NEW EXPERIMENTAL METHOD FOR MEASURING POWER CHARACTERISTICS OF PHOTOVOLTAIC CELLS AT GIVEN LIGHT IRRADIATION

Andrea Varga

Óbuda University; Department of Power Systems
Bécsi u. 96/b. Budapest H-1034 HUNGARY
varga.andrea@kvk.uni-obuda.hu
Outline

- Introduction
- The problem and the way to the new idea
- New experimental setup and arrangement
- New results
- Summary
INTRODUCTION
Characteristics of a solar cell

Knowing I-U characteristics of a solar cell is determinative at their applications. $P_{\text{MPP}}$ can be determined from I-U plot.
THE PROBLEM

...WAY

TO THE NEW IDEA
Older experimental method

Main properties of the old setup:
1. Discrete resistances in the setup
2. Voltage and current meters were used
3. Manual reading of the meters
4. Manual data recording

Disadvantages:
1. Slow process
2. Manual process, nothing is automatized
3. Low number of saved data
4. Changing experimental conditions during the experimental run (weather)

Goal: new upgraded experimental processes need in order to improve the properties of the old experiment
New experimental process is needed

OLD EXPERIMENT

1. Slow process
2. Manual process, nothing is automatized
3. Low number of saved data
4. Changing experimental conditions during the experimental run

NEW PROCESS
should be:

1. Fast
2. Automatized process
3. Possibility to record big amount of data
4. Constant experimental conditions during the experiments
Newer Experimental Method

Main properties of the new setup:
1. Fast process
2. Semi-automatized process (using data storage oscilloscope)
3. Big amount of data can be recorded (2500 data pairs)
4. Constant experimental conditions during the experiments

More fast and reliable measurements can be run on more type of solar panels simultaneously.
Additional step: New adjustable holder for more PV cells

- New adjustable holder was installed on the roof top of the university building.
- The holder is able to hold, rotate, tilt more PV cell tables.
- This way investigation of more solar panels can be performed simultaneously.

- Purely comparable experimental data for more solar cells
- Different type of PV cells were investigated:
  - SANYO HIP
  - KORAX
  - RENESOLA
  - UPSOLAR
  - FLEXCELL
New experimental arrangement

1st part: the holder with PV cells on the roof

2nd part: in the lab

Cables with outlet of voltage signals

Cables with voltage data signals

3rd part: in the lab

Measurement places for more PV cells
One more additional step to improve the new experiment: Irradiation measurement

- Irradiation Measurement

- Weather conditions
  - Temperature was close to 0 °C
  - Sky was overcast
  - Sunshine was blocked by dense cloudy

- Recorded the spektrum of irradiation
NEW EXPERIMENTAL RESULTS
Data evaluation

Many plots needed:

U-t plots  I-t plots

Data evaluation process

Voltage [V]
Many plots needed:

- **I-R plots**
- **P-R plots**
- **U-t plots**
- **P-t plots**
- **I-U plots**

**U-I characteristics SANYO HIP**
I-U Characteristics of 4 PV cells

Observations:
- plots are similar to the characteristics given by the manufacturer
- curve shapes are different for the different type of solar panels
- maximum voltages are different for each PV panels
OLD EXPERIMENT

1. Slow process
2. Manual process, nothing is automatized
3. Low number of saved data
4. Changing experimental conditions during the experimental run

NEW PROCESS should be:

1. Fast
2. Automatized process
3. Possibility to record big amount of data
4. Constant experimental conditions during the experiments

GOALS were fulfilled
Acknowledgment

Thanks for attention