Space Research Institute (IKI)
NPP “Astron Electronics”

Lunar soil SIMS experiment “ARIES-L” on Russian Lunar landing mission “Luna-Resource”

JUICE Radiation Modeling Workshop 2012

November, 2012

About

Space Research Institute (IKI) main building, Moscow

IKI Department of Space Plasma Physics
Management, research, modeling

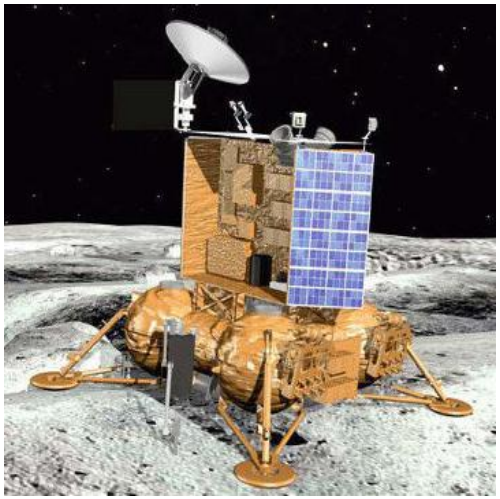
Roman Zhuravlev
Engineer, Experiment manager
of “ARIES-L”
zhuravlev_roman@iki.rssi.ru

NPP “Astron Electronics”
Design, manufacturing

Aleksei Koziura
Design Engineer
alexey.kozyura@astronel.ru

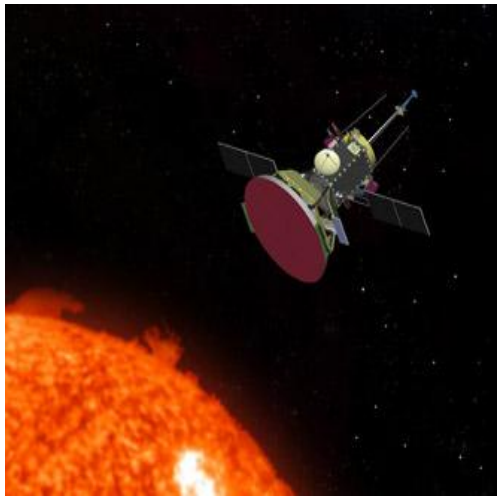
Our projects

LUNA-RESOURCE

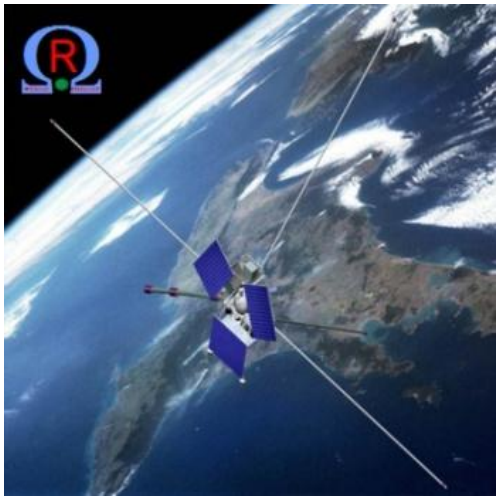


LUNA-GLOB

LUNA-GLOB ORBITER



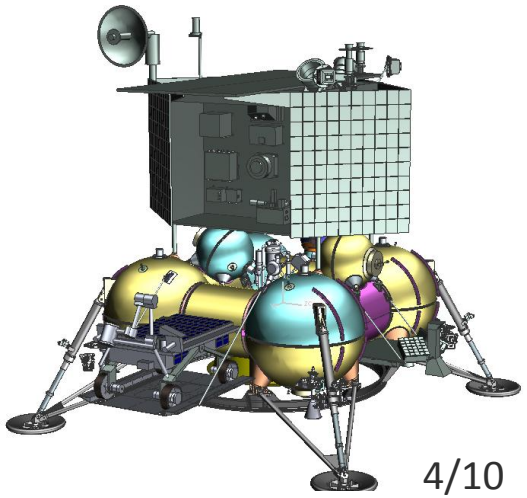
INTERHELIOZOND



RESONANCE

Mission overview

1. The mission is dedicated to investigation of South Pole area of the Moon.
2. Launch Vehicle – GSLV Mk-II (India).
3. Spacecraft structure:
   - Orbiter (India);
   - Lander with ground station (Russia) and Indian Minirover (India);
   - Intermodule adapter (Russia, India).
4. Mission duration – 1 year.
5. Lift-off mass of the Lander is 1 260 kg, including:
   - Lander with stationary surface station – 1 245 kg;
   - Minirover – 15 kg.

