World Academy of Science, Engineering and Technology
International Journal of Health and Medical Engineering
Vol:9, No:09, 2015

Effect of PMMA Shield on the Patient Dose Equivalent from Photoneutrons Produced by High Energy Medical Linacs

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Abstract : One of the important problems of using high energy linacs at IMRT is the production of photoneutrons. Besides the clinically useful photon beams, high-energy photon beams from medical linacs produce secondary neutrons. These photoneutrons increase the patient dose and may cause secondary malignancies. The effect of the shield on the reduction of photoneutron dose equivalent produced by a high energy medical linac at the patient plane is investigated in this study. To determine the photoneutron dose equivalent received to the patient a Varian linac working at 18 MV photon mode investigated. Photoneutron dose equivalent measured with Polycarbonate films of 0.25 mm thick. PC films placed at distances of 0, 10, 20, and 50 cm from the center of X-ray field on the patient couch. The results show that by increasing the distance from the center of the X-ray beam towards the periphery, the photoneutron dose equivalent decreases rapidly for both open and shielded fields and that by inserting the shield in the path of the X-ray beam, the photoneutron dose equivalent was decreased obviously compared to open field. Results show the shield, significantly reduces photoneutron dose equivalent to the patient. Results can be readily generalized to other models of medical linacs. It may be concluded that using this kind of shield can help more safe, inexpensive and efficient employment of high energy linacs in radiotherapy and IMRT.

Keywords : photoneutron, Linac, PMMA shield, equivalent dose
Conference Title : ICMPRPR 2015 : International Conference on Medical Physics, Radiation Protection and Radiobiology
Conference Location : Istanbul, Türkiye
Conference Dates : September 28-29, 2015