САМАРСКИЙ УНИВЕРСИТЕТ
SAMARA UNIVERSITY

Samara center for nanosatellite testing: opportunities and services

Associate Professor,
Technical Director of CTN
Ivliev Alexander V.

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THE GOALS AND OBGECTIVES OF THE CNT

Center of nanosatellites testing (CNT) was created in 2014 with the assistance of the Government of the Samara region.

The purpose of establishing CNT is to create a production and test base for development nanosatellites, for scientific-educational programs of universities.

The tasks:

1. Design, prototyping, software development and verification of individual systems of nanosatellites.
2. Development of design documentation.
3. Preparation of all necessary systems and prototype building.
4. The ground tests:

a) to confirm the safety of nanosatellite platform;

b) to demonstrate the efficiency of the design of a nanosatellite during transportation to the launch site, launch into orbit and the execution of an orbital flight.

5. Preparation of documents required for obtaining a certificate of airworthiness, arranging transportation to the launch site.
6. Providing a technical base for training qualified staff and providing all types of services.

STRUCTURE OF CNT

To accomplish the goals and objectives, in the CNT includes the following units.

1. Laboratory of development, manufacturing, assembly and testing of nanosatellites electronic systems.
2. Laboratory of studies of the influence of space factors.
3. Laboratory of study of the effect of mechanical stress on the system of nanosatellites.
4. Laboratory of testing orientation and stabilization systems of nanosatellites.
5. Laboratory of nanosatellites dynamics simulation and inertial sensor testing.
6. Stand for determination of moments of inertia and position of center of mass of the nanosatellite.
7. Bench testing of solar panels.
8. The mechanical workshop.

On the basis of the CNT students, graduate students and professors were realized projects of the two nanosatellites of Samara University (SamSat-218 and SamSat-QB50). Currently, CNT is testing propulsion system on the basis of which in the future will create a new nanosatellite (SamSat-M).

LABORATORY OF DEVELOPMENT, MANUFACTURING, ASSEMBLY AND NANOSATELLITES ELECTRONIC SYSTEMS TESTING

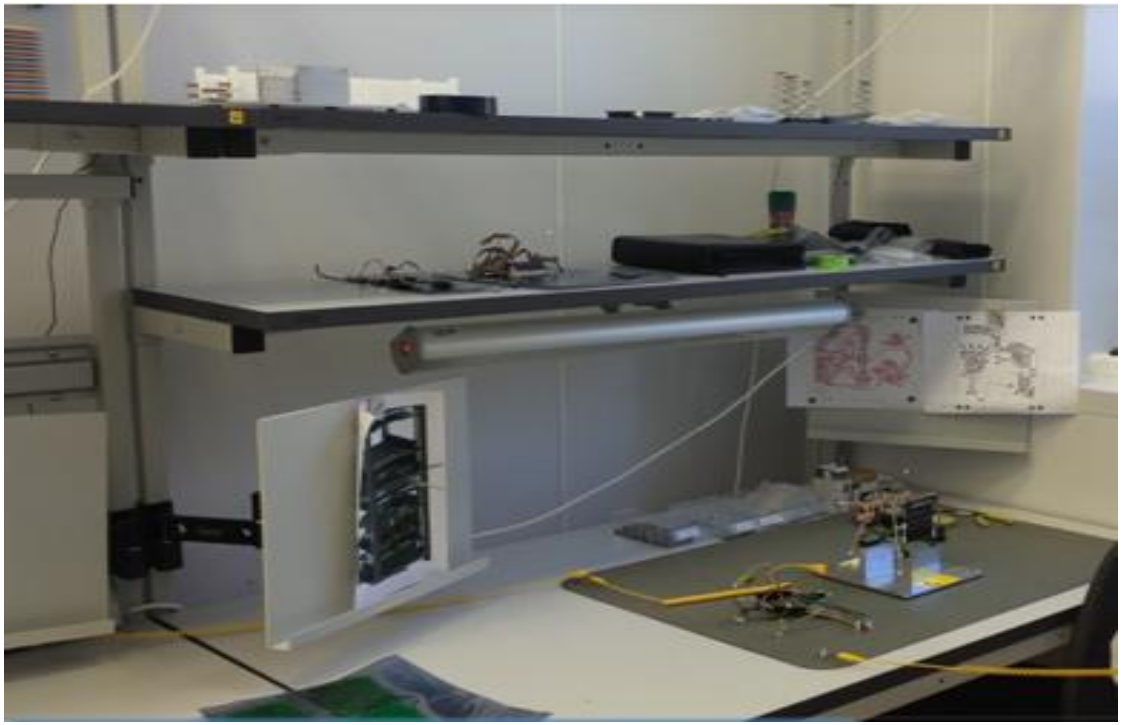
The lab includes equipment for the development, production and repair of electronic assemblies. It includes semi-automatic installation of all types of modern components, precision dispenser and a stencil printer for applying, oven and a Hairdryer for reflow soldering pastes, ultrasonic cleaning, test and measurement specialized and other necessary equipment, software.

