

# The Measurement of Gamma Dose in Radiotherapy Unit

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Cancer is one of the most deadly diseases posing threat for our health. The most important method for eradicating of cancer cells is photoradiotherapy. Electrons accelerated by the accelerator are converted to photons in the process of bremsstrahlung. These photons are focused on diseased cells. Photon leaving accelerator head should assure a given dose intensity in cancer cells. Measuring of beam parameters at apparatus output is essential to determine the dose. In this study, Suleyman Demirel University research and education hospital in radiation Oncology department which has located at 18 MeV accelerator in energy gamma dose was measured.

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## 1. Introduction

Cancer is one of the main diseases to threat for human health. Besides surgery and medical treatment (chemotherapy), radiotherapy is commonly used treatment method to kill cancer cell. For this method high energy photon is required. Clinic Linear Accelerator (cLINAC) relatively lower energy than other LINAC has been used to obtain photon via bremsstrahlung processes. When accelerated electron beam impinges to the thin target bremsstrahlung occurs and photon can be created.

Those photons can be focused on cancer cell and kill cancer. In order to focus photon beam collimator materials in LINAC head generally contains heavy elements is used and the interaction of bremsstrahlung photon with the such heavy nuclei the neutron can be produced inside the treatment rooms. The production of neutron associated to gamma capture becomes significant when the energy of a linear accelerator is higher than 10 MeV. In this study gamma dose rate has been measured in radiotherapy room [1–3].

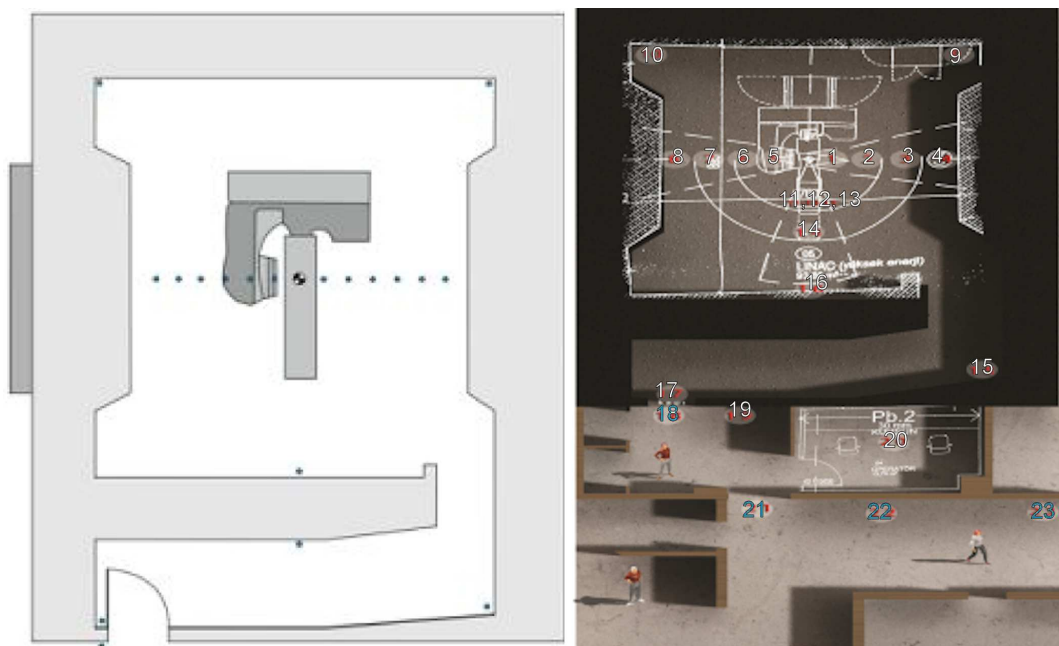


Fig. 1. 2D-3D medical linac measurements area (points 1–23).

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**2. Material and method**

Radiation has existed since creation of universe and started to be used in a large of different fields nowadays. As human health is important one of the main fields of radiation utilization is medical science, especially in the diagnostic and treatment of diseases. Af-



Fig. 2. Medical linac used in experiments.

