Solar Inverter System

This is a report on a basic Solar Inverter System. In this report, the performance of a Solar Inverter system is observed and evolved. A Solar Inverter System is a System or Device used as an alternative at the time of power cuts, which converts photo energy to electrical energy.

The simulink module is designed for the domestic purpose. Thus, it included basic circuit components.

Block Diagram

Solar Panel:

Solar panel is a block which consists of a PV Array . PV Array is an array/ group of Photovoltaic cells which convert the light energy from the sun to electric energy. It takes two inputs, Irradiance and Temperature.

Voltage Booster:

Voltage Booster is a block used to boost or step-up the voltage. The output of the Solar Panel is lower than the desired output , hence the Voltage Booster is utilized for step-up of output voltage.

Inverter:

Inverter is a block which converts the DC Energy to AC Energy. This is the heart of the system. In this system, Inverter is a Single Phased and Full-Bridge inverter. This block produces the pulsed AC as output.

Passive Filter:

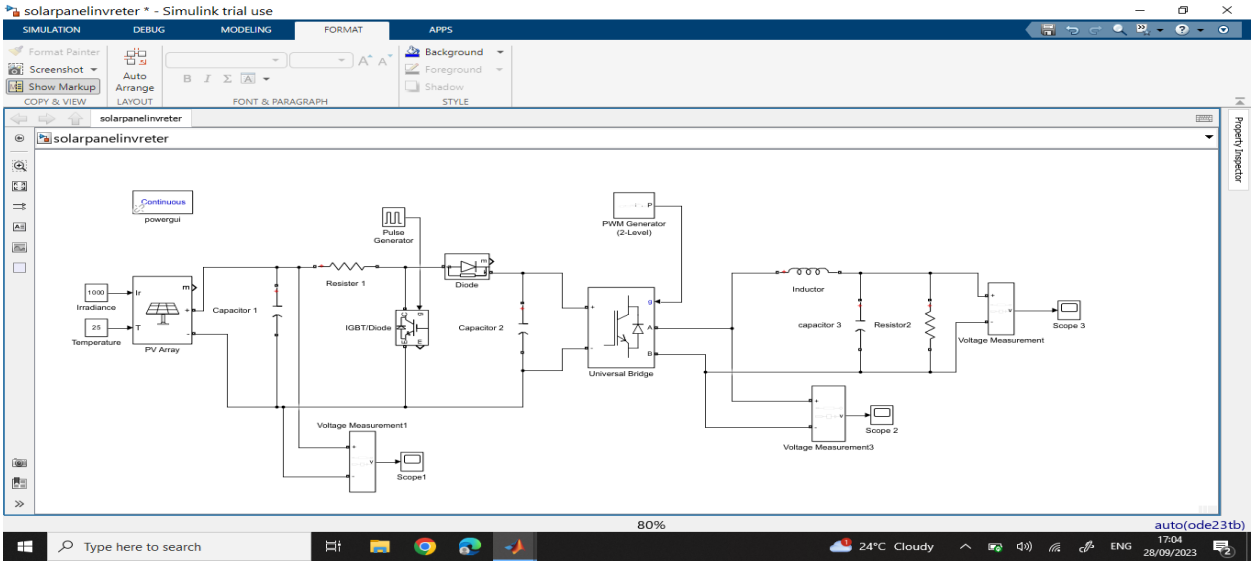
Passive Filter is a simple LC circuit. It is used to convert the pulsed AC to Pure AC and eliminate the DC components in the output.

Load:

