Assessment of Photon Dosimetry, Oslo University Hospital
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Language: English.

Key words:

Abstract:
The quality of absolute photon dosimetry of two linear accelerators at Oslo University Hospital has been audited. The results show a good compliance between the NRPA and the hospital absolute photon dosimetry.

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Språk: Engelsk.

Emneord:

Resymé:
Stråleutbyttet fra to av Oslo universitetssykehus’ to lineærakseleratorer ble kontrollert. Resultatet av målingene viste god overensstemmelse mellom Strålevernets og sykehusets absoluttdosimetri.

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Approved:

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Assessment of Photon Dosimetry, Oslo University Hospital

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1 Introduction

The purpose of this study was to assess the quality of absolute photon dosimetry of two linear accelerators at Oslo University Hospital. The hospital performs quality controls according to international protocols, but with their own equipment. By comparing the hospital’s absolute dosimetry with independent tests performed by the Norwegian Radiation Protection Authority (NRPA), the preciseness of the hospital quality controls could be verified. Prior to absolute dosimetry measurements, the geometric properties of the linear accelerators were evaluated.

The NRPA measurements were performed by two representatives from the NRPA Secondary Standard Dosimetry Laboratory, Hans Bjerke and Per Otto Hetland. The hospital dosimetry was performed by Aniko Balazs and Christina Ramberg, who are physicists at Oslo University Hospital (OUS). All measurements were performed on Mars 19th 2018.

2 Theoretical background and methods

Absolute dosimetry was performed according to the Technical Report Series (TRS) 398 [1] from the International Atomic Energy Agency (IAEA), using an ionization chamber in a water phantom.

All tests were done on Varian TrueBeam STx linear accelerators; treatment machines number 5 and 6 at Oslo University Hospital, Radiumhospitalet. The machines were installed in 2014 and features two photon energies; 6 MV and 10 MV, in addition to 6 MV FFF and 10 MV FFF used only for stereotactic treatments. The measurements were done on a random day with no prior calibration or quality control of the linear accelerator. The linear accelerator’s geometric properties for the reference dosimetry were assessed and approved by the NRPA representatives before performing absolute dosimetry.

Measurements were first performed on the two photon energies on both linacs by NRPA using their equipment and procedures. The theoretical background and the NRPA methods and equipment have been described previously in Strålevern Rapport 2003:11 [2] and 2010:2 [3]. Dosimetry was then repeated by the hospital physicists using OUS equipment and procedures. The uncertainty in both systems were estimated to 2 % (k=2). The OUS equipment was a solid water slab phantom (Gammex) shown in Figure 1 and that of NRPA in Figure 2. Finally, the results of the two sets of measurements were compared. All exposures were given using 260 Monitor Units, which should correspond to a reference dose of 2.000 Gy.

Figure 1 Oslo University Hospital’s solid water slab phantom for routine calibration.

Figure 2 The Bjerke phantom used by NRPA.
3 Results

Absolute dose in Gy (absorbed dose to water) for both energies on both linacs were measured by the NRPA and the hospital physicists, successively. The results are given in Table 1. The deviation between the NRPA measurements and the reference dose of 2.000 Gy is less than 1.5%. The deviation between the dose measured by the NRPA and the hospital is ranging from -0.05 % to -0.55 %.

Table 1: Absolute dose (in Gy) as measured by the NRPA and the hospital.

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4 Discussion and conclusions

The results show a good compliance between the NRPA and the hospital absolute photon dosimetry. The hospital absolute dosimetry is hence regarded satisfactory and well within the requirement from EORTC of 3 %.

5 References

