

AbstractID: 11159 Title: A study on output factor determination for kilovoltage x-ray beams

Purpose: To evaluate the influence of different detectors in measuring output factors of kilovoltage x-ray beams and compare with Monte Carlo calculated data.

Method and Materials: Four different ionization chambers were used to measure output factors: the Advanced Markus, NACP, PTW Semiflex and NE 2577 ionization chambers. These were used with 2, 4 and 6 cm diameter cones and x-ray beam energies of 50, 100 and 280 kVp. The measured output factors were determined with the ionization chamber at the surface of a water or Solid Water phantom. Output factors for each field size and beam energy were calculated using the EGSnrc/BEAMnrc Monte Carlo code and derived from backscatter factors published in the AAPM TG61 kilovoltage dosimetry protocol. The BEAMnrc code was used to derive phase space file data for each of the 2, 4 and 6 cm cones and subsequently used to determine the output factor.

Results: The agreement in output factor for the four chambers was generally better than 2.5%. The largest difference was found for 2 cm diameter cone and the 280 kVp x-ray beam. Output factors derived for the same field sizes using the Monte Carlo and TG61 data were greater than the measured output factors. For the 4 cm applicator, the agreement between measured and Monte Carlo calculated data was better than 4% but with differences of up to 10% for the 2 cm diameter cone. These larger differences at the small field size are attributed to the dimensions of the detector and the radiation field size.

Conclusion: Each of the four ionization chambers were suitable for output factors for field sizes no less than 4 cm. Output factors at smaller field size require further investigation.