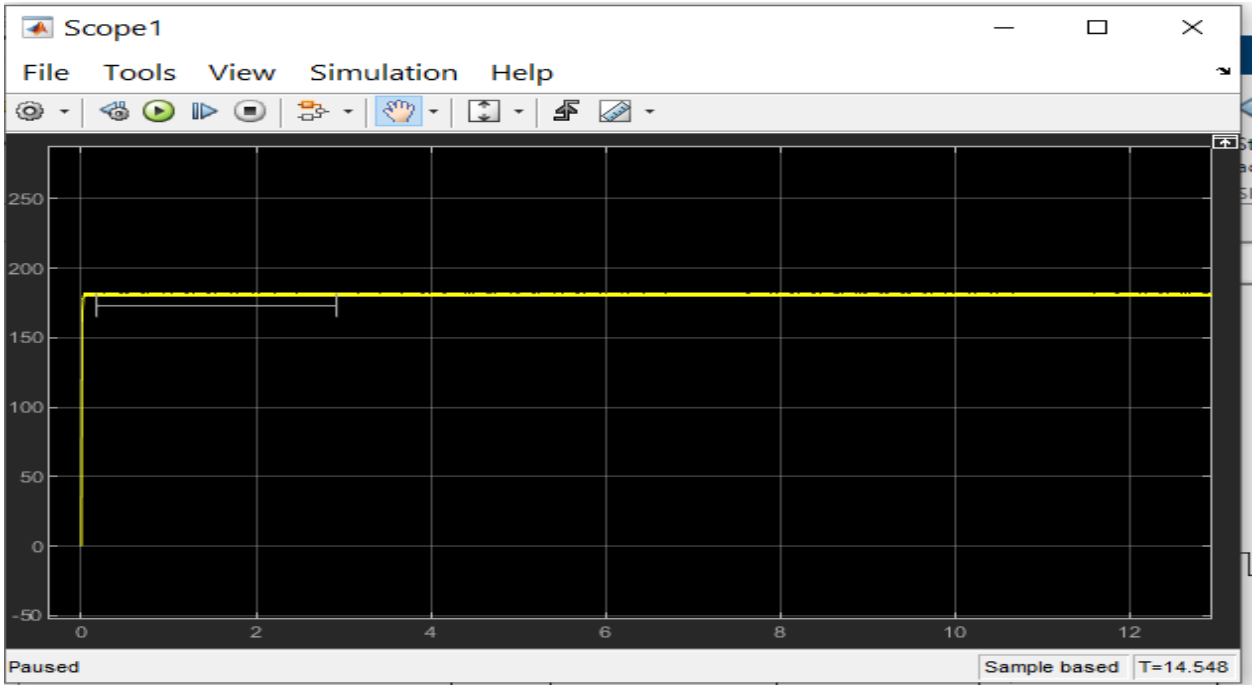
In this system, resistive load is used of 200 ohms. The output can be measured across the block.

System performance under Standard Test Conditions:

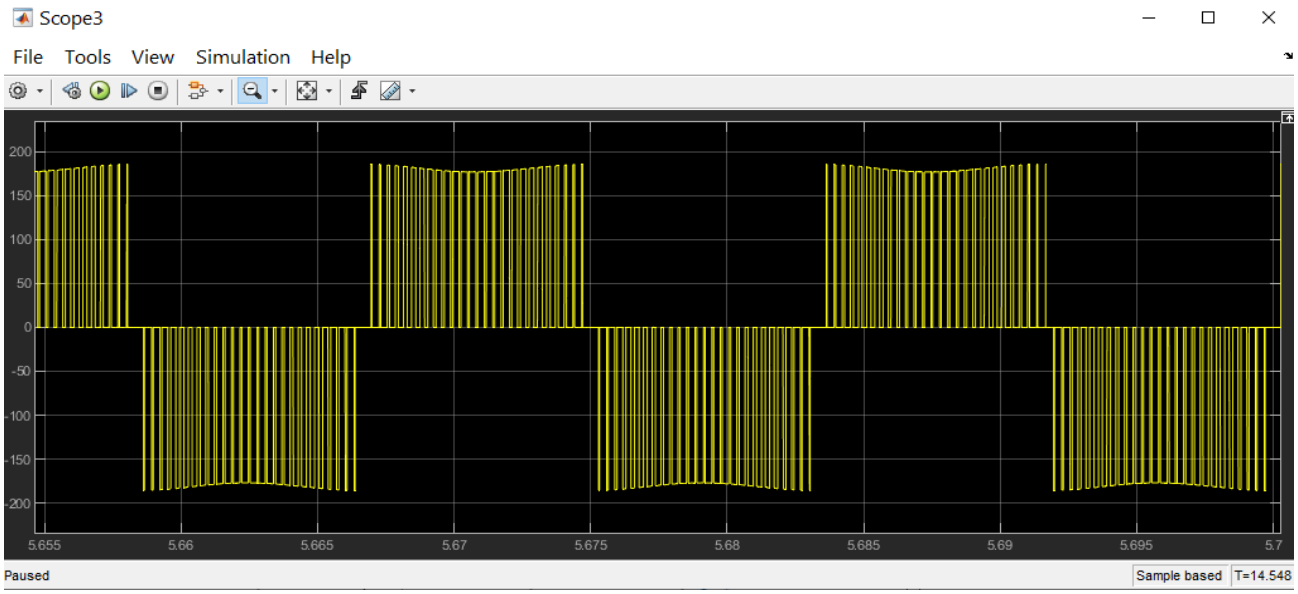
This system is simulated under the Standard Test Conditions (1000W/m^2, 25°c), and output is observed as equivalent to the desired output(230V, 50Hz).



