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Evaluation of Optically Stimulated Luminescence (OSL) 'DOT' Dosemeters for Area Monitoring of diagnostic low energy X-rays Laboratory

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Radiation protection theory involves occupational, public and patient exposure. The importance of measuring exact radiation doses has been increasing in regard to the studies of patient exposure, dose guides and radiation protection. There are few studies of area monitoring, including scattered radiation and outdoor environment around the irradiation room of diagnostic X-ray unlike studies related to radiation therapy. Most area monitoring data published in the literature are performed using lithium fluoride (LiF) TL dosimeters such as TLDs-100, marketed by Harshaw, and calcium sulfate ($CaSO_4$:Dy) manufactured and marketed by the Laboratory of Dosimetric Materials of the Radiation Metrology Center/IPEN. The Optically stimulated luminescence (OSL) dosimeters have acquired importance in external dosimetry of ionizing radiation. The aluminum oxide grown at low pressure in the carbon atmosphere (Al_2O_3:C) generally has provided good results as luminescent detector. The electronic processes and dosimetric characteristics of the crystals are relatively similar to the TL, the difference is in the reading method: the evaluation of OSL detectors is performed by laser or LED light instead of heat in the TL. OSL 'dot' dosimeters (manufactured by Landauer Inc.) are reported to have a high degree of environmental stability, high level of sensitivity and provide wide range of dose measuring capabilities from 0.05mGy to 100Gy. The optical readout method is fast and relatively simple and permits repeated readout, but few studies have been performed about its application in area radiation monitoring. The aim of this work is to evaluate the performance of OSL 'dot' dosimeters for area monitoring of diagnostic energy X-rays laboratory including the assessment of scattered radiation dose and the outdoor environment around the irradiation room. Testing was performed in the laboratory to evaluate reproducibility and stability and in the field to evaluate scattered radiation dose and in the outdoor environment. The results showed that OSL 'dot' dosimeters present good reproducibility and stability in both laboratory and field tests and met the performance requirements of standards of the American National Standards Institute.