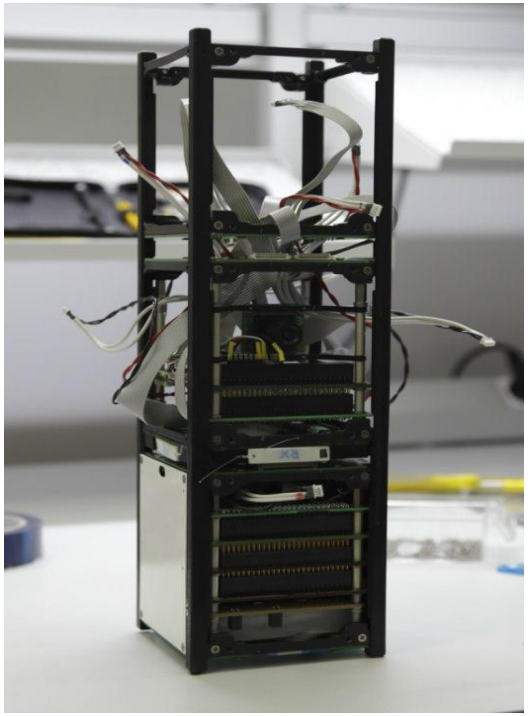
Part of the laboratory for development of schematics and PCB

Part of the laboratory for prototyping of electronic devices

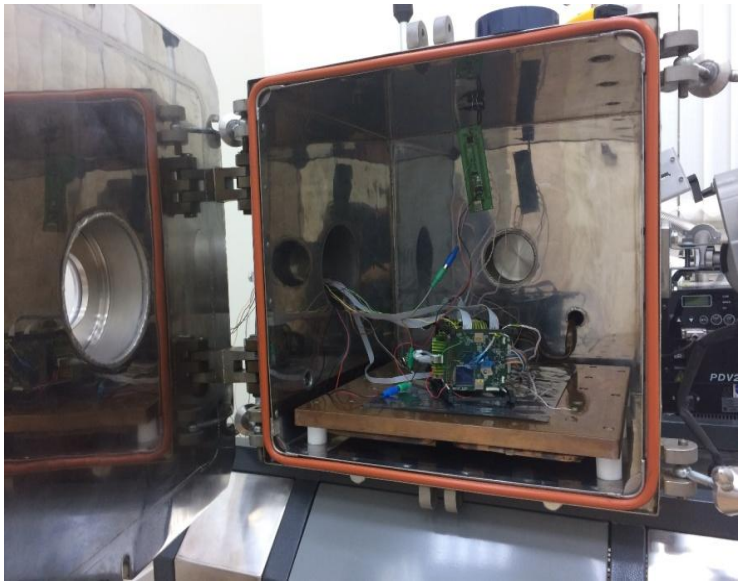
LABORATORY OF DEVELOPMENT, MANUFACTURING, ASSEMBLY AND NANOSATELLITES ELECTRONIC SYSTEMS TESTING

Part of the laboratory of automated Assembly of printed circuit assemblies





Part of the laboratory for the Assembly of mechanical components, electronic components and nanosatellites



The laboratory has a thermal vacuum chamber УП-125ТХД designed to study the influence of space factors (high vacuum, cyclic heating-cooling) on the performance of onboard systems and nanosatellite in a generally orbital motion.

