

SCO – 1st YOUNG SCIENTISTS CONCLAVE
 Shaping SCO-STI Partnership: Young Scientists Perspectives



NOMINEE'S DETAILS/INFORMATION

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(DD/MM/YYYY) 21.03.1990

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Field of Science and Technology: Physics, Theoretical physics, Laser physics.

ACADEMIC QUALIFICATION: degree and discipline (please indicate where appropriate)

Degree:	Bachelors		Masters		PhD		Other	
Discipline:	Physics		Theoretical Physics		Laser Physics			

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Nomination Statement (up to 300 words): Please describe area of expertise in which the nominee has demonstrated innovation excellence. Please provide the information in English.

DEVELOPMENT AND IMPLEMENTATION OF HIGH EFFICIENCY SOLAR PHOTOELECTRIC ENERGY DEVICE 3D FORMAT FOR WIDE PURPOSE.

One of the urgent problems of using photovoltaic devices is the negative impact of a hot climate on them. We know that heat is transferred through radiation, heat conduction and convection. Due to direct rays hitting solar panels, the surface temperature of solar panels increases over time compared to the environment due to radiation. But the surface temperature also depends to some extent on the ambient temperature. If we consider Newton's cooling theory, the surface temperature of a solar panel can rise to a certain value. This is determined by the ambient temperature. For example, in an experiment with an ambient temperature of 33 ° C, the surface temperature of the solar panel rose to 52 ° C in 1 hour, which led to a 34% decrease in output voltage and efficiency. If the ambient temperature were above this, the surface of the solar panel would be heated to a higher temperature and the efficiency would be significantly reduced. In Uzbekistan, the average summer temperature is 40 ° C. This means that the use of traditional solar panels creates both economic and energy problems in Uzbekistan.

To solve the above problems, we proposed a rotating photovoltaic power device of a new 3D format. The principle of operation of the device is based on self-cooling. Our experiments on this device showed that even after 1 hour of operation, the surface temperature of the solar panel did not change, no decrease in efficiency and output voltage was observed. This is because "forced convection" is formed in it. That is, traditional solar panels do not have time to emit thermal energy, which they absorb, into the environment, and cause surface heating. However, in the proposed design, in addition to thermal radiation, heat losses are also observed due to forced convection, which prevents the occurrence of temperature drops with the environment and becomes the cause of self-cooling.

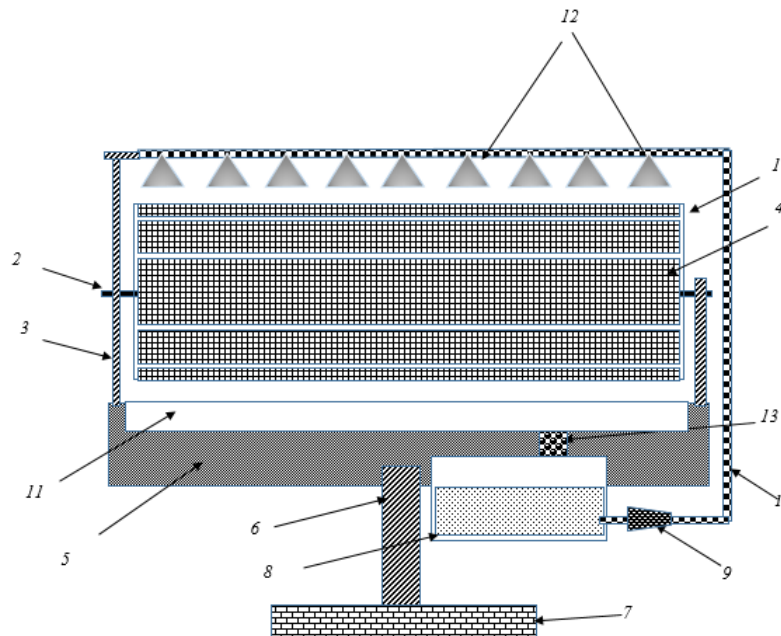


Fig.1. Solar photovoltaic power device.

Innovative Project Statement (up to 300 words): Please provide brief information on the nominee's innovative idea. Please provide the information in English.

The proposed and developed design of a rotating photovoltaic module "Solar photovoltaic power device" SPPD contains a solar panel in the form of a cylinder or mono-facet prism with semiconductor solar cells, freely rotating around a horizontal axis, a rotation mechanism, a fixed base, electromagnetic coils, permanent magnets and connecting wires. The device contains electromagnetic coils connected in the form of a load to the solar battery, and the electromagnetic coil of the most illuminated flat side of the prism with solar panels is located in the field of a permanent magnet fixed to the inner fixed part of the device. The device also contains a water cleaning system for the outer surface of solar panels, and the cleaning system is powered by a portion of the photovoltaic energy generated by the device itself. To increase the reliability and efficiency of the device, the purification system is equipped with a container of clean water, a water collector, an electric pump, a filter, a pipeline with breezing holes. A polyhedral prism has an outer surface in the form of many rectangles, and the length of the rectangle is equal to an integer number of square solar cells $L = n \times a$, and the width of the rectangle is equal to the side length of a square solar cell $l = a$, where n is an integer a is the side length of a square solar cell ...

