# A PORTABLE SOLAR IRRADIANCE METER

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# ABSTRACT

This thesis presents a method of measuring the solar irradiance called a Portable Solar Irradiance Meter. The proposed technique helps to design simple, complex and low cost equipment. Same like other meter, this technique also have a same function which is to measure the solar irradiance in $W/m^2$. Due to the factor of cost of the sensor, a Portable Solar Irradiance Meter using microcontroller PIC 16F877A is designed. Instead of using other equipments such as sunshine recorder, pyranometer and pyrheliometer, a portable solar irradiance meter will also have the same functions with a low cost and simpler. On this project, a solar cell is used as a sensor to generate electric power where the energy from the sun will be converted into a flow of electrons. The solar cell is then been connected to auxiliary circuit as to amplify the current drawn from solar cell and to convert its current into voltage. All the analog output from auxiliary circuit become as input to microcontroller. PIC 16F877A was used in this project as to process all the output from solar cell before send it to information window (display). The information window is available to display the solar irradiance in $W/m^2$. Based on the result, the Designed Meter successfully measures the solar irradiance in $W/m^2$. All the data obtained from this project been tabulated in performance comparison table as to compared with Megger Meter and shows very low error at below 12%. From the system performance graph, it is clearly shows that the system designed almost has similarity with Megger Meter in irradiance measurement.

# TABLE OF CONTENTS

# CHAPTER 1

# INTRODUCTION

## 1.1 OVERVIEW

Solar energy is the most abundant renewable resource. The electromagnetic waves emitted by the sun are referred to as solar radiation. The amount of sunlight received by any surface on earth will depend on several factors including; geographical location, time of the day, season, local landscape and local weather. The light's angle of incidence on a given surface will depend on the orientation since the Earth's surface is round and the intensity will depend on the distance that the light has to travel to reach the respective surface. The solar irradiance received by a surface will have two components one which is direct and will depend on the distance the rays travel (air mass). The other component is called difuse radiation and is illustrated in figure 1.1[1]. There is a distinction between direct and diffuse radiation. When it comes directly from the sun it is known as direct radiation. When the radiation is scattered by the atmo- sphere back to Earth it is called diffuse radiation [3].

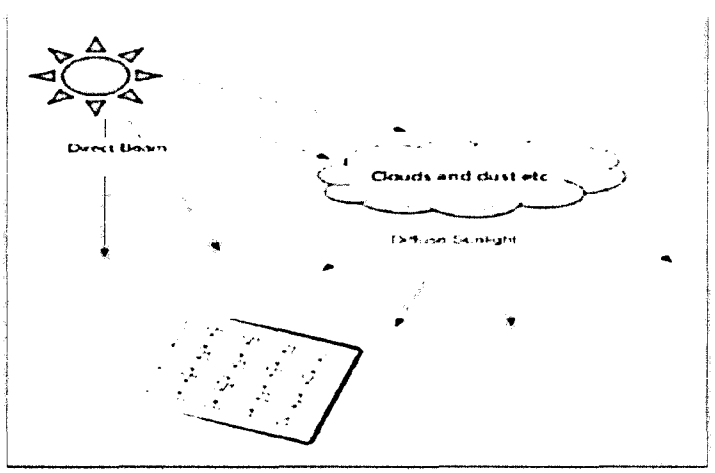


Figure 1.1: Types of radiation from the sun [2]