

https://dspace.org/

Beam quality specification in kilo-voltage radiotherapy

Jozela, Sibusiso

2008-05-29T13:00:02Z
http://hdl.handle.net/10539/4902

Downloaded from a DSpace repository. https://dspace.org/

ABSTRACT

Purpose: The purpose of this work was to compare and analyse two clinically measurable beam quality specifiers, the half value layer (HVL) and the ratio of the doses at depths 2 cm and 5 cm (D_2/D_5) for a range of kilovoltage modalities, and to determine whether a practical, alternative and/or better correlation exists.

Methods and materials: Four x-ray units were used: two Philips RT 250 units, a Pantak HF 420 operated up to 250 kV, and a D3300 Gulmay Medical unit operated up to 300 kV. As not all these units were equipped with an internal monitor chamber, a system was used where either the first measurement was repeated at the end of each series or an external monitor chamber was employed in order to ensure output constancy. A range of HVL's were measured on each of the energies investigated on this work, which were used clinically. A calibrated 0.6 cc ionization chamber was used in a 30 cm x 30 cm x 30 cm water phantom to measure the absorbed dose to water at depths 2 cm and 5 cm in order to investigate D_2/D_5 as the alternative quality index.

Results: The effectiveness of using a monitor chamber in the determination of HVL has been shown to be significant in this work where HVLs differed by up to 3%. Errors incurred from using HVL have been identified. This work verified that the ratio of doses at depths 2 cm and 5 cm in water could be applied as a kilovoltage beam quality specifier in the clinical environment at low and medium energies with a well defined FSD and field size.

Conclusions: The use of D_2/D_5 as a tool to verify the beam quality index would simplify quality control in the clinical environment. Further work would have to be done to investigate other energies. Lower energies may require the use of shallower depths in order to improve accuracy and ensure a more clinically relevant setup.