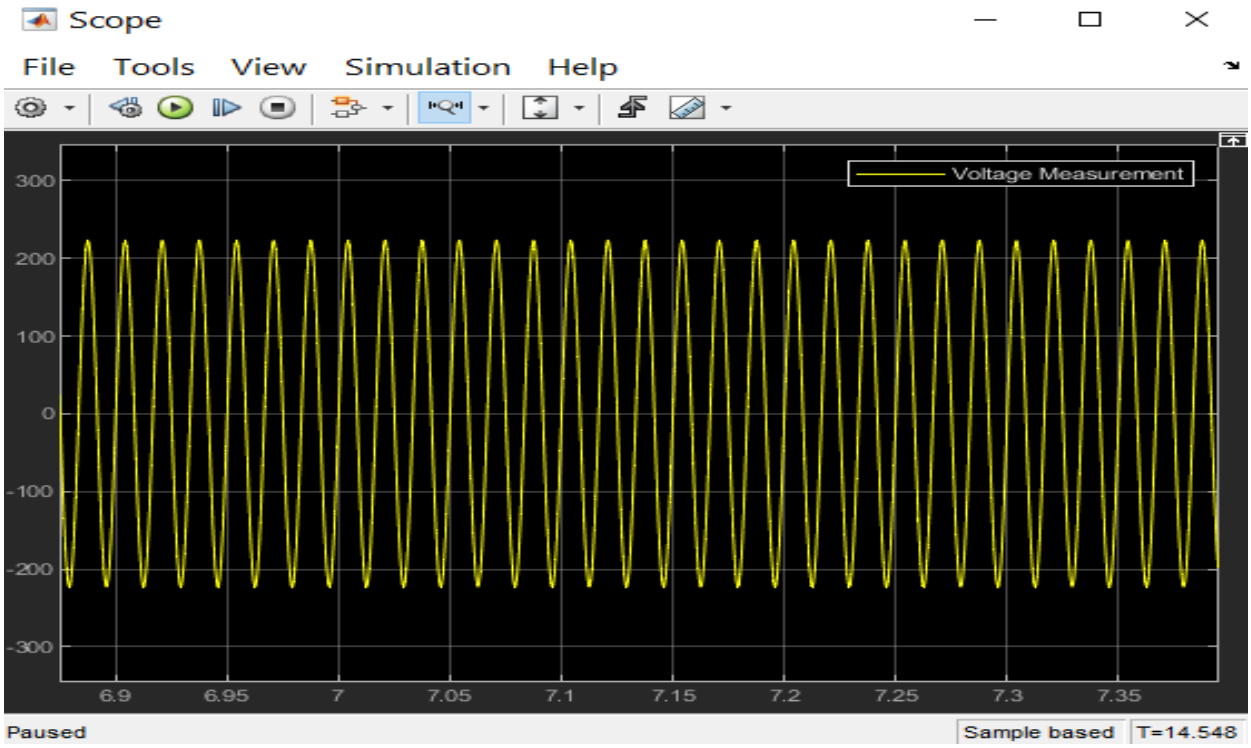
The fig shows the circuit diagram of the Basic Solar Inverter System.



The above image shown is the DC output of the Solar Panel, which is DC output but not as desired. So, Voltage Booster/ Step-up Regulator is needed for obtaining the desired output.



The above image is the Pulsed AC output obtained from Inverter. The system is supposed to generate the AC current from DC current. Thus the output of Inverter is fed to the Passive filter.

