

COMMISSIONING OF AN X-RAY BIOLOGICAL RESEARCH IRRADIATOR

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Background and Objective

The use of radiation is a recognized technique for cancer treatments, but the previous knowledge of its effect in different tissues and doses is highly desirable. Experiment that uses specially designed biological irradiators for cells or small animals are becoming available using X-ray beams with kilovoltage in the range of 40–300 kVp. The aim of this study was initially to perform the dosimetric calibration of the RS 2000 X-ray biological irradiator (Figure 1) using a NE 2571 Farmer type ionization chamber associated to a Keithley 6514 electrometer and compare the results with the Fricke solution.

Methods

For this purpose:

- The measurement of HVL was done.
- The mean energy was obtained for this radiation beam.
- The shelf of the irradiator was fixed at (FSD 31 cm) for all exposures.
- All measurements were carried out with 150 kV and 20 mA.
- Considering 0.8 mm of Be inherent filtration and an added filtration of 0.33 mm of Cu and 1.75 mm of Al.

Results and Discussion

As result the first HVL was 0.64 mm of Cu at the source detector distance (SDD) of 310 ± 5 mm, for a radiation field of 225.6 mm and the mean energy of the beam was then defined as 73.2 keV. Further work is needed to determine all correction factors associated with the Fricke method for different beam qualities used in the radiobiology studies performed with this irradiator.



Figure 1 - RS 2000 X-ray biological irradiator

Conclusions

- As the quality of a beam depends on many factors (tube potential, target angle, target material, window material, and thickness, monitor chamber material and thickness, filtration material and thickness, shape of collimation, and the source-chamber distance) a measurement of HVL was done.
- Further work is needed to determine all correction factors associated with the Fricke method for different beam qualities used in the radiobiology studies performed with this irradiator.

References

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