AbstractID: 11124 Title: Temporal Methods for the Elimination of the Cerenkov and Fluorescence Interference in Optical Fiber Dosimeters for External Beam Radiation Therapy

Purpose: To compare previous temporal methods for the elimination of the Cerenkov and fluorescence interference in optical fiber dosimeters, and propose a new temporal method.

Methods and Materials: When using optical fiber dosimeters in external beam radiation therapy there is an unwanted interference signal generated in the optical fiber connecting the light output from the actual dosimeter scintillating element to the photodetector readout system. This signal consists of both Cerenkov and fluorescence light both induced in the section of the fiber that is located inside the beam area and it therefore varies with changing beam geometry and intensity distribution. It is created by high energy photons reacting with the different parts of the fiber, mainly the cladding material.

The most effective methods for the elimination this signal have been based on temporal i.e. time dependent separation of the interfering signal from the dose signal. In this work we present an analysis of the efficiency and practical usability of the different temporal methods that have been presented in earlier papers. Comparison between the different methods is made with actual dose measurements performed in different field geometries.
A new temporal method is introduced. This new method uses new type of connection between an optical fiber and a large area scintillator panel. It eliminates the need for the connection of electrical cable, thus has a simpler configuration.

Results: The signals from the scintillator panel measured by a continuous wave (CW) photodetector at 30cm/100cm are 14,000/6,000 CPS. These values are comparable to signals from a trigger detector placed inside the beam area, which typically are 7,000 - 10,000 CPS.

Conclusions: New temporal method using new type of connection between an optical fiber and a large area scintillator panel provides potential improvement for the elimination of the Cerenkov and fluorescence interference in optical dosimeters.