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Author: Ms. Valeriia Melnikova
Bauman Moscow State Technical University, Russian Federation, vg-melnikova@yandex.ru

Dr. Vera Mayorova
Bauman Moscow State Technical University, Russian Federation, victoria.mayorova@gmail.com
Ms. Adelina Gataulina
Bauman Moscow State Technical University, Russian Federation, gataulinaadelina@gmail.com
Mr. Alexandr Zakharchenko
Bauman Moscow State Technical University, Russian Federation, alvlzak@gmail.com
Ms. Anastasiia Ignateva
Bauman Moscow State Technical University, Russian Federation, ignatieva.anastasia01@gmail.com
Mr. Nikita Lazarev
Bauman Moscow State Technical University, Russian Federation, niklazarev12@yandex.ru
Mr. Sergei Polschikov
Bauman Moscow State Technical University, Russian Federation, abramlinkoln.1809@yandex.ru
Ms. Svetlana Porseva
Bauman Moscow State Technical University, Russian Federation, Sveta.porseva@yandex.ru
Mr. Dmitry Romanenko
Bauman Moscow State Technical University, Russian Federation, locan-rus@yandex.ru
Mr. Anatoly Shapovalov
Bauman Moscow State Technical University, Russian Federation, anatoly.bmstu@yandex.ru
Mr. Aleksandr Borovikov
Bauman Moscow State Technical University, Russian Federation, borovic68@mail.ru
Mr. Maxim Koretskii
Bauman Moscow State Technical University, Russian Federation, hardsofa@gmail.com
Mrs. Ekaterina Zhivilo
Bauman Moscow State Technical University, Russian Federation, ti-kate7@yandex.ru
Mr. Kirill Frolov
Bauman Moscow State Technical University, Russian Federation, dinamik1994@yandex.ru
Mr. Oleg Kotsur
Bauman Moscow State Technical University, Russian Federation, roger_ne_@mail.ru
Dr. Nikolay Nerovny
Bauman Moscow State Technical University, Russian Federation, nikolay.nerovniy@gmail.com
Mr. Dmitry Rachkin
Bauman Moscow State Technical University, Russian Federation, radiman@yandex.ru
Mr. Stepan Tenenbaum
Bauman Moscow State Technical University, Russian Federation, ivankovo@list.ru

YAREELO – GROUP OF NANOSATELLITES FOR SPACE WEATHER MONITORING

Abstract

The Yareelo project is a group of two Cubesat 1.5U size. An x-ray spectrophotometer developed by The Lebedev Physical Institute of the Russian Academy of Sciences (LPI RAS) was installed as a payload on one of the nanosatellites. The detector allows monitoring of solar activity in the soft x-ray range of 0.5-15 KeV, including observation of microflares, as well as performing spectral diagnostics of plasma in the studied objects. The data that can be obtained from this scientific equipment is unique in Russia. The payload of the second nanosatellites is a gamma ray and charged particle detector (DeCoR) developed by the Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University. The objectives of the device are to study fast variations of electron fluxes in the zone of the gap between radiation belts, and to study the dynamics of particle fluxes and gamma radiation in low orbits, depending on geomagnetic conditions in the range of 0.3-3 MeV.

A feature of the developed nanosatellites is a two-bladed rotary solar sail unit. The use of a solar sail as a propulsion system, taking into account the mass-size and energy limitations of the Cubesat, is a very promising technology in comparison with traditional small-sized propulsion systems. The use of the solar sail in the Yareelo project is to build and maintain a satellite constellation in one orbital plane with a phase angle 30 between the satellites. After the end of the active existence period, both nanosatellites will be passively reduced from orbit using the sail.

In addition, the Yareelo nanosatellites will conduct flight tests of experimental power supply systems, VHF and X-band radio communications systems, orientation and stabilization system on magnetic coils and flywheels, an on-board computer, and a navigation receiver created by Bauman Moscow State Technical University (BMSTU) students and a computer based on the Sputnik processor developed by LPI RAS. As part of the mission.

The Yareelo spacecraft will be operated from the BMSTU small spacecraft mission control center.

The project is being developed by students and postgraduates students of BMSTU. In addition to scientific and applied tasks in the interests of Russian science, the project has an educational goal - to improve the quality of engineering education by involving students in creating real space technology and scientific education. The launch is scheduled for July 2020.