

AbstractID: 6589 Title: Dosimetric Verification of a Commercial Research Irradiator

Purpose: To present a collection of simple tests that can be used to verify the dosimetric characteristics of the MDS Nordion Gammacell 40 Extractor Low Dose-Rate Research Irradiator.

Method and Materials: The manufacturer specifies that the irradiator is provided with two 61.1 TBq Cesium 137 sources that together produce a central dose rate of 1.10 Gy/minute \pm 15% in its sample tray. In the central 260 mm diameter by 100 mm height region, the specified dose uniformity is \pm 7%.

Custom measurement jigs were made to fit inside the irradiator's sample trays and assemblies. Ionization chamber readings were made to determine exposure rate constancy and timer errors. Radiochromic film was used to measure dose and dose rate constancy, the attenuation of manufacturer-provided attenuators, depth dose characteristics in Solid WaterTM, and uniformity of dose across the sample tray. Thermoluminescent devices (TLD's) were assessed as an alternate means of measuring dose and dose rate constancy.

Results: The exposure rate was constant down to two seconds and timer error was about 1.4 seconds. Film measurements showed that dose reduction for the attenuation filters (33%, 60%, 80%) is within 3% of specifications. Film measurements in a central 10x10 cm area showed dose uniformity within about 2%. Depth doses in Solid WaterTM showed a variation of about 10%. Film and TLD's yielded similarly accurate dose measurements and constancy estimates.

Conclusion: Our facility's irradiator operates within the manufacturer's specifications except for dose variance with depth which may be somewhat greater than 7%. Although the manufacturer provides basic dosimetric information about each irradiator, it is advantageous to verify and expand this information. As with linacs, irradiators must certainly differ from machine to machine and change over time. It is prudent when doing research using these devices to validate their performance under their conditions of usage.