

HIGHER TECHNICAL INSTITUTE  
ELECTRICAL ENGINEERING DEPARTMENT

ACADEMIC YEAR 1989

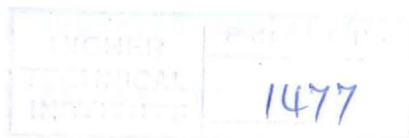
RADIATION DETECTION MONITOR  
SYSTEM

Project report submitted by PANAYI MARIA in part satisfaction of the award of Diploma of Technician Engineer in Electrical Engineering of the Higher Technical Institute, CYPRUS.

Project supervisor : Mr. A. Kaplanis

Type of project : individual

June, 1989.



PANAYI MARIA

RADIATION DETECTION MONITOR SYSTEM

ABSTRACT

This project, whose aims and terms of reference are outlined herewith, has given the writer the opportunity to familiarise and understand some basic concepts about X-ray and electromagnetic radiation in general.

Radiations detectors are instruments which are designed to detect and measure, usually, ionising electromagnetic radiation.

There are various types, some of which are mentioned in this project report, and their principle of operation is based on the fact that radiation ionise gases.

Such instruments are expensive in comparison to the one that the author has constructed and in any case their design and construction is backed up by designers and manufacturers of high quality and performance.

It is not claimed, therefore, that the simple design outlined and discussed in this report outperforms similar devices in the market from well established manufacturers.

Nevertheless, despite the very many difficulties and limitations (mostly on the availability of components and sensors) that had to be faced in producing such a device, the author has managed to design construct and test a

detector capable of giving an indication when X-ray radiation falls on the surface of a rather inexpensive (and not strictly suitable for all wavelengths of ionising radiation) sensor, the BW21.

The characteristics of such a device are attached herewith from which it will be realised that only a portion of the X-ray frequency spectrum can be detected or sensed by this device.

In order to improve its performance an intensifying screen has been used in practice and the results are in the opinion of the author, satisfactory.

## CONTENTS

	PAGE
ABSTRACT	
ACKNOWLEDGEMENT	
INTRODUCTION	
CHAPTER 1	
1.1 Electromagnetic radiation and X-rays	1
1.2 X-rays wavelength range	3
1.3 Choosing the detector	4
CHAPTER 2	
2.1 Meeting the objective	5
2.2 Block diagram representation	7
2.3 Theory	8
2.3.1. Operational Amplifiers - Inverting amplifier	8
2.3.2. Buffer	14
2.3.3. Non inverting amplifier	15
2.3.4. Voltage regulators	17
2.3.5. V.C.O.	19
2.3.6. Peak detector	22
2.3.7. Transistor amplifier	23
CHAPTER 3	
3.1 Printed circuit board	24

	PAGE
3.2 COSTING	26
3.3 CONGLUSIONS	27