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The Development of a Mid-Dose Irradiator for Radiation Biology Study

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Recent we developed a mid-dose irradiator at KIRAMS using Cesium-137 sources for studies of mid-dose radiation effects in biology and also for a calibration of Thermo Luminescent dosimeter (TLD). In this presentation, we will introduce the design, construction and performance test of the convenient mid-dose irradiator. The source housing of the irradiator contained three rods sources, which were separated by 10 cm in order to produce a uniform dose distribution. When operating to exposure the radiation to the biological samples, the source housing will rotate 180 degrees and face to biological samples, or TLD. After irradiating for the set time, it will return to its shielded position. A compact Field Point (CFP) controls the sequence of operation, interlock, motor rotation and safety system. The rotation speed of biological samples can vary up to 20 RPM. A real time monitoring system was also incorporated to check and control the operation status of the irradiator. The capacity of the irradiation chamber was 5 liters. The isodose distribution at arbitrary vertical plans was measured by using film dosimetry. The dose-rate was determined 1.25 cGy/min in air equivalent material in the case of 55.5GBq Cesium-137. The homogeneity of dose distribution in the chamber was ±10 %. The radiation level with a maximum 3 μSv/hr radiation leakage measured on its surface was considered within permissible levels for the operation.

Keywords : Irradiator, Cesium-137, Dose-rate