The specified solar energy device, in contrast to analogs, has a general innovative character, which consists in the fact that the solar panels are made in a non-standard 3D shape and they rotate around the central horizontal axis during operation. In other words, solar panels are cooled as they rotate and are excluded from continuous exposure to direct sunlight, which ensures their low operating temperature, hence high efficiency and a longer operating life.

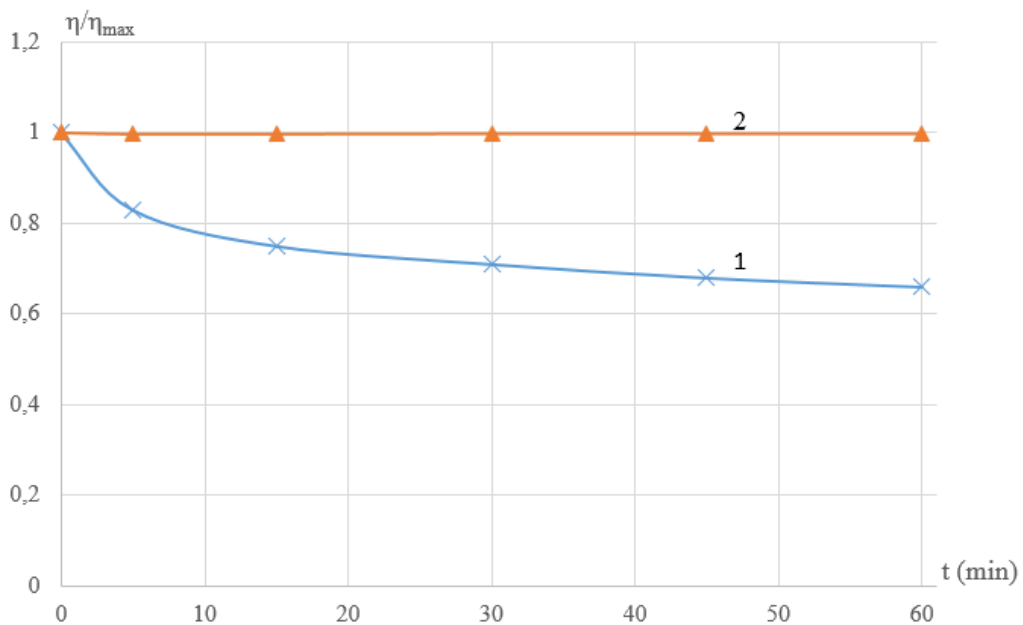


Fig 2. Graph of the relative change in efficiency over time [1] of a traditional flat solar panel and [2] of a new rotating photovoltaic power device in 3D format.

Summing up the results of the experiment, we can say that the surface temperature of conventional flat solar panels increases over time, which leads to a decrease in their efficiency and a decrease in the output voltage. In the proposed new format of a 3D rotating photovoltaic power device, its surface temperature does not change due to self-cooling over time, which guarantees a constant efficiency of the photovoltaic device and the output voltage U (Figure 2). In regions with high ambient temperatures, it is recommended to use the device we offer.

Participation in Innovation Competitions/Awards/Achievements: Please list previous participation in innovation competitions and awards/achievements, if any. Please provide the information in English.

The project is dedicated to the finalization and manufacture of an experimental industrial batch of new designs of the "Solar photovoltaic power device" (SPPD) for which applications have been submitted to the AIS RUz for obtaining patents (*Table 1*).

List of developments of previous years ASU on solar photovoltaic devices

Table 1

№	Development name	№ Application or patent number	Date of issue of the patent	Authors
1	Photovoltaic converter and method of its manufacture	№ IAP 20170549	29.12.2017.	R.Aliyev, M.Muydinova, S.Aliyev, N.Yuldasheva
2	Solar generator	№ FAP 00623	07.05.2010.	R.Aliyev, E.Muxtarov, A.Mirzaalimov
3	"Solar Photovoltaic Power Device"	№ FAP20200046	26.02.2020	R.Aliyev A.Mirzaalimov J.Ziyoidinov S.Aliyev

DECLARATION BY THE CANDIDATE:

I hereby declare that all the information given above is true to the best of my knowledge. I accept to participate in the virtual conference of 1st SCO -Young Scientists Conclave in India, and will attend the entire programme of five days.

Place: Uzbekistan

Date: 24.09.2020

Signature of the nominee:



Name of the nominating authority:

(Contact details, i.e. telephone, email and designation)

Place: -----

Date: -----

Signature: -----