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Dosimetric Characterization of a Polycrystalline Diamond Detector Prototype in Radiotherapy Beams

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Abstract

Polycrystalline diamond films were made and characterized in terms of structural parameters using Raman and scanning electron microscopy techniques. A CVD diamond detector prototype was tested as on-line radiotherapy beam dosimeter biasing the detector with 100 V. The signal to noise ratio was 10 and a good linearity between the detector reading and the dose to water was achieved. The detector sensitivity was 30 nC Gy⁻¹ mm⁻³ of detector sensitive volume. A power law with exponent equal to 0.92 was found to fit the detector average current as a function of the dose rate to water. The results show that a better detector current linearity with the dose rate can be achieved by supplying to the detector a bias voltage higher than 100 V, on expense of the signal to noise ratio. However, when the dose rate dependence of the CVD detector signal was corrected, the percentage depth signal in a PMMA phantom along the x-ray beam central axis, and the relative output factor resulted in agreement with those obtained by an ionization chamber, confirming the water equivalence of the CVD detector.

KEYWORDS: CVD Diamond, Photon dosimetry, Solid state detectors.

Experimental evaluation of absorption coefficient in scattering media using different solutions to the diffusion equation

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Abstract

Many biomedical applications of time-resolved transmittance require precise measurements of optical properties of scattering samples. In this paper the use of time-resolved transmittance for optical characterization of scattering and absorbing media using different analytical solutions to the diffusion equation has been tested. Particular attention has been paid to the measurement of absolute value and small changes of absorption coefficient. Well-defined fitting procedures with and without the amplitude factor of the theoretical function have been checked. A femtosecond Ti:Sa laser working at 800 nm and a streak camera have been employed. Various Intralipid suspensions with different concentrations of absorbing ink have been investigated. These studies have experimentally confirmed that time-resolved transmittance is able to discriminate small changes in absorbing properties. In addition, the detailed investigation here reported has shown the role played by the different solution to the diffusion equation and fitting procedures.

KEYWORDS: Time-resolved transmittance, optical properties, intralipid, ink.

Design, construction and performance of a secondary collimator for a cobalt unit

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Abstract

In order to get sharper radiation beams in a 100 cm SAD cobalt unit without hampering the use of wedges and shielding blocks an electronically driven secondary collimator was developed. This collimator consists of four electronically controlled independently moving tungsten trimmer bars at 67 cm distance from the source. Between trimmer bars and primary collimator there is sufficient freely accessible space to allow simultaneous use of shadow tray and wedges.

The 80-20% penumbra at d_{max} is 5.8 mm for a $10 \times 10 \text{ cm}^2$ field and 6.5 mm for a $20 \times 20 \text{ cm}^2$ field which is comparable to linear accelerator beams. The penumbra increases considerably with depth but is consistently smaller by about 6 mm compared to the standard collimator.

The device weighs 11.1 kg but can be handled fairly easily. The secondary collimator can be used to obtain sharp cobalt beams while still allowing simultaneous use of shadow tray and wedges. This device is useful when critical structures adjacent to the target volume have to be spared.

KEYWORDS: Cobalt therapy, Secondary collimator, Cobalt penumbra.

EFOMP Document

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Implementation of the EC-Directives 97/43/Euratom [MED] and 96/29/Euratom [BSS] in Europe*

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Abstract

The implementation of the EC-Directives 97/43/Euratom [Med] and 96/29/Euratom [BSS] was investigated. A questionnaire was therefore sent by e-mail to all EFOMP members electronically accessible. The preliminary results were presented during the VIIth EFOMP Congress in Belfast September 2001.

From the 30 members electronically accessible 24 responded (80 %). This response rate was comparable with a former inquiry. In this paper the questions and answers are presented. Amongst the 24 responders 14 were from European Union members (EUM).

The MED is implemented in 14 (11 EUM) member organizations. The BSS implementation is realized in 15 (11 EUM) member organizations. A majority:

- considers the legislation not to be reflecting accurately the requirements of MED and BSS in health care.
- has an education and training system.
- does not have a CPD system according to Policy Document 10 of EFOMP.
- indicates that governmental resources for recognition of QE and MPE are not planned.

The number of QE and MPE per million inhabitants should increase to be able to operate adequately according to the Directives.

KEYWORDS: EC Directive, Qualified Expert, Medical Physics Expert.