

AbstractID: 10704 Title: Dose comparison study of a 2D scintillating fiber dosimeter array prototype with ionization chamber and film measurements

Purpose: To present results from a dose comparison study of a 2D scintillation fiber dosimeter array (SFDA) prototype with ionization chamber and film measurements.

Method and Materials: The SFDA prototype consist in 729 scintillation fiber dosimeters insert up in a solid water slab (Plastic Water DT, Radiation Products Design Inc.) with a uniform spacing of 1 cm, covering a 26 cm by 26 cm region. Each detector consist in a 1 mm diameter and 2.5 mm long polystyrene plastic scintillating fiber (BFC-12, Saint-Gobain, Inc.) coupled to a 2.5 m long acrylic plastic optical fiber (Eska, Mitsubishi). Subtractions of the parasite Cerenkov signal produce in the optical fibers has been done using a spectral discrimination technique. The calibration of the 729 detectors was performed using dose profiles of a 30x30 cm² 6MV photon field measured with an IC-10 ionization chamber. The comparison of the SFDA response with ionization chamber measurements has been done with a dose profile produced by a simple 10x10 cm² 6MV photon beam. The comparison of the SFDA and film measurements has been done with a strong gradient dose distribution produced by a combination of three 6MV photon fields.

Results: Results from the comparison of the SFDA and ionization chamber measurements using a 10x10 cm² field show that most detectors of the array are in agreement with the IC-10 measurements within 1% of the maximum dose for both in-field and out-of-field regions. The comparison of the SFDA and film measurements using a complex dose distribution show that these two detectors are in agreement within less than 2% of the maximum dose.

Conclusion:

The SFDA measurements show good agreement with conventional detectors. This dosimeter array could potentially be use as a quality assurance tool for IMRT and arc therapy patient plan verification.