

AbstractID: 9284 Title: Experimental and Monte Carlo investigations of the energy dependence of alanine/EPR dosimetry system for clinical electron and photon beams

The energy response of alanine/EPR dosimeters (alanine EPR reading per unit dose to water vs. energy) in clinical electron beams (8, 12, 18, 22 MeV) and photon beams (6, 10, 25 MV) has been investigated. Alanine pellets in a waterproof holder were irradiated in a water phantom with doses from 10 Gy to 50 Gy. The dose rate at the reference point was determined using an NACP parallel-plane chamber for electrons and an NE2571 Farmer-type chamber for photons. The spectrum recording of the irradiated pellets was performed using a Bruker EMX 081 EPR spectrometer. The slope of the alanine reading versus dose to water was obtained for each beam quality and normalized to the reference beam qualities: 12 MeV for electrons and 10 MV for photons. The EGSnrc Monte Carlo code was used to simulate the measurements. For the electrons, it is found that there is an energy dependence of 0.992 for 8 MeV and 1.006 for 22 MeV for pellets in the PMMA holder. However, MC simulations also show that the dosimeter holder has a significant effect on the dose to alanine. If this is taken into account the variation with beam energy is smaller. For photon beams, measurements show 1.007 energy dependence for 6 MV and 1.003 for 25 MV, but MC calculations indicate very little variation with beam quality, 1.001 for 6 MV and 0.999 for 25 MV. This difference may be caused by a higher measurement uncertainty in photon beams than in electron beams due to using lower delivered doses for photons.