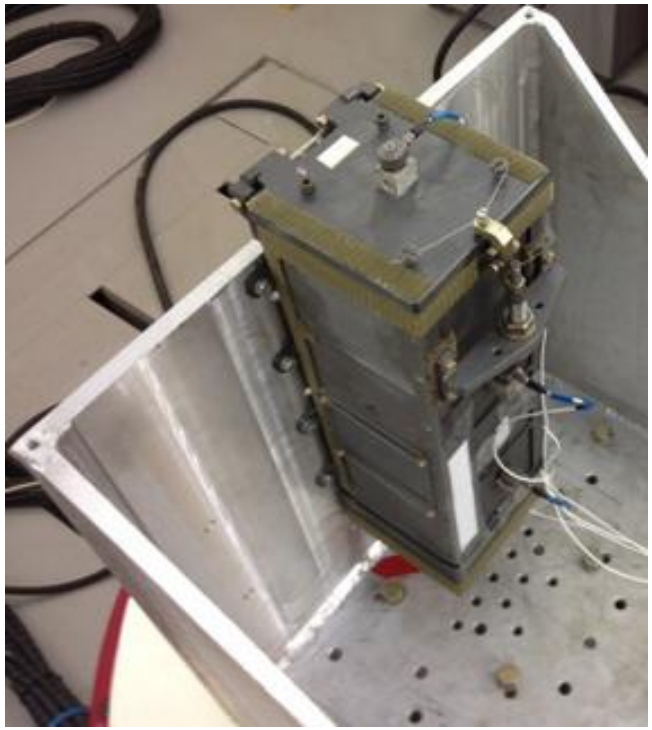
Working area size, mm3	500x500x500
Range of temperature control thermoplay,	-70...200 °C
The temperature control accuracy,°C	±0.5
Temperature uniformity thermoplay, °C	±2
The minimum pressure, mm RT, article	1x10-6
Interface	Ethernet, USB

The housing for testing the thermal Cycling

Equipped with a vibration testing electrodynamic VSV-202-150, allowing dynamic testing of nano-satellites and their components.

Maximum weight of test object: 60 kg; frequency: 11.6...4000 Hz; amplitude: 5 ... 23 mm.

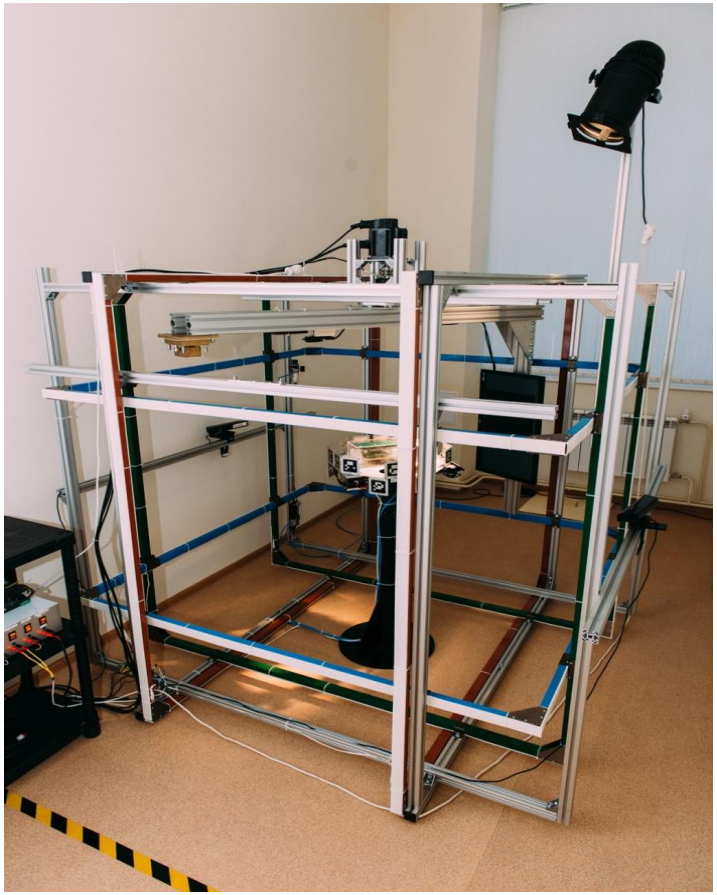
Modes of vibration testing:
sinusoidal vibration;
random vibration;
shock.