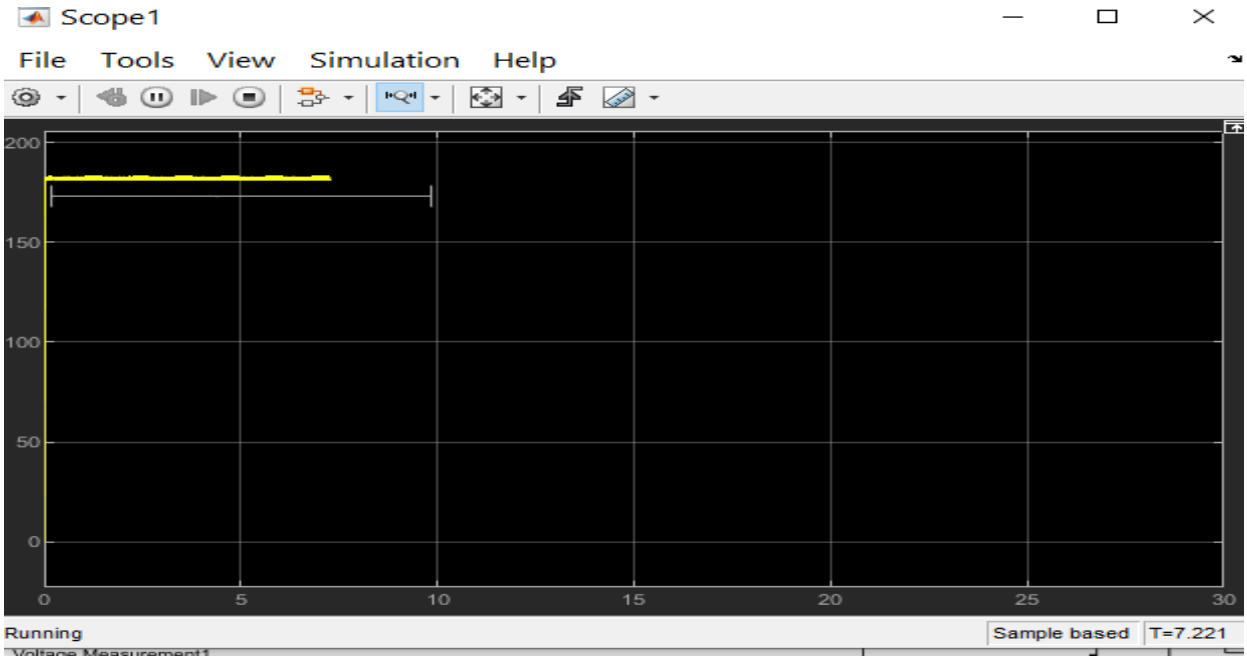


The above image shows the Pure AC output across the load, which is equivalent to the desired output.

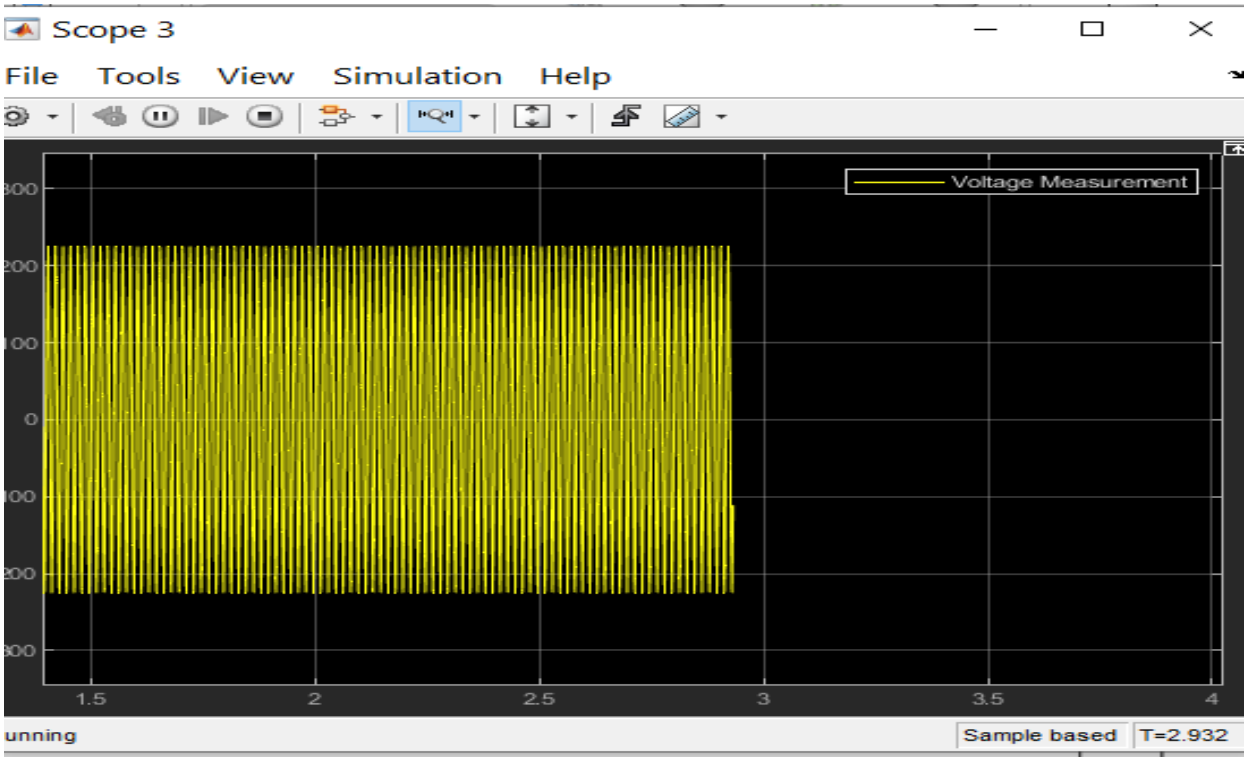
These are the outputs of the Basic Solar Inverter System under the Standard Test Conditions and also generated the desired output.

