

AbstractID: 1429 Title: Polarity Effect of Commercially Available Micro Ionization Chambers

Small volume chambers are preferred for specialized applications in radiosurgery, small field, IMRT and high gradient radiation dosimetry. Chambers can be divided into three categories, regular/normal, mini ($\leq 0.125 \text{ cm}^3$) and micro chambers ($\leq 0.01 \text{ cm}^3$). Several ultra-small volume diodes are commercially available, however due to energy and dose rate dependence, ion chambers are still preferred. The small volume chambers provide better spatial resolution but have poor signal-to-noise ratio. The dosimetric factors such as polarity effect (P_{pol}) have not been studied for micro chambers which is needed for radiation dosimetry. P_{pol} could be dependent on the type of radiation, dose rate, beam energy, depth, type and design of the chamber. Four micro-chambers: Exradin-A16, Wellhofer-IC4, PTW-pinpoint (steel and Al electrode) were investigated on a Varian 2100C accelerator for all photon and electron energies. Results show that P_{pol} is nearly independent of dose rate in photon beam but the magnitude is dependent on the type of chamber. For example, P_{pol} is +9% for the A-16 chamber, whereas it is -3% for the PTW (Al) chamber at surface. P_{pol} is nearly constant and magnitude is within $\pm 1\%$ at deeper depths but higher for the lower energies. For electron beams, P_{pol} is opposite compared to the photon beams. P_{pol} is slightly dependent on the dose rate at depths but not at surface, however the magnitude of P_{pol} is dependent on the chamber and electron energy. It is concluded that for accurate dosimetry, characteristics of micro-chambers should be carefully determined in IMRT or high gradient dosimetry.