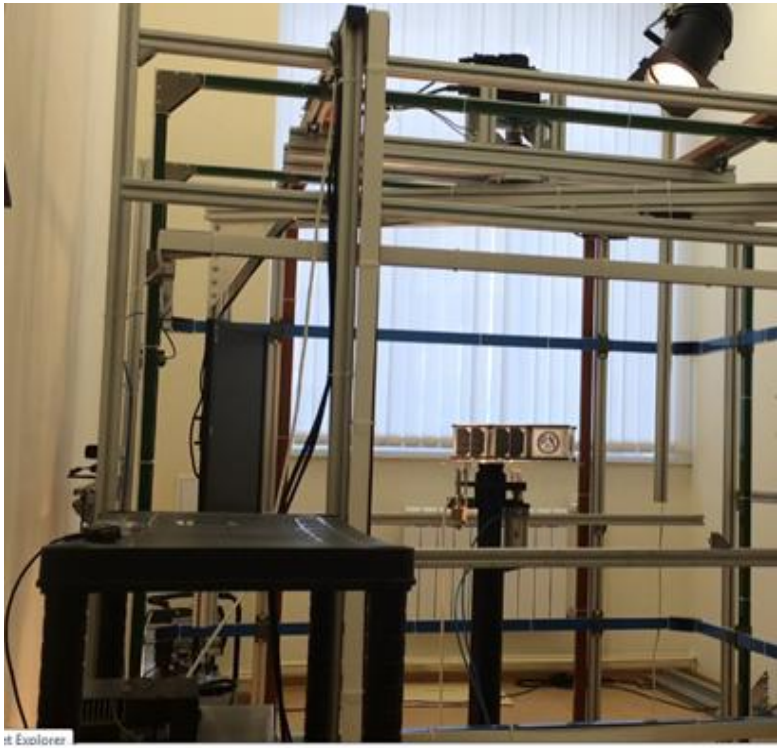


Tooling used for testing of individual printed circuit boards, stacks and media Department of nanosatellites.

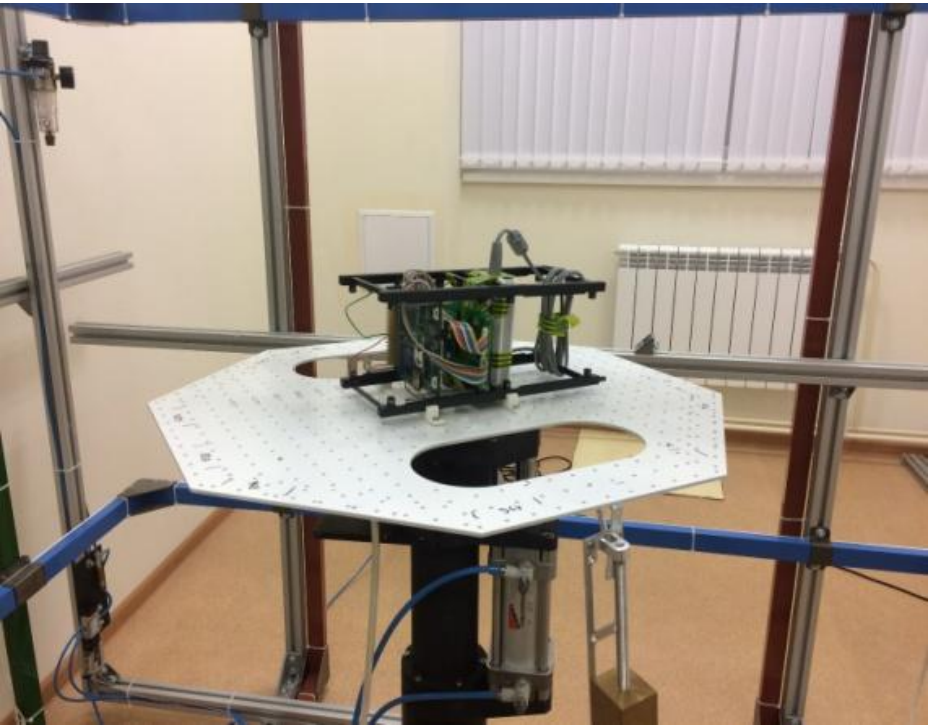
Equipped with a pneumatic "membrane" suspension, Gemgolts coils for modeling magnetic fields, simulators rolling the sky and the Sun.