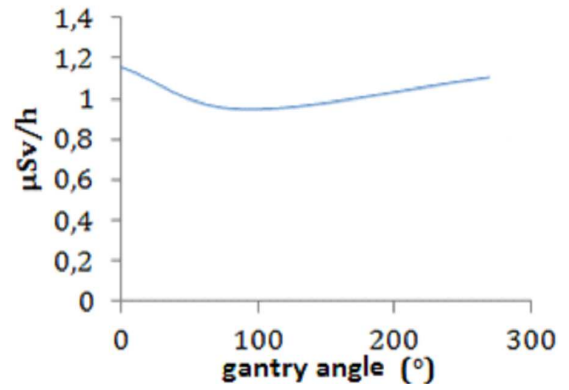


Fig. 6. Gamma dose graphics gantry angles (0°) (points 11–13).

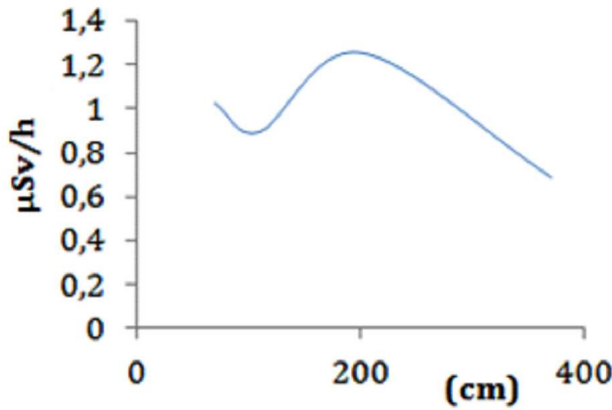


Fig. 4. Gamma dose graphics (points 1–4).

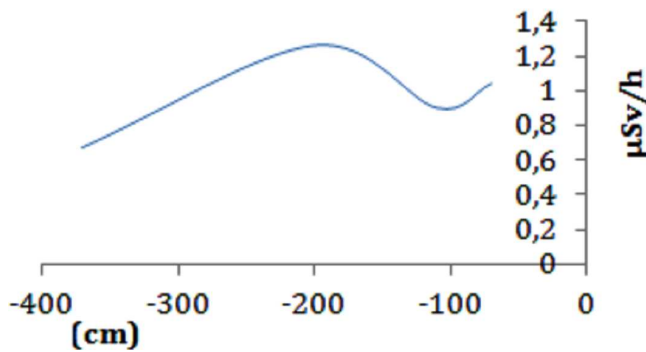


Fig. 5. Gamma dose graphics (points 5–8).

ter chemotherapy treatment photon radiotherapy is commonly used method in cancer treatment. Photon is generated from the high-energy electron accelerators (LINAC) where an electron beam can be accelerated up to about 20 MeV. In medical equipment electron beam impinges into thin sheet of metal photons are created

TABLE

Measured gamma doses.

point	[μSV/h]
1	1.03
2	0.9
3	1.26
4	0.69
5	1.04
6	0.9
7	1.26
8	0.67
9	0.56
10	0.59
11 (angle of table 0°)	1.16
12 (angle of table 90°)	0.95
13 (angle of table 270°)	1.11
14	0.91
15	0.1
16	0.1
17	0.1
18	0.1
19	0.1
20	0.1
21	0.1
22	0.1
23	0

via bremsstrahlung processes hospital. The photoneutrons are produced in electron linear accelerators when the bremsstrahlung energy exceeds the threshold energy of photonuclear reactions of the materials [1]. A significant number of neutrons are generated via (γ,n) reaction. Those contamination comes from the target, the filter, the collimator and any places struck by high energy X-rays ([1–6]). Besides the known effects of radiation, the effects of surgical operations are still largely unknown. Thus it is important and also difficult to measure doses of physicians and their patients during radiotherapy treatment. In this work, radiation dose due to the gamma

contamination has been measured high energy medical linac we accelerated up to about 18 MeV using gamma detector and calculated in radiotherapy room.

### 3. Conclusion

In this paper, we worked on Radiation Oncology Department in Suleyman Demirel Research Hospital. The gamma dose distribution depends on some parameters such as gantry angles. In this study neutron dose rate has been measured in several points (see Fig. 1) as a function of gantry angle and we measured these dose only one gantry angle is  $0^\circ$ . Those results showed that doses values within the treatment room are negligible.

In this study Clinic Linear Accelerator (cLINAC) we measured the differences in cross sections used for bremsstrahlung effect on result in different photon spectra generated in the target and impinging on the surface of the phantom. However, the effect of these differences on dose computations are negligible.

### Acknowledgments

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