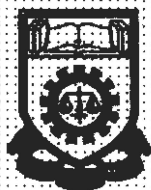


**FIELD CONSIDERATION OF FOCUSING WAVEGUIDE
APPLICATOR FOR DEEP MICROWAVE HYPERTHERMIA**

**This thesis is presented as part of a fulfilment for the award of the
Advanced Diploma in Electrical Engineering of
INSTITUT TEKNOLOGI MARA**



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DECEMBER 1995

ACKNOWLEDGEMENTS

In the name of ALLAH, the Most Beneficent and the Most Merciful who has given me the strength and ability to complete this project and thesis.

I would like to express my sincere gratitude and appreciation to Dr. Riadh W. Y. Habash for the valuable guidance of this project. Thanks are also due to Mr. Saufi, and all the Communication laboratory technicians for their cooperation and assistance. Lastly, I would like to thank all my friends especially Mr Shahrudeen who contributed directly or indirectly in completing this thesis and may ALLAH bless all of you.

HARUN BIN MOHAMED.

ABSTRACT

Microwave hyperthermia using waveguide applicators has gained popularity because of the desirable heating characteristic of this type of heating modality. This project investigates the feasibility of using Dielectric Open-ended Rectangular Waveguide Direct-contact Antenna (DORWDA) array for depositing microwave energy into the human body for heating deep-seated tumours. A distilled water-loaded DORWDA array applicator with a small aperture size (1.75×10.3 cm) has been developed for deep hyperthermia applications.

The operating frequency is chosen to be 915 MHz. The water loading provides a good coupling of radiated power into tissues. The observed variation in standing wave ratios and the concentration of the fields are found to be satisfactory for localized deep hyperthermia treatments. Analytically, the near field distributions inside the human muscle are obtained by using the Kirchoff-Huygens principles and scalar theory of diffraction. The obtained field patterns may only be moderately focused, but these are the optimum for the present applicator.

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CHAPTER 1

1.0 INTRODUCTION

1.1 General

Heat has been employed medically since antiquity to reduce aches and pains. Its application to cancer therapy is not of recent origin. Lately, there has been a dramatically renewed interest in cancer thermotherapy, primarily, due to the *limitations of conventional therapeutic modalities (surgery, chemotherapy and radiotherapy)* and the current on combating cancer [1,2].

Electromagnetic radiation has been used as a therapeutic agent in medicine for many centuries. In more recent times, extensions of the known electromagnetic spectrum seem to have led to a study of the biological effects of these radiations and the possibilities of their use in medicine.

With the use of the radar during the Second World War, a question was raised whether the radiations from the radar had a physiological ill effects on radar operators. Investigations carried out revealed no evidence of any biological effects other than the production of heat. Hence, no serious ill effects of microwave radiation were envisaged. On the contrary, it was considered that microwave radiation might prove to be a useful thermogenic agent in the practice of physiotherapy, provided a method of applying these to patients could be developed.