

**Abstract:**

This paper demonstrates a mathematical representation of Photovoltaic (PV) solar cells and hence panels performance. One-diode solar cell model is implemented to simulate the cell and extract the performance indications. The tested PV modules are BP Solar (60 Watt) and Synthesis Power (50 Watts), which are operating in a PV generation system in the University of Anbar - Iraq, College of Applied Sciences. The math model demonstrates Power versus Voltage (P-V) characteristic curves to depict and study various parameters with affecting variations in the PV array performance. The parameters include ambient and cell temperature degrees and solar irradiance (G) level which are the main elements to dictate the productivity of a solar system. G is represented by sun unit (1 sun=1 kW/m<sup>2</sup>). The outcomes of the simulation model characteristics curves have been compared with curves provided by the tested modules data sheets. MATLAB software has been used to simulate the model and extract the results. This paper also investigated photovoltaic simulation with maximum power point tracking (MPPT) converter to evaluate hence predict the behaviors of the whole photovoltaic DC current generation using PSIM Power Electronics program. The model focuses on the basic components in PV systems; The panel and the DC-DC converter. The modeling outcome data will be used as a reference verifying the performance of the tested modules during the year seasons under the dominating dusty hot weather in western Iraq.