The range of generation of magnetic field: ±150 μt;
the accuracy of the magnetic field generation: >90%;
the intensity of solar radiation:1400 W/m2.

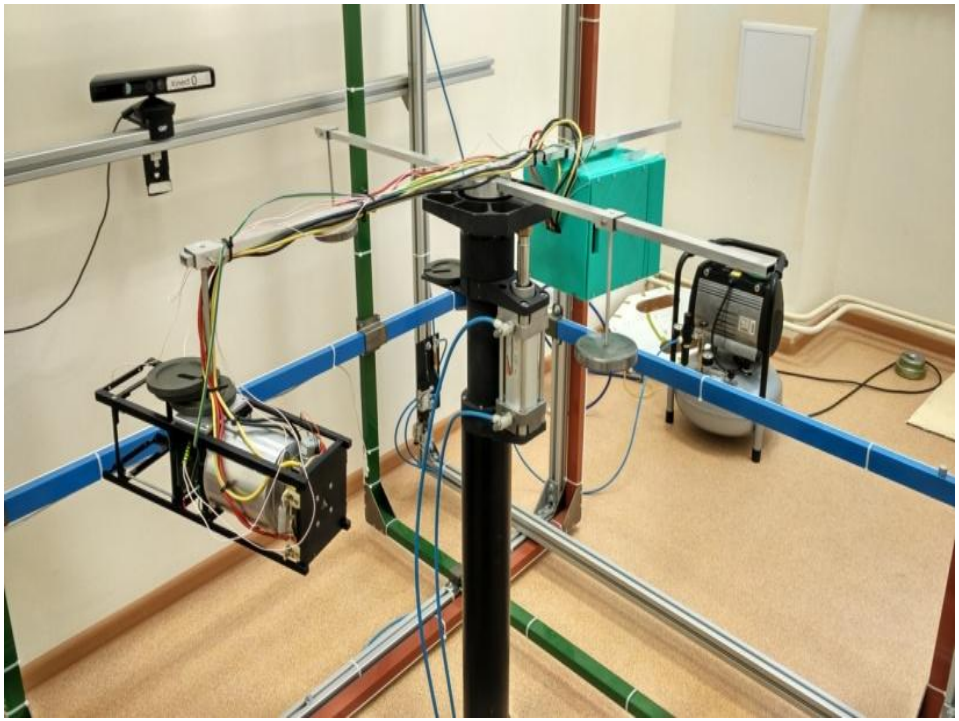




Testing orientation sensors

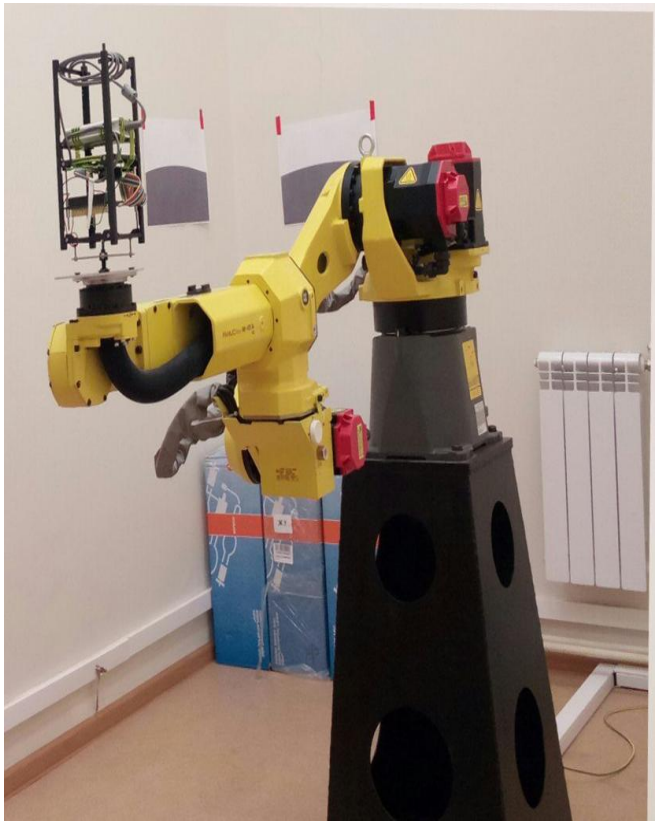


Testing of electromagnetic devices stabilization

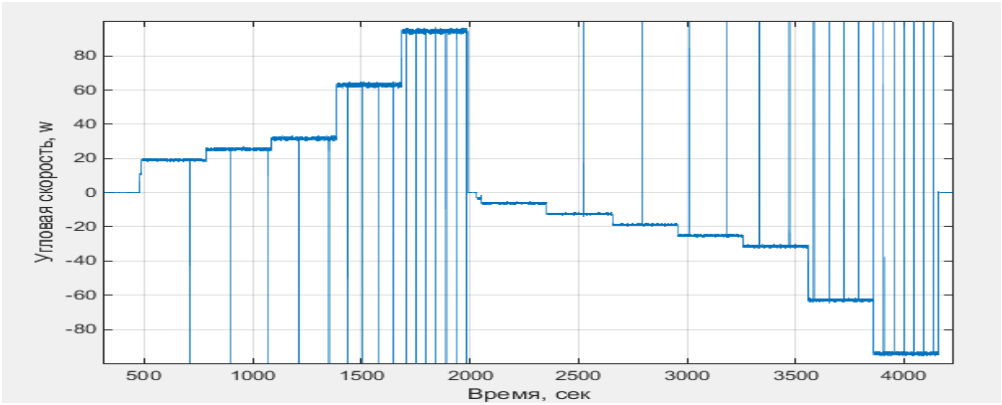


The experimental testing of unit maneuvering a nanosatellite with electro thermal engine

With robot manipulator FANUC M-10iA/12HS, with six degrees of freedom, with a positioning accuracy of 0.08 mm, which allows to move the weight up to 10 kg, with additional software “infinite rotation along the axis "Z“.



