

Experimental study of the effectiveness of energy efficiency of solar cells «CUBESAT»

The main objective of research was experimental determination of efficiency of development of solar batteries energy at various orientation of the CubeSat case concerning a source of light radiation.

For research the model of the satellite (fig. 1, *a*) was assembled. As converters of light energy solar Solar Panel Cell Solar batteries were used: 80×85 mm; 6V; 0,8W.

The model of the satellite 1 (fig. 1, *a*) represents a cube with a size of edge of 100 mm. Each panel of solar batteries was numbered (fig. 1, *b*).

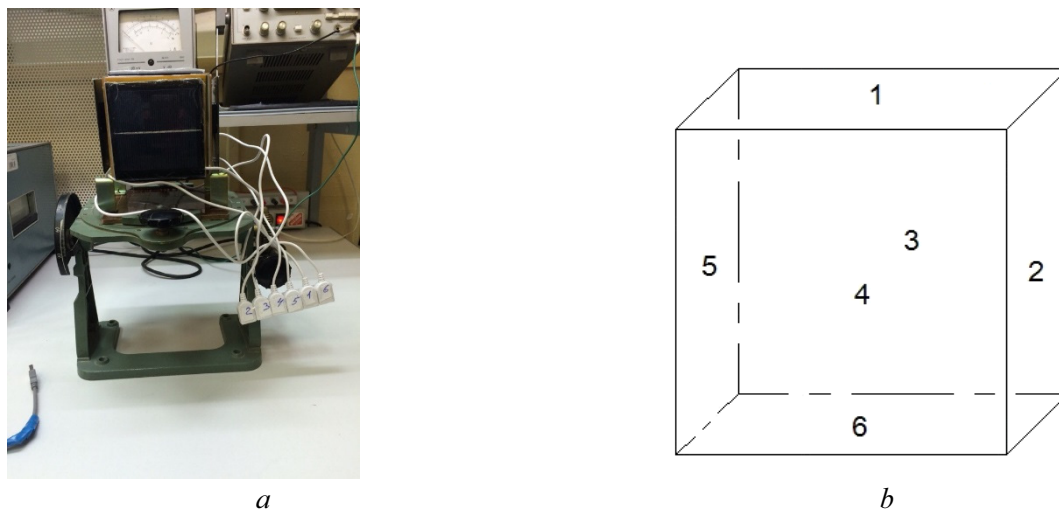


Fig. 1. The CubeSat model with panels:

- a* – a general view of experimental installation: 1 – the model of the satellite, 2 – swivel bracket;
b – the scheme of an arrangement of solar panels on the satellite model:
1 – top side; 2 – the right side; 3 – back side; 4 – forward side; 5 – the left side; 6 – lower side

The model of the satellite was installed on swivel bracket (fig. 1, *a*) which provides two rotary degrees of freedom [2]. During the first experiment orientation of the model concerning a light source changed only on antiaircraft corner, and during the second experiment – at the same time both on antiaircraft and on azimuthal to corners.

As a source of lighting the usual luminescent lamp and a street daylight were used. Distance from installation to a lamp of 65 cm. Tension from each solar battery was measured serially by means of a multimeter (Mastech my 61).

The model turned on antiaircraft and an azimuth ranging from 0 to 90 degrees with a step of 10 degrees. In fig. 3 schedules of dependences of tension at the exit of each of six solar panels from angular situation concerning a light source are submitted, removal of data took place at a fluorescent lamp. The arrangement of solar panels on the model corresponds to an arrangement in (fig. 1, *a*), thus, an arrangement of the light source is located perpendicular to the top side of the model.

Then experiment on removal of tension from solar batteries, but already was made open-air at day lighting (fig. 4).

For an assessment of efficiency of development of energy all panels of solar CubeSat batteries made summation of tension (fig. 5) from each panel corresponding angular provisions, in both conditions of carrying out experiment at a usual luminescent lamp and at a daylight respectively. In

experiment 3 and 4 data at turn of the model on antiaircraft corner and on antiaircraft and on azimuthal to corners respectively in street conditions and their total dependence on a corner is shown graphically (fig. 5).

