrated that the neutron spectra and dose are dependent on field size and distances. Beyond 225 cm of isocenter, the dependence of the neutron dose on field size is minimal. As a result, it is concluded that as the open field increases, neutron dose determined decreases. It is important to remember that when treating with high energy photons, the dose from contamination neutrons must be considered as it is much greater than the photon dose.

Keywords : radiotherapy, neutron contamination, linear accelerators, photon

Conference Title : ICCSR 2017 : International Conference on Cancer Science and Research

Conference Location : Amsterdam, Netherlands

Conference Dates : July 10-11, 2017