System performance under varying Conditions:

System performance at 1200W/m²

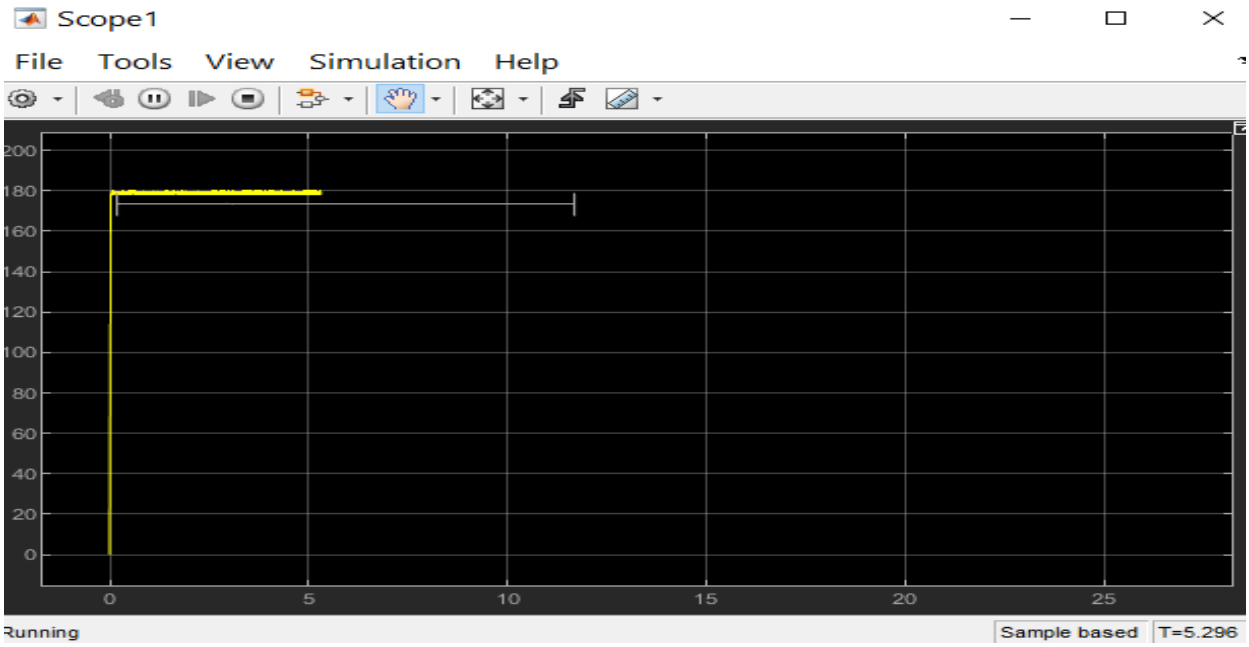


DC output of Solar Panel at 1200W/m²

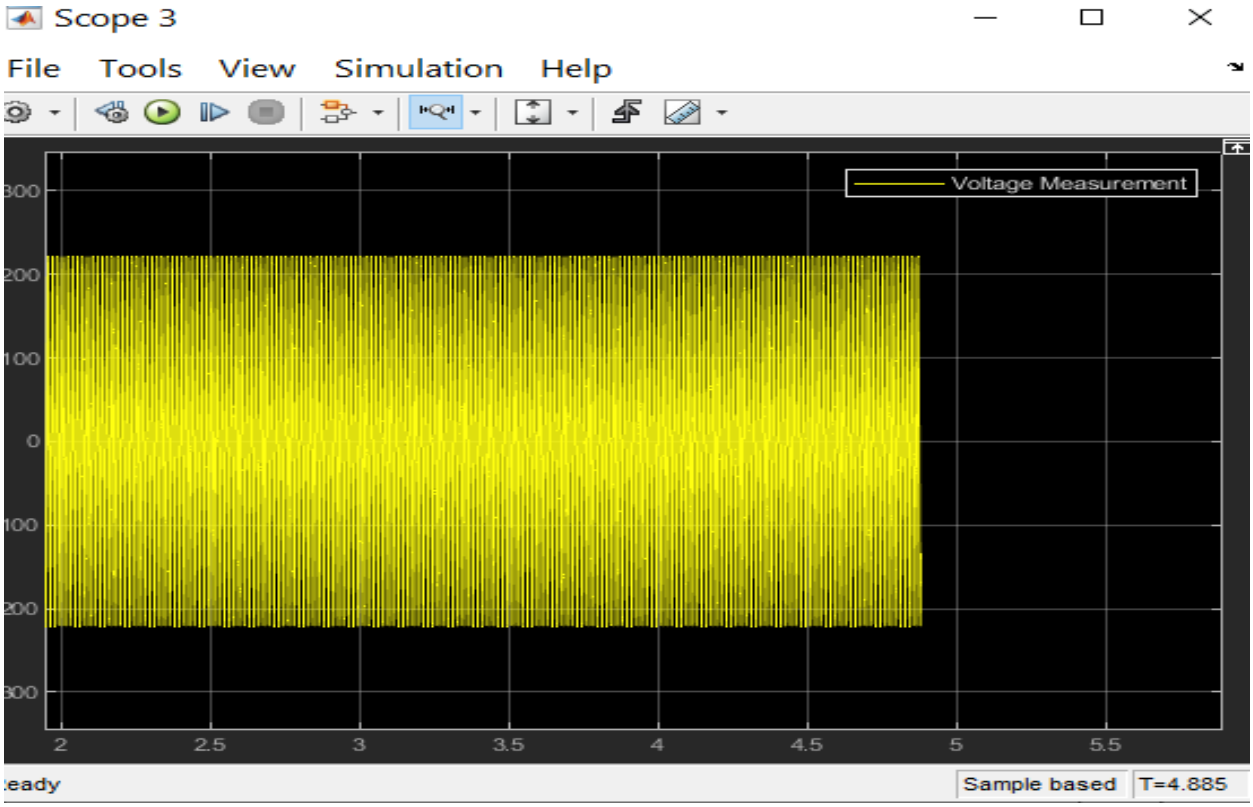


AC output across Load at 1200W/m²

System performance at 800W/m²

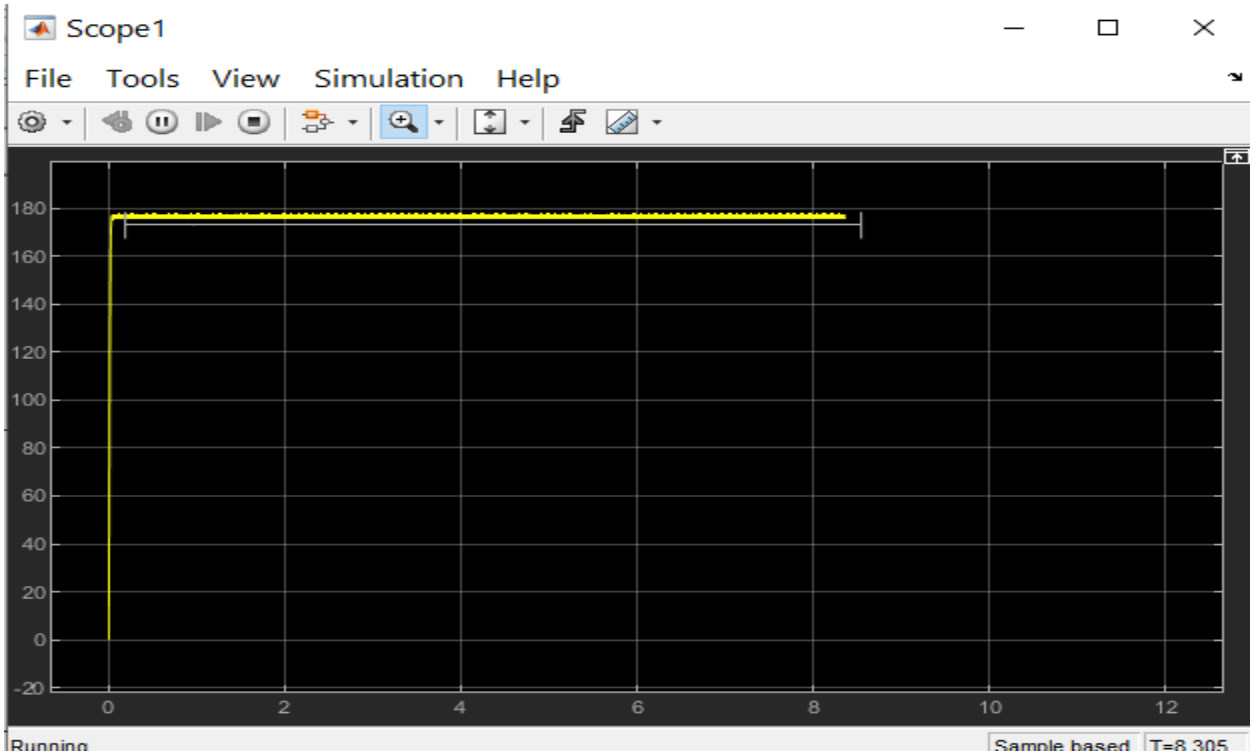


DC output of Solar Panel at 800W/m²

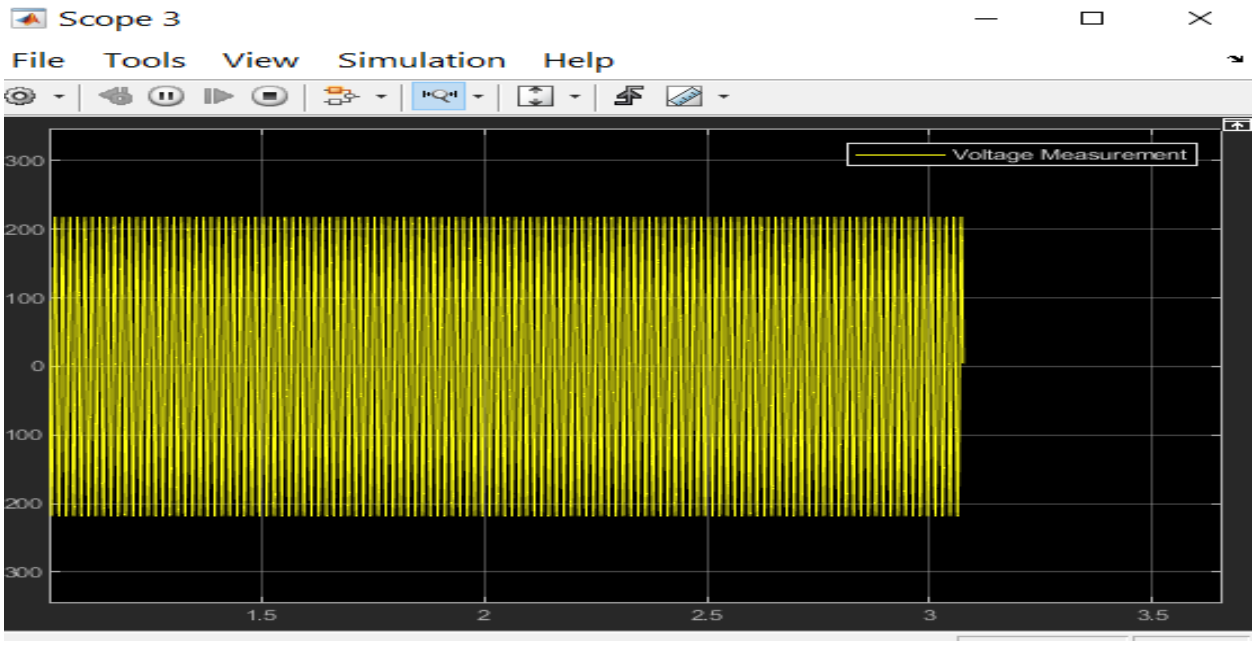


