Abstract

In the recent past the use of renewable energy as an alternative source of energy has increased considerably. The solar cells modules manufacturing technology is becoming more reliable and economical. The feasibility of photovoltaic solar energy as an alternative source of energy has become real. The low efficiency and the weather condition dependency give room for improvement of this technology to extract maximum power for different environmental conditions. Therefore, the current–voltage (I-V) experimental measurement present the electrical parameters of a photovoltaic device, whose measurement gives relevant information about the design, degradation and environmental effects on the performance of solar photovoltaic modules. In these work three categories of modules were tested (namely amorphous, Polycrystalline and Mono-crystalline solar cell modules). First a dark I-V curve was obtained, this was done by covering and placing the module under investigation in a dark enclosure and a variable voltage was fed and the variation in current at fixed voltage values were recorded. This gave a graph similar to a graph of a single diode. In the outdoor set up the module under investigation was placed on a flat rack outside the laboratory. This was motivated by site proximity to the equator (plane of array). A thermocouple was used to monitor temperature. USB6009 was used to digitally obtain current and voltage values in less than 20 seconds using LabVIEW signal express program and the data obtained was saved as text file for further analysis. A 10kΩ resistor was used as a variable load. Voltage – temperature (V-T) graphs and current – temperature (I-T) graphs were also plotted. From the V-T and I-T graphs current temperature and voltage temperature coefficients were obtained. The voltage temperature coefficient, back of cell temperature and solar irradiance were used to correct obtained data to STC that is 25oC and 1000W/m2 . The corrected I-V data was used to plot I-V curves LABVIEW program was used to automatically extract all the solar cell parameters. The performance parameters obtained were compared with manufacturer`s specification. It was found to fall within 5% margin error. This shows that the system is reliable in electrically characterising the solar cell modules. The designed system comprised of USB 6009, personal computer installed with LabVIEW 8 and LabVIEW signal express 2011, a potential divider and variable resistor as the load.