

Table of Contents

Abstract	I
Arabic Abstract.....	II
Table of Contents.....	III
List of Figures.....	VII
List of Tables.....	XI
Acknowledgement.....	XIII
Abbreviations.....	XIV

Chapter 1

1. Introduction.....	1
1.1 Overview.....	1
1.2 Research problem.....	4
1.3 Objective of the study.....	4
1.3.1 General objectives of study.....	4
1.3.2 Specific objectives of the study.....	4
1.4 Organization of the Thesis.....	5

Chapter 2

2. Background Theory.....	6
2.1 Radiation Therapy.....	6
2.2 Radiation Delivery.....	7
2.3 Radiation Physics.....	12
2.3.1 Photon Interactions.....	13
2.3.2 Dosimetric Quantities.....	15
2.3.2.1 KERMA.....	15

2.3.2.2 CEMA.....	16
2.3.2.3 Absorbed Dose.....	16
2.4 Cavity Theory	18
2.4.1 Bragg–Gray cavity theory	18
2.4.1.1 Stopping power ratios	21
2.5 Ionization chamber dosimetry system	22
2.5.1 Cylindrical ionization chambers.....	24
2.5.2 Parallel-plate ionization chambers.....	25
2.6 Determination of the absorbed Dose to water	27
2.6.1 Reference Condition of measurement.....	27
2.7 Absolute and Relative dosimetry	28
2.8 Descriptors of photon beam dose distribution	29
2.8.1 Percent Depth Dose	29
2.8.2 Beam Profile	30
2.8.3 Isodose Chart	31
2.9 Components of Dose Distribution.....	32
2.10 Radiobiology.....	34
2.11 Treatment Planning Systems (TPSs).....	41
2.11.1 TPS Software and Calculation Algorithm.....	42
2.11.2 Beam modifiers.....	46

Chapter 3

3. Equipment and Methodology.....	48
3.1 Equipment.....	48
3.1.1 Clinac Medical Linear Accelerator.....	48
3.1.2 Treatment Planning System.....	49
3.1.3 Water Phantom System.....	50
3.1.4 Dual Channel Electrometer.....	52
3.1.5 Detector Extension Cables.....	53
3.1.6 Waterproof thimble chamber.....	54
3.1.7 Semiflex Ionization Chambers.....	54
3.1.8 Beam Analysis Software.....	55
3.2 Methodology.....	57
3.2.1 Datasets for PlanW2000 for 6MV Photon beam.....	58
3.2.2 Experimental measurements.....	59
3.2.2.1 Spectral distribution Data.....	59
3.2.2.2 Percentage Depth Dose Data.....	60
3.2.2.3 Photon beam Profile data.....	61
3.2.2.4 Absolute dose rate, Output and Wedge factors.....	61
3.2.3 Comparison between the Calculated and Measured Data.....	61
3.2.3.1 Dose Point verification.....	63
3.2.3.2 PDDs Verification.....	63
3.2.3.3 Beam Profile Verification.....	64

Chapter 4

4. Results & Discussions	65
4.1 Machine Data Collection.....	65
4.1.1 Absolute Dose data	65
4.1.2 Percentage depth dose (PDD) data	65
4.1.3 Photon Beam Profiles	66
4.1.4 Wedge Factors.....	68

4.1.5 Spectral distribution Data.....	69
4.1.6 Back scatter Factor (BSF).....	69
4.1.7 Output factor	69
4.2 Verification Tests.....	70
4.2.1 Dose point verification.....	70
4.2.2 Percentage Depth Dose verification.....	87
4.2.3 Photon Beam Profiles verification.....	91

Chapter 5

5. Conclusions & Recommendations.....	95
5.1 Conclusions.....	95
5.1Recommendations.....	96
References.....	97