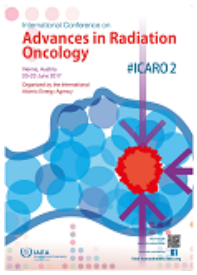

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Project to implement an OSL Dosimetry System in Argentina

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Project to implement an OSL Dosimetry System in Argentina
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The Regional Reference Center with Secondary Standards for Dosimetry (CRRD) carries out a National Program for independent verification of the dose delivered by cobalt therapy equipments and LINACs at radiotherapy centers in Argentina, through the use of thermoluminescent dosimeters (TLDs) in rectangular fields of radiation and in irregular fields shaped with MLC. The objective of this program is to verify that the participating institutions, through their treatment protocols, are consistently delivering the prescribed dose of treatment, minimizing its uncertainty.
Optically stimulated luminescence dosimetry (OSL) with aluminum oxide doped with carbon Al2O3:C, has a number of advantages over the TLD thermoluminescence dosimetry system currently used. The OSL dosimeters can be used at room temperature and they can be stored for longs periods of time without significant loss of information. At the same time, the OSL dosimeters are more sensitive than TL dosimeters. One of the major advantages of OSL dosimeters is that they can be read out repeatedly and their readings can be corrected using a predetermined decay constant. The OSL allows operations with simple process, also allows successive readings of a single exposure to the radiation providing a low degree of uncertainty between the repeated readings. In addition, the OSL dosimeters can be reused until it reaches the saturation dose (before the linearity or saturation in the dose response), only at this point is the optical annealing.
Since optically stimulated luminescence dosimetry (OSL) has been widely used to monitor occupational radiation doses and dose measurement at therapeutic levels, the CRRD has decided to implement the use of these dosimeters in its dose verification program. To achieve this, it has acquired a commercial system: the MicroStar® reader equipment with the InLight® dosimeters knows as dots.
Objective
The objective of this work is to perform an evaluation of this system through the following activities:
- Calculations of the sensitivity of the system, as well as of the dosimeters, and their normalization.
- Reproducibility of the different tests and readings of the dosimeters, in order to design an optimal procedure.
- Determine and study the characteristics of the dose response, as well as the linear response of the system and dosimeters, and the dose response signal.
- Calculate and define the optimum time of annealing through an annealing device designed by the laboratory.
- Calculate and determine the fading by decay of the signal through time and through successive readings of the dosimeters.
- Determine the optimal linearity corrections for the implementation of the system and thus calibrate the equipment and the system.
- Design special holders for the OSL dosimeters irradiations to be used by the participants.
- Determine the uncertainty of the system, and apply it in order to determine possible variations.
- Design the procedures for the implementation of the system.
Methodology.
In this work, a beam of 60Co will be used to irradiate the dosimeters. OSL dosimeters, commonly known as

“dots”, will be read in a MicroStar® reader equipment. Starting from these irradiations, different tests will be performed to study the dosimeters response.
The reader equipment consists of an automatic system for the reading the dosimeters which uses diodes (LEDs) to stimulate the nanodots and, by means of a photomultiplier, absorbs the emitted light and transforms it into absorbed dose. This photon counting system is highly sensitive.
This study will base on the characterization of the OSL dosimetry system in order to estimate the stability and reproducibility of the readings, as well as to calculate the uncertainty and apply it to the system.
The first test already performed was the verification of the parameters suggested by the manufacturer of the equipment. This means that the calibration readings have been performed.
Next steps will imply the irradiation of dosimeters with known doses, in order to study the response obtained and if it corresponds to the delivered dose, as well as the study of the holder designed for its irradiation.

Country

Argentina

Institution

Comisión Nacional de Energía Atómica

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