The nanosatellite, mounted on manipulator



The test results of angular rate sensor

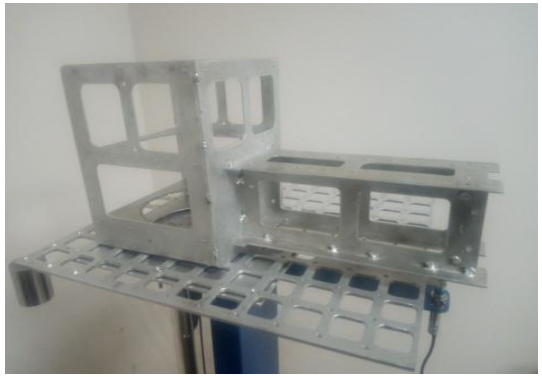
The test object was in motion around the longitudinal axis in several modes of robot-manipulator: 1, 2, 3, 4, 5, 10, 15 % from the maximum speed of rotation 6th axis of the robot manipulator (600 ◦/sec).

8 Robot 2.MOV

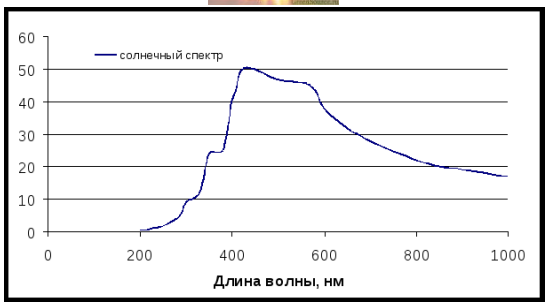
STAND DETERMINATION OF MOMENTS OF INERTIA AND POSITION OF CENTER OF MASS OF NANOSATELLITES

The stand is designed to determine the inertial and mass-centering characteristics of the inertia tensor and the position of the center of mass of the nanosatellite in the construction coordinate system;