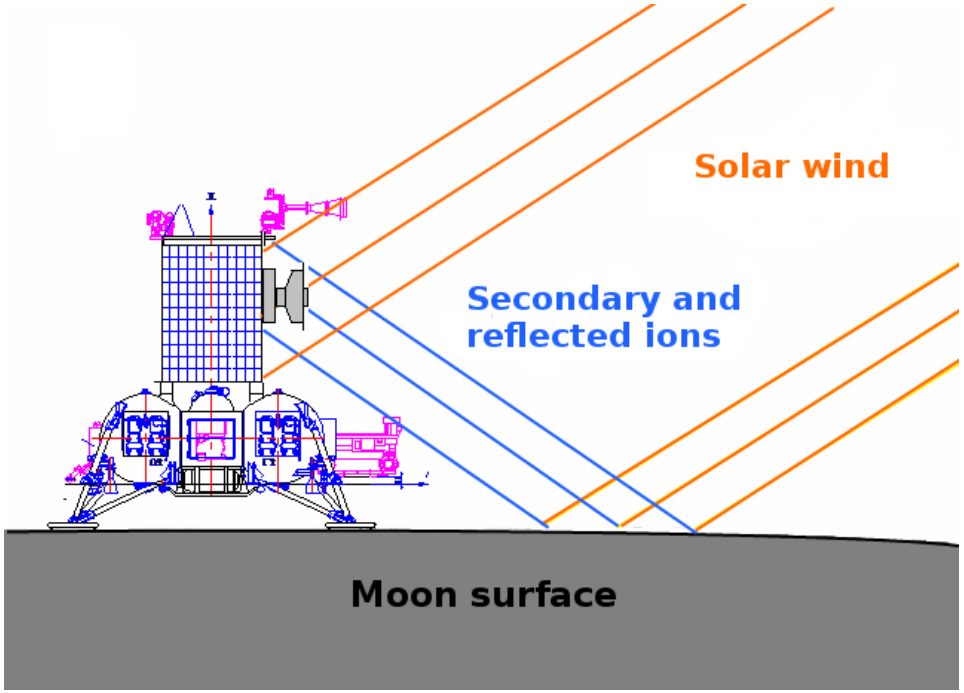


Surver methodology and requirements for the experiment

Secondary Ion Mass Spectrometry (SIMS) allows to analyze the composition of solid surfaces by sputtering the surface of the specimen with a focused primary ion beam and collecting and analyzing ejected secondary ions.

Our experiment uses solar wind as primary ion beam.

Solar wind hits lunar surface and sputters secondary ions and neutral atoms off the regolith.



ARIES–L. Panoramic energy-mass ion and neutrals spectrometer

Measurements of energy, mass composition and angular distribution of

the solar wind and sputtered ions (SIMS), as well as sputtered neutrals

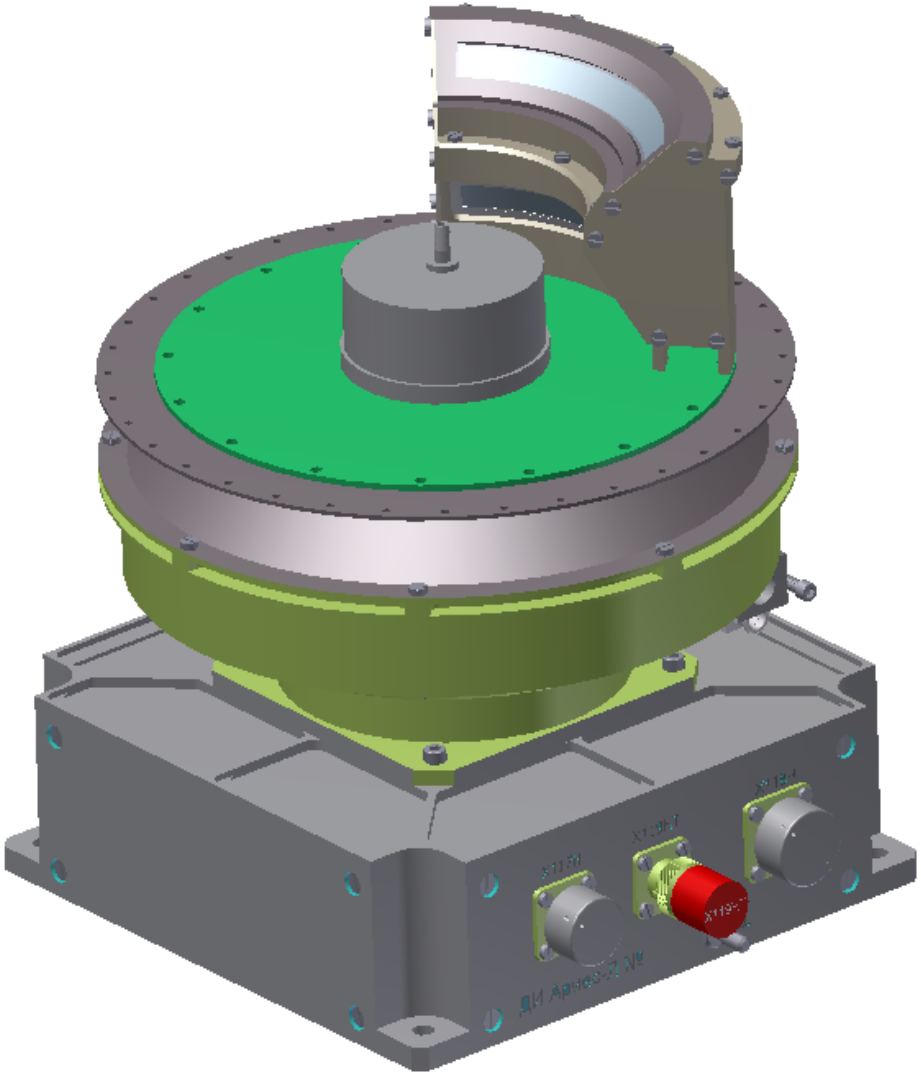
- Energy range: 5 eV – 5 keV
- Mass range: 1 - 100 amu
- Field of view: 2π
- Angular resolution: 7.5° x 15°

