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Measurement of One-Dimensional Photon Dose Distribution in Radiotherapy Dosimetry Using a High-Resolution Fiber-Optic Radiation Sensor

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The purpose of this study is to develop a method for measuring the one-dimensional dose distribution of high-energy photon beam using a miniaturized high-resolution fiber-optic radiation sensor array. The measurements are made by thin plastic optical fibers with organic scintillating fiber sensor tips that emit the visible wavelength of light. The scintillating light is guided to silicon photodiode array by plastic optical fibers in order to convert light output to electrical signal. The one-dimensional spatial dependence of photon beam is measured by a one-dimensional fiber-optic sensor array in a polymethylmethacrylate (PMMA) phantom. It is shown that this fiber-optic radiation sensor has better spatial resolution than a conventional ion chamber and it takes much less time to measure one-dimensional dose distribution in the high radiation fields. The real-time and the high spatial resolution measurements due to the small detector volume make this system suitable for the dosimetry in the radiation therapy.

Keywords : Fiber-Optic Sensor, Scintillating Light, One-Dimensional Measurement