Contribution ID: **67** Type: **Poster**

Study of angular dependence in Fiber Optic Dosimetry by Monte Carlo simulations

Real-time dosimetry for radiotherapy with high spatial resolution is a growing research field. Development of new radiotherapy techniques, such as intensity-modulated radiation therapy, stereotactic radiosurgery, and high dose rate brachyterapy among others, require high performance dosimetrics techniques. Even though different kinds of detection systems have been investigated to perform in-vivo dosimetry, most of them do not permit simultaneously spatial resolution, real-time dose assessment and intracavitary measurements.
The so-called fiberoptic dosimetry (FOD) technique has shown to meet most of these requirements mostly needed in radiotherapy [1]. FOD is based on the use of a tiny piece of a scintillation crystal (1mmˆ3 aprox) attached to the end of an optical fiber [1]. The fiber collects the light emitted by the scintillator during irradiation (radioluminescence, RL) and a light detector at the other end of the optical fiber measures its intensity. FOD technique allows for in-vivo and real-time dose assessment, and due to the small size of the detector it not only permit accurate measurements in regions of high dose gradients but also intracavitary measurements [2].
Martinez et al. [3] observed angular dependency of the scintillating signal when cylindrical detectors are employed as usual in this technique.
In the present work, we study the angular response of a $YVO_4:Eu^{3+}$ based FOD probe by using Monte Carlo simulations in order to explain the different attenuation process.
Two geometrical configurations have been studied: 1mm diameter spherically shaped detector, and 2mm length-1mm diameter cylindrical detector. Simulations have been achieved by using PENELOPE employing an hybrid virtual source model based on IAEA phase space data base. In both cases results have been compared with experimental measurements.

1. Justus, B.L. et al., 2004. Gated fiber-optic-coupled detector for in vivo real-time radiation dosimetry. Appl. Opt. 43, 1663-1668.
2. Spasic, E., et al., 2011. Intracavitary in vivo dosimetry based on multichannel fibercoupled radioluminescence and optically stimulated luminescence of Al2O3:C. In: IEEE Conference Publication. 2nd International Conference on Advancements in Nuclear Instrumentation Measurement Methods and Their Applications (ANIMMA), pp. 1-6.
3. N Martinez, et al., 2017. Characterization of YVO4:Eu3+ scintillator as detector for Fiber Optic Dosimetry. Radiation Measurements, in press.

Primary authors: Mr MARTÍNEZ CLEMENTE, Nahuel Facundo (Instituto de Física Arroyo Seco (UNCPBA) and CIFICEN (UNCPBA –CICPBA –CONICET)); Ms FERNANDEZ, Yohanna (Departamento de Ciencias Físicas y Ambientales, fac. Cs. Exactas (UNCPBA)); Ms MACHELLO, Soledad (Centro Oncológico de las Sierras, Tandil, Argentina)

Co-authors: Dr SANTIAGO, Martin (Instituto de Física Arroyo Seco (UNCPBA) and CIFICEN (UNCPBA –CICPBA –CONICET)); Dr MOLINA, Pablo (Instituto de Física Arroyo Seco (UNCPBA) and CIFICEN (UNCPBA –CICPBA –CONICET)); Dr CRAVERO, Walter (Instituto de Física del Sur (IFISUR), Departamento de Física, UNS--CONICET); Dr MASSA, Jose (INTIA, Facultad de Cs. Exactas, Universidad. Nac. del Centro de la Prov. de Bs As)

Presenter: Mr MARTÍNEZ CLEMENTE, Nahuel Facundo (Instituto de Física Arroyo Seco (UNCPBA) and CIFICEN (UNCPBA –CICPBA –CONICET))

Session Classification: Poster Session - MP

Track Classification: Medical Physics