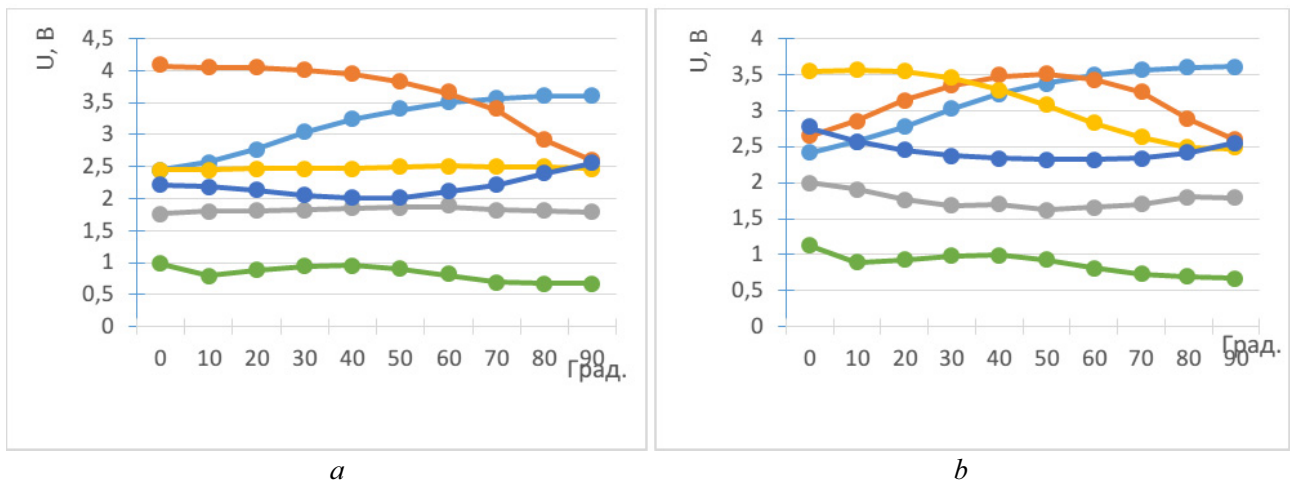


Fig. 3. Schedules of dependence of tension on a corner at a fluorescent lamp:
a) on antiaircraft corner; b) on antiaircraft and on azimuthal to corners at the same time

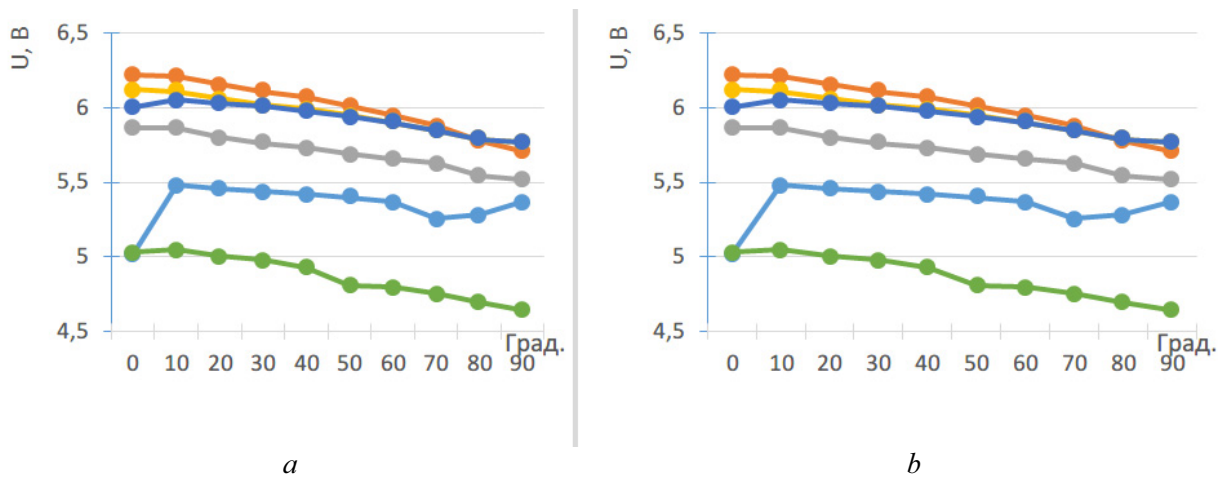


Fig. 4. Schedules of dependence of tension on orientation of panels of the model to the Sun at continuous overcast: a) on antiaircraft corner; b) on antiaircraft and on azimuthal to corners at the same time

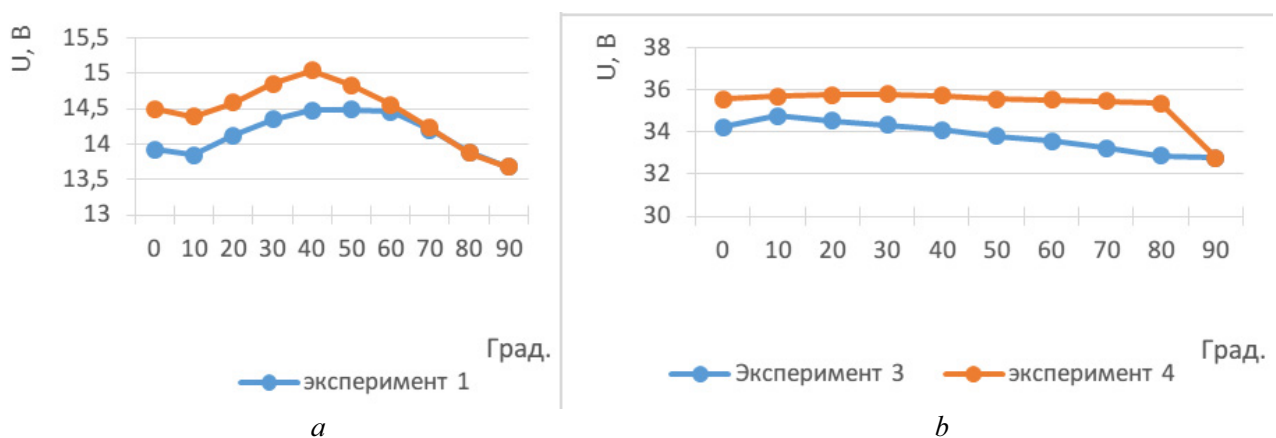


Fig. 5. Schedule of dependence of total tension on a corner:
a) a light source – a fluorescent lamp; b) a light source – Sun overcast

From experimental data it is visible that at a perpendicular arrangement of one of panels of solar batteries of the model concerning a light source, this solar battery gives out the greatest tension. However, total tension from all panels thus is less than, at turn of the model on a certain corner as in such situation other panels receive more light.

By changing only an anti-aircraft corner the maximum total development of energy (fig. 5, *a*) takes place at coal 40–45 a hail. When carrying out experiment in the conditions of continuous overcast, light scattered. Thus obviously expressed extremum (fig. 5, *b*) it isn't observed.

References

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