

EGU21-11190

<https://doi.org/10.5194/egusphere-egu21-11190>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



ROBOTS for MOON EXPLORATION

Maxim Litvak, Igor Mitrofanov, Lev Zelenyi, Vladislav Tretyakov, Tatiana Kozlova, Maxim Mokrousov, Alexander Kozyrev, Artem Nosov, and Vladislav Yakovlev
Space Research Institute, Laboratory, Moscow, Russian Federation (litvak@mx.iki.rssi.ru)

Russian lunar program includes several landing missions of Luna-25, Luna-27, Luna-28 which should be implemented step by step to explore mineralogical, chemical, and isotopic compositions of the lunar polar regolith, search for volatile compounds, deliver soil samples to the Earth and prepare future manned expeditions to Moon.

The successful implementation of these missions requires employing of excavation and drilling of lunar regolith to the different depths with extraction of soil samples for the farther analysis (in situ or sample return). The first mission in row Luna-25 will be launched in October 2021 and landed at the area located north of Boguslawsky crater. This lander is equipped with the Lunar Manipulation Complex (LMC) – the robotic arm that should excavate lunar regolith (down to 5 – 25 cm) and deliver sample of lunar soil to the analytical instrumentation for the elemental and isotopic analysis. The robotic arm is already passed through the validation, functional and calibration tests in lunar-like conditions (low pressures and low temperatures) to imitate interaction with lunar soil simulat enriched with different content of water.

The Luna – 27 and Luna – 28 will be landed at southern polar regions (landing site selection is in progress). They will be equipped with Deep Drill Systems (DDS) to take samples of polar regolith enriched with water ice and other volatiles from 1-2 m depths. The DDS for Luna-27, as part of the PROSPECT suit, shall be contributed by ESA. The DDS for Luna – 28 (the sample polar return mission) is being developed by Space Research Institute. In this presentation we report the results of ground tests with LMC units and DDS prototype. In addition to DDS, it is expected that Luna – 28 will carry a small sized lunokhod (~100 kg) to support sample collection and proceed with geological survey program (up to 30 km around the landing site per one year). The lunokhod will study elemental/isotopic/mineral composition of lunar regolith along rover traverse to estimate accessibility of lunar resources (first of all, water ice as a source of hydrogen and oxygen) applicable for potential industry utilization and support of manned expeditions.

The Russian lunar program assumes synergy of robotic and manned missions. Beyond Luna -25,27,28, it is expected that the next lunar missions will deliver to Moon surface heavy lunokhod, which will prepare the landing of the manned mission. Finally, as part of testing program for manned lander (without cosmonauts), it is proposed to deliver multifunctional robotic equipment to support the following arrival of cosmonauts.

