

**UNIVERSITI TEKNOLOGI MARA**

**PERFORMANCE ANALYSIS OF PSO  
MPPT FOR PHOTOVOLTAIC (PV)  
SYSTEM DURING IRRADIANCE  
CHANGES**

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## ABSTRACT

Maximum power point tracking have been widely used to track maximum power from the PV panel. The study focus on extracting maximum power from the PV panel based on the change in solar irradiance absorbed by the PV panel. In order to validate the workability of the proposed technique, development of the MPPT test-rig device is implemented consisting proposed MPPT method. The MPPT method applied to track maximum power from PV panel is particle swarm optimization (PSO). Particle swarm optimization is soft computing methods which follow the bird swarm to track maximum power from PV panel. The process continues repeatedly to track maximum power depending on the swarmsize of the MPPT algorithm. In order to validate this technique simulation was conducted using MATLAB SIMULINK software in order to observe and identify the output power extracted from the PV panel. SIMULINK prove to be efficient due to the features of the simulation software that allow observation of the PV power collected from the PV panel. In order to verify the proposed technique, output from the PV panel is also compared with the output power collected using perturb and observe (PNO) and incremental conductance (IC) MPPT method. The hardware was tested using PV simulator (Chroma programmable 62000H DC power supply) to identify the output power extracted from the PV panel for each irradiance value.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of Study

Solar energy is part of renewable energy which is used to replace the conventional way of delivering electricity, research studies have been conducted on solar field to fulfill the high demand of electrical energy uses. PV power generation is one of the most promising means in producing electricity from solar energy, thanks to its reliable and nearly maintenance-free nature[1]. The conventional way of delivering electricity using non-renewable energy source will cause the source to deplete due to high demand for electrical energy. High energy prices, environmental problem such as pollution and depleted non-renewable energy resources have urged the demand to the affordable, inexhaustible and clean renewable sources of energy[2]. Solar energy is a replenish energy source which is available in most places and can be utilized. Due to this reason, research on solar energy have been widely studied so that solar energy can be used as the source to produce electricity. To exploit the benefit from the application of PV systems, research activities are being conducted to achieve further improvement in their performance, cost, efficiency, integration and reliability[3].

Basic PV system consists of PV modules, dc to dc converter, MPPT and loads resistance in order for the PV panel to delivered maximum power. The PV panel used for the research is following the NT R5E3E specification. The PV panel is connected to the boost converter and MPPT for maximum power tracking process. The MPPT method used for the research is PSO which is a group of soft computing method and able to track the maximum power by using search space method. Furthermore the PSO MPPT method provide fast convergence hence able to track the PV power rapidly compare to the other method. In terms of contribution, using PSO MPPT will provide more power delivery compare to the other MPPT method such as PNO and IC method.

The power delivery by using PSO MPPT is further discussed in second chapter of the thesis. The amount generate electrical energy generated by the PV panel depends on the irradiance value absorb by the PV panel. The behavior of PV system varies with environmental conditions like irradiance and temperature[3]. PV module is also known as variable voltage source where the electrical energy depends on the value of solar and irradiance absorbed from