AC output across Load at 800W/m²

System performance at 600W/m²

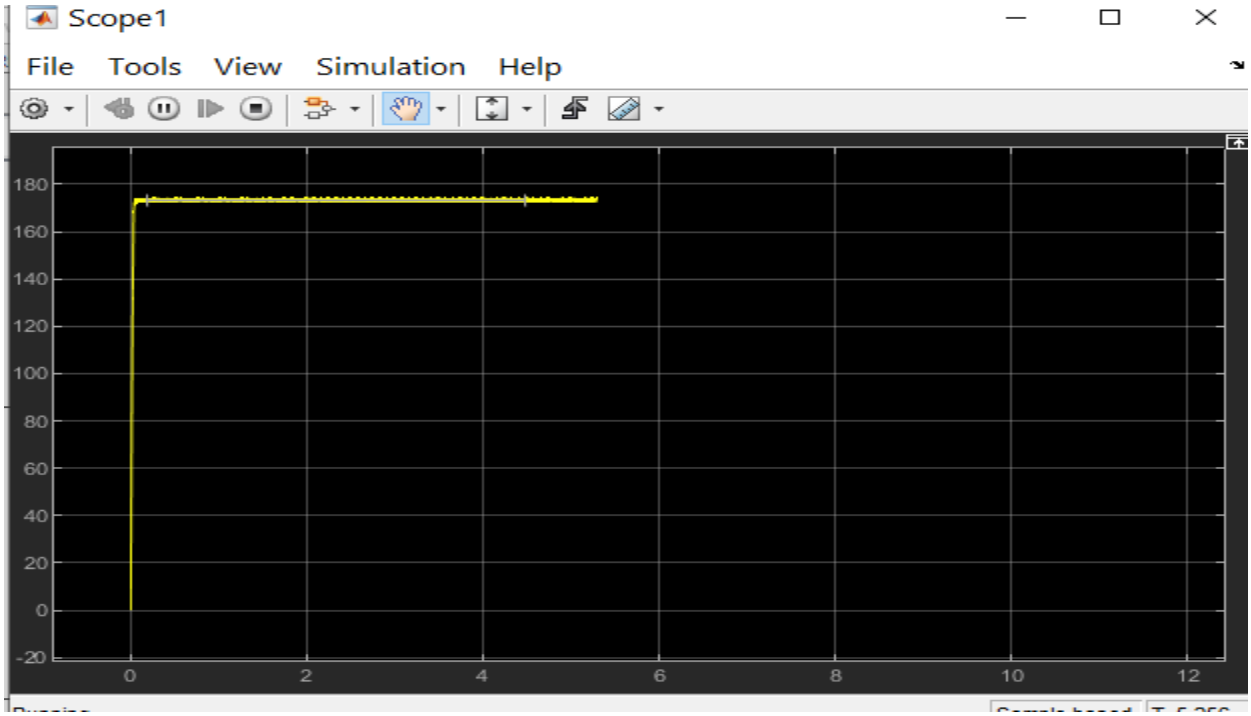


DC output of Solar Panel at 600W/m²

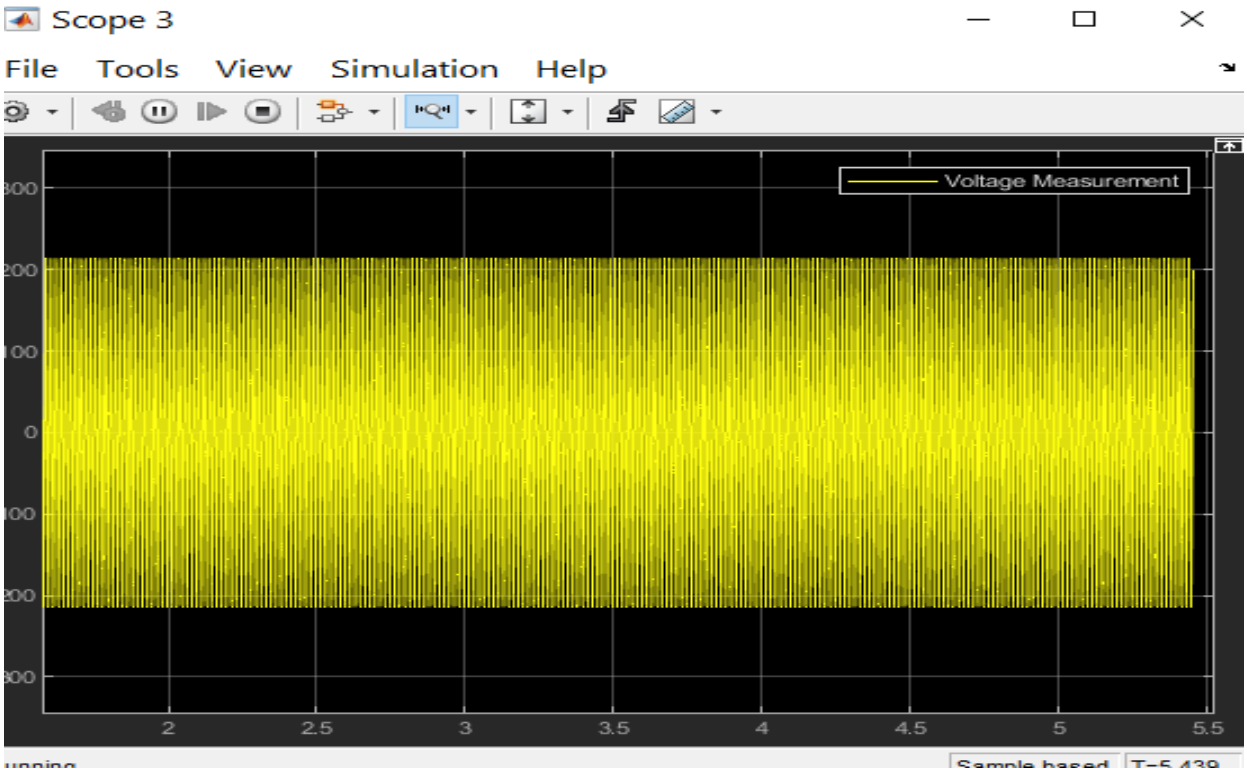


AC output across Load at 600W/m²

System performance at 400W/m²



DC output of Solar Panel at 400W/m²



AC output across Load at 400W/m²

Analysis of Solar Inverter System:

The above figures show the DC output of the Solar Panel and the AC output across the load. It can be observed that the DC output of PV Array under different conditions (1200W/m^2, 1000W/m^2, 800W/m^2, 600W/m^2, 400W/m^2) is varying with respect to the Irradiance value. But the Pure AC output across the Load is not varying in any condition.

Thus we can say that the system is invariant and always generates the same output on every working condition. Hence the system is effective, adaptable, and efficient for house-hold.

Areas of Improvement:

- The system generates the equivalent of desired output. The system can be improved by making it more efficient and precise.
- A battery can be connected to the above system. By connecting batteries to the system, one can store the energy in the form of chemical energy and can be utilized in need.