DOSIMETRIC CHARACTERISTICS AND OPTIMIZATION FOR

A MULTISLICE COMPUTED TOMOGRAPHY

A PROJECT REPORT PRESENTED BY

SIVAGNANASUNDARAM BALAMURALI

to the Board of Study in Physics of the

POSTGRADUATE INSTITUE OF SCIENCE

in partial fulfillment of the requirement

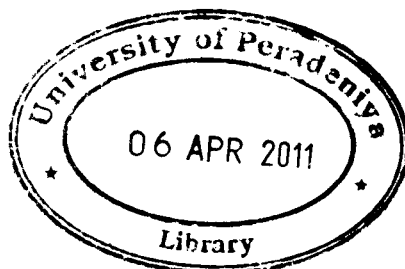*for the award of the degree of*

MASTER OF SCIENCE IN MEDICAL PHYSICS

of the

UNIVERSITY OF PERADENIYA

SRI LANKA

2009

ABSTRACT

DOSIMETRIC CHARACTERISTICS AND OPTIMIZATION FOR A MULTISLICE COMPUTED TOMOGRAPHY

SIVAGNANASUNDARAM BALAMURALI

PGIS

UNIVERSITY OF PERADENIYA

SRI LANKA

This is the first study in the National Cancer Institute, Sri Lanka to evaluate dose measurements with Head and Body phantoms in Toshiba Acquilion Computed Tomography (CT) Simulation which is one and only large bore CT scanner in the whole Island. Results from this study were compared with EU reference dose levels for CT, compiled from ACR, IAEA, NRPB and UK [5]. The measured dosimetric quantities are weighted computed tomography dose index ($CTDI_w$), dose length product (DLP) and effective dose (E). The radiation risk factors were compared with European guidelines (data obtained from ICRP 60) with different age groups of patients such as 0 – 5 yrs, 5 -10 yrs and adults with standard SURE MODE CT exposure of clinical practice. It is found that the risk associated in head phantom studies for infant age group (0 – 5 yrs) effective doses varies from 14.92 - 38.8 %, child age group (5 - 10 yrs) effective doses varies from 71.43 - 122.37 % and adult age group effective doses varies from 15.2 - 40 % , while for body phantom the estimation of effective dose risk, infant age group (0 - 5 yrs) varies from 16.98 - 66.50 % , child age group (5 - 10 yrs) varies from 108.87 - 138.97 % and there is no deviation observed for adult age group. It is noted that percentage variation is higher due to smaller beam collimation and higher mAs values. It is found that the pediatrics in the age group (5 - 10 yrs) is more prone to risk due to biological phase, perhaps the focal spot was analyzed through Linear Regression Graphs, there is no discontinuity observed in nCTDI values. It is concluded that justification of practice should be implemented in special procedures like IMRT, SRS and SRT. Then the dose optimization should be calculated for the entire treatment schedule. Our study has confirmed the great impact of technical factors and acquisition parameters on CT doses. The provided comprehensive dosimetric data will facilitate the dose-effective use of the scanner study.