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Calibration of Gammacell 220 E Irradiator Using Fricke and Alanine Dosimeters

**A thesis submitted for partial fulfillment of the requirement for the
degree of M. Sc in nuclear physics**

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Dedication

اهداء

... الى روح ابي الطاهرة النقية

... أمى نبض شرايىنى

أيمن و أمانى و أمين و أميمة و ندى و
أحمد

... معينى الذى لا ينضب

الغالية سارة

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الخلاصة

تستخدم المشعّات الغامية بتوسع كبير فى كثير من الدول و هذا النوع من المشعّات يستخدم لاغراض البحث .

فى السودان ، تم منح المشعّ الغامى بواسطة الوكالة الدولية للطاقة الذرية لمعمل المعالجة الاشعاعية بهيئة الطاقة الذرية لاغراض البحث، وهو مدرع ذاتيا و يعمل بطريقة امنة.

من الضرورى معايرة الجرعة الاشعاعية الصادرة من (Gammacell 220E)، بغرض تحديد الجرعة- للعينات المختلفة. فى هذا العمل تم استخدام الكاشف الكيمياءى (Fricke) و الذى تبلغ ثقة قياسه 95% فى حدود للجرعة لا تتجاوز 400 غراى ، و بغرض عمل مقياس روتينى للجرعات كمعاير، خاصة للجرعات العالية حتى 5000 غراى تم استخدام الكاشف الكيمياءى (Alanine) حيث ان مدى استخدامه يوضح مقدرة جهاز (Gammacell 220E) لاعادة انتاج الجرعات العالية وتوزعها بشكل موجه و محكوم.

تتضمن مواصفات التشعيع فى اغلب الاحيان حدود للجرعات العليا والدنيا او جرعة مركزية، لهذا تم تعيين مخطط توزع الجرعة الاشعاعية داخل حجيرة التشعيع و ذلك لتعيين توزع الجرعة داخلها .

ايضا تمت مقارنة (Fricke) و (Alanine) كمركبات كيمياءية لمعايرة اجهزة التشعيع و توضيح الفرق بينهما. كان هنالك اتفاق جيد بين مخطط توزع الجرعة الذى تم قياسه فى هذا العمل و المخطط الذى اورده الشركة المصنعة.

Abstract

Using of Gammacell 220 Excel irradiators is widely spread in many countries. This type of irradiators is being used for research purposes.

Gammacell 220 Excel was provided by the International Atomic Energy Agency (IAEA) to the Radiation Processing laboratory of Sudan Atomic Energy Commission (SAEC). It is a self-contained gamma irradiator and self shielded, this makes it operates safely.

Dose calibration for this cell is important for samples irradiation. In this work, a dosimetry system for the GC220E of SAEC was established using Fricke dosimeter. Fricke dosimeter has a confidence 95% in the range not exceed 400 Gy.

To establish routine dosimetry at high doses up to 5000 Gy, Alanine dosimeter was used. This range can demonstrate the ability of GC220E to deliver known controllable doses in reproducible manner for high doses.

The irradiation specifications often include a lower and upper limit of absorbed dose or central target dose. Absorbed dose mapping was carried out by both dosimeters to determine the magnitude and locations of D.max and D.min in the irradiation chamber. The results are in good agreement with dose distribution given in the machine manual.

A comparison between the tow dosimeters was done and explained.

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