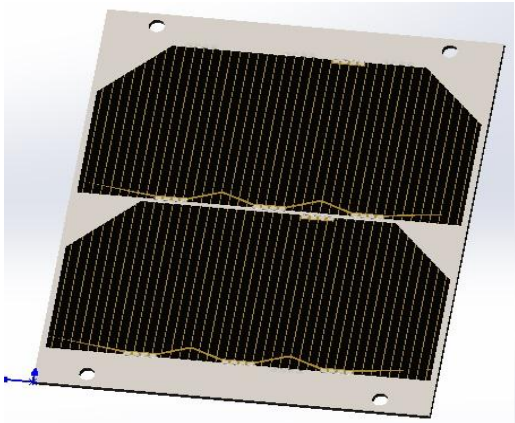
- maximum object size 350 x 150 x 150 mm;
- the range of masses of objects 0,5 ... 10 kg;
-the relative measurement error not worse than 1%.



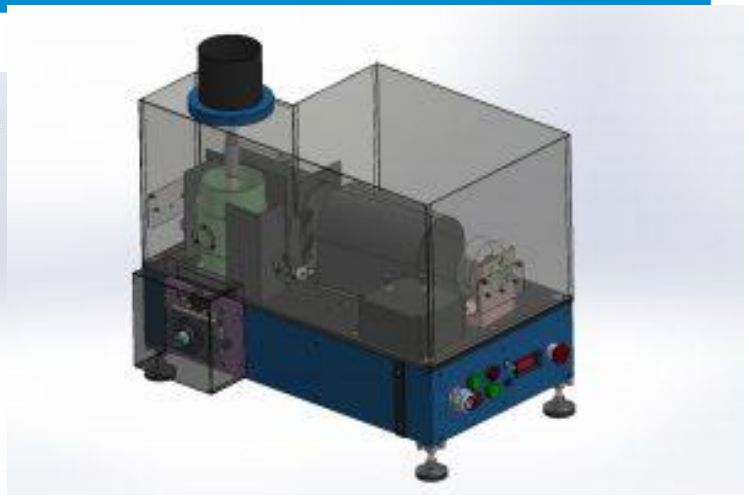
STAND FOR TESTING SOLAR PANELS AND LIGHT SENSORS, EQUIPPED WITH A SUN SIMULATOR



Spectrum Of The Sun



Solar panel



Simulator the Sun IS-100, LOMO

Technical characteristics of the simulator of the Sun IS-100

The angular size of simulated Sun angle. min	32±4
The diameter of the irradiated surface at a distance of 1 m, mm, not less than	100
Illumination of the Central part of the irradiated surface at a distance of (1000±10) mm, LK, at least	140 000
The relative deviation of the illumination from the illumination in the Central part:	
ring in the marginal zone with a width of 10 mm	±0.5
at other points	±0.3
The intensity of the light, KD	9000
The total power consumed by the simulator, V•A, not more than	3 500
Overall dimensions, mm, not more	850x550x53
Weight, kg, not more than	80

THE SERVICES PROVIDED BY THE CENTRE

1.The provision of consulting services for the evaluation of the implementation of the national Assembly given the mission of the flight.
2. Development of software and hardware for embedded systems.
3. Developing a programmer of thematic processing of the data coming from the experimental apparatus nanosatellite.
4.Testing of onboard subsystems of the national Assembly and specialized software.
5. Conduct Autonomous ground tests, as confirming the compatibility of this model of NS with the platform launch and the performance of the national Assembly at all stages of its life cycle.
6. Refinement of the structure of the national Assembly on the results of the tests conducted.
7. Design, manufacture, ground testing and preparation for the launch of the national Assembly by the customer.
8. Formation of requirements to the system of the separation of the nanosatellite.
9. Testing and integrated testing systems, nanosatellite.
10. Organization of training of Russian and foreign specialists on the topic: "How to build a nanosatellite".
11. Development of the virtual appearance of the nanosatellite at the request of the customer.
12. Participation in realization of educational programs of a new type in the field of space technology.

САМАРСКИЙ УНИВЕРСИТЕТ
SAMARA UNIVERSITY

THANK YOU

Tel.: +79272023982
e-mail: ivlievav@mail.ru

spacetest.ru

34, Moskovskoye shosse, Samara, 443086, Russia
Tel.: +7 (846) 335-18-26, fax: +7 (846) 335-18-36
www.ssau.ru, e-mail: ssau@ssau.ru