الآية

بسم الله الرحمن الرحيم

قال تعالى:" فَتَعَالَى اللَّهُ الْمَلِكُ الْحَقُّ ۗ وَلَا تَعْجَلْ بِالْقُرْآنِ مِن قَبْلِ أَن يُقْضَىٰ إِلَيْكَ وَحْيُهُ ۖ وَقُل رَّبِّ زِدْنِي عِلْمًا ﴿١١٤﴾"

صدق الله العظيم

سورة طه

DEDICATION

To my mother 'Soad'

My father 'Ahmed'

My sisters and brother

To my friends

And to all help me I want to say thanks

Acknowledgments

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List of abbreviations

RICK   Radiation and isotopes center of Khartoum

QA   Quality Assurance

QC   Quality control

SSD   Source Skin Distance

SAD   Source Axis distance

ICRU   International Commission on Radiation Unit and measurement

LINAC   Linear accelerator

LASER   Light amplification by stimulated emission of radiation

AAPM   American Association of Physicists in Medicine

EPID   Electronic portal imaging (device)

Gy   Gray, unit of absorbed dose (1J/kg)

MLC   Multileaf collimator

MU   Monitor unit

PMMA   Polymethyl methacrylate

ALARA   As Low As Reasonably Practicable

IAEA   International Atomic Energy Agency

IMRT   Intensity Modulated Radiotherapy

XRT   External Radiotherapy

XBRT   External beam radiotherapy

TRS   Technical report series

Abstract

This Study was performed to evaluate the linear accelerator performance in radiation and isotopes center Khartoum (RICK) concerning the mechanical tests done according to AAPM protocol and Canadian protocol. The result showed that the collimator isocenter rotation was optimum at 0 mm shift, Gantryisocenter rotation was at 2 mm shift and the table rotation was optimum at 0 mm shift i.e. all parameters were within the tolerance.Also the light and radiation field congruence showed 2 mm shift, the laser beam coincidence showed 2mm shift, the variation of field size (20x20, 14x14, 12x12, 10x10, 8x8, 6x6, 4x4 and 2x2cm^2) versus SSD was optimum and the correlation was so significant at R^2 =0.998. The Dose rate increase with Field sizes increment due to scatter from collimator, in the other hand the dose decreases with SSD increment according to inverse square law which was verified for field size 10x10 cm^2 and 2x2 cm^2.

The temperature effect causes change in the output measurement according to the following equation: Y = 0.0041X+1.093, where Y refers to output in Gy/MU and X refers to temperature, while the pressure leading to change in the output measurement according to the following equation: Y = 0.063X + 7.298, where Y refers to output and X refers to pressure.

The effect (temperature and pressure correction factor) the output varies linearly according to the following equation: $Y = 1.0129X + 0.2901$, where Y refers to output and X refers to temperature pressure correction factor.

ملخص البحث

لقد تمت هذه الدراسه في مركز الخرطوم للعلاج بالاشعة والطب النووي لتقييم اداء جهاز المعجل الخطي وتمت بعض اختبارات الجوده المكيانيكيه وفق للبروتكولات الكندي والامريكي ولقد وجد أن نقطه دوران كل من محور الدوران(2mm) والمحدد (0 mm) وطاوله العلاج (0 mm) وكذا تطابق الحقل الاشعاعي والضوئي (2mm) كما أن الليزرات متطابقه (2mm shift)،تغير الحقل الاشعاعي مع المسافه بين المصدر والسطح له علاقه خطيه بالنسبه للحقول 20x20,14x14,12x12,10x10,8x8,6x6,4x4,2x2 وتعتبر العلاقه ذات قيمه إحصائية مميزه $R^2=0.998$ كما ان معدل الجرعه تزيد بزياده الحقل الاشعاعي نسبه لتشتت الاشعه كما ان معدل الجرعه يقل بزياده المسافه من المصدر وذلك وفق لقانون التربيع العكسي لكل من الحقلين 10x10و2x2 والغلاقة لها قيمة إحصائية حيث R^2 تقترب من الواحد.

بالنسبه لقياسات الجرعه تمت وفق لبرتكول الوكالة رقم 398 والتغير في خرج الجهاز مع درجة الحرارة والضغط وفق للمعادلتين $Y=0.0041X+1.093$ و $Y=0.063X+7.298$ علي التوالي.

ونجد أن تغيرات الجرعه مع ال (K_{TP}) بصوره خطيه وفق المعادله $Y=1.0129\ X+0.2901$.