AbstractID: 8884 Title: Energy and irradiation modality independence of calibration coefficients for water equivalent plastic scintillation detectors

Purpose: To demonstrate that approximate water equivalence of plastic scintillation detector (PSD) has for consequence the energy independence of the calibration coefficients for both photon and electron beams in the megavoltage energy range.

Method and Materials:
The PSD consists in a small 1 mm diameter and 2 mm long plastic scintillating fiber made of a polystyrene core (BCF-12, Saint-Gobain, inc.). The scintillator was coupled to a 2 meters long non-scintillating plastic optical fiber and a color CCD camera (Apogee instruments inc.) was used as photodetector. The calibration coefficients of the PSD where extracted for 6 MV, 23 MV photon beams and 9,12,15 and 18 MeV electron beams using a Farmer ionization chamber (Exradin).Complete removal of the Cerenkov radiation produced in the optical fiber was done with a chromatic discrimination technique using the blue and green channel of the CCD camera. All measurements were performed according to the recommendations of the AAPM TG-51 protocol for clinical dosimetry.

Results:
The PSD exhibits a maximum deviation of less than 1.7 % (about the mean) of its calibration coefficients over the measured energy range for both irradiation modalities.

Conclusion: The energy independence of the calibration coefficients for PSD was demonstrated experimentally for the first time for both photons and electrons**.** PSDs have the potential to simplify and improve accuracy of dose measurements in clinical situations where photons and electrons are both present in the beam such as electron contamination in photon beams or bremsstrahlung contaminated electron beams.