

AbstractID: 2909 Title: Direct calibration of ionization chambers in linac photon beams

Purpose

Currently, the starting point for dosimetry in the radiotherapy clinic is an ion chamber calibrated at the standards laboratory in a ^{60}Co beam. Conversion factors obtained from a protocol such as TG-51 are then required to derive the dose in a linac beam. This paper details the measurement of these k_Q factors in photon beams from a clinical linac.

Methods and Materials

The NRC primary standard water calorimeter was used to calibrate a set of NE2571 Farmer-type ion chambers in 6, 10 & 25 MV photon beams from an Elekta *Precise* linac installed at NRC. A number of influence quantities – water purity, temperature sensors, temperature measurement system – were investigated in detail. In addition, significant effort was put into monitoring the stability of the linac to ensure that output variations did not significantly affect the measurements.

Results

The k_Q factors obtained were in good agreement with previous measurements using the NRC Vickers research linac reported by Seuntjens *et al* in 2000. This indicates no dependence on accelerator type and validates the use of $\%dd10_x$ as a beam quality specifier for megavoltage photon beams. The calculated factors given in TG-51 also agree well with these measured k_Q factors. The standard uncertainty in the calibration of an ion chamber is estimated to be 0.45%, a significant improvement over using the calculated values.

Conclusion

A clinical linac can be successfully used for primary standards dosimetry. Absorbed dose calibration factors for a set of NE2571 chambers have been obtained for 6, 10 & 25 MV photon beams. Factors for other chambers can be determined by direct comparison with these reference chambers in a water phantom.