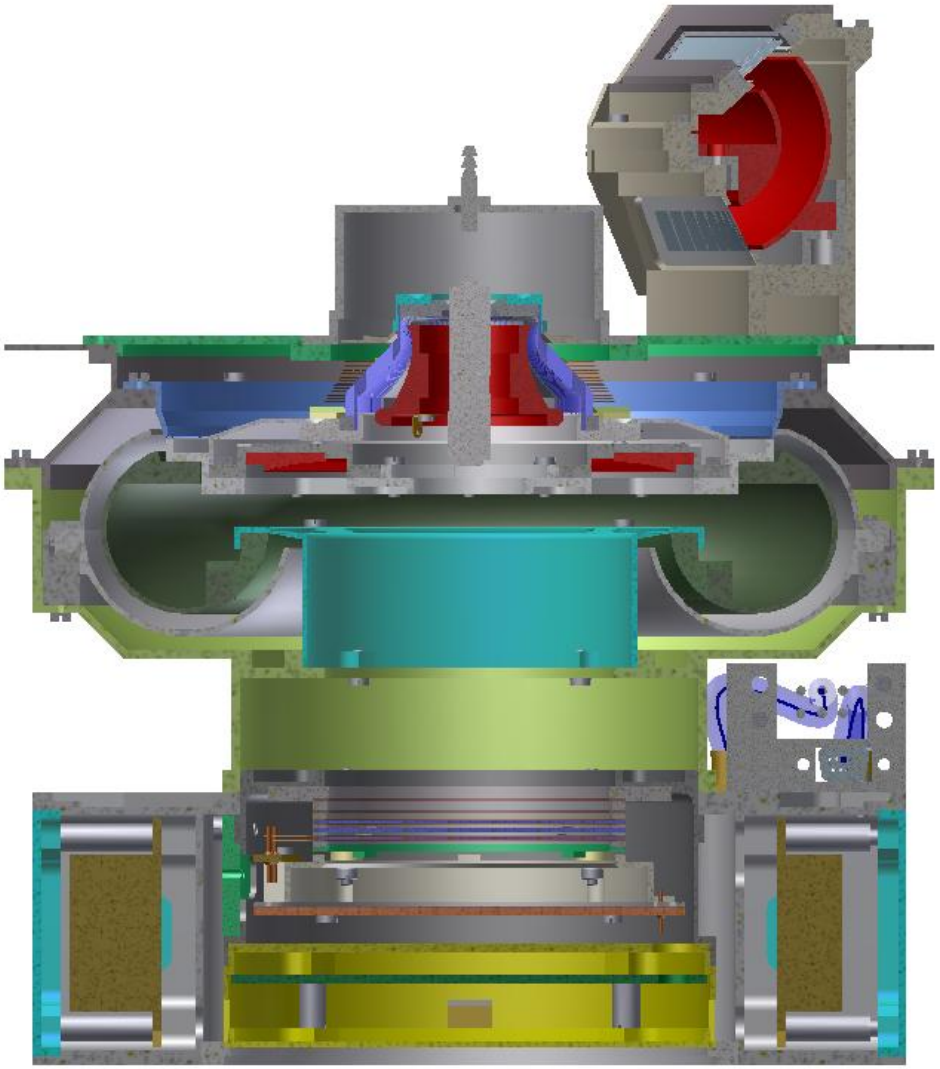
Panoramic energy-mass analyzer of ions DI for Phobos-Grunt mission is used as a prototype.

1st Scientific objective: Analysis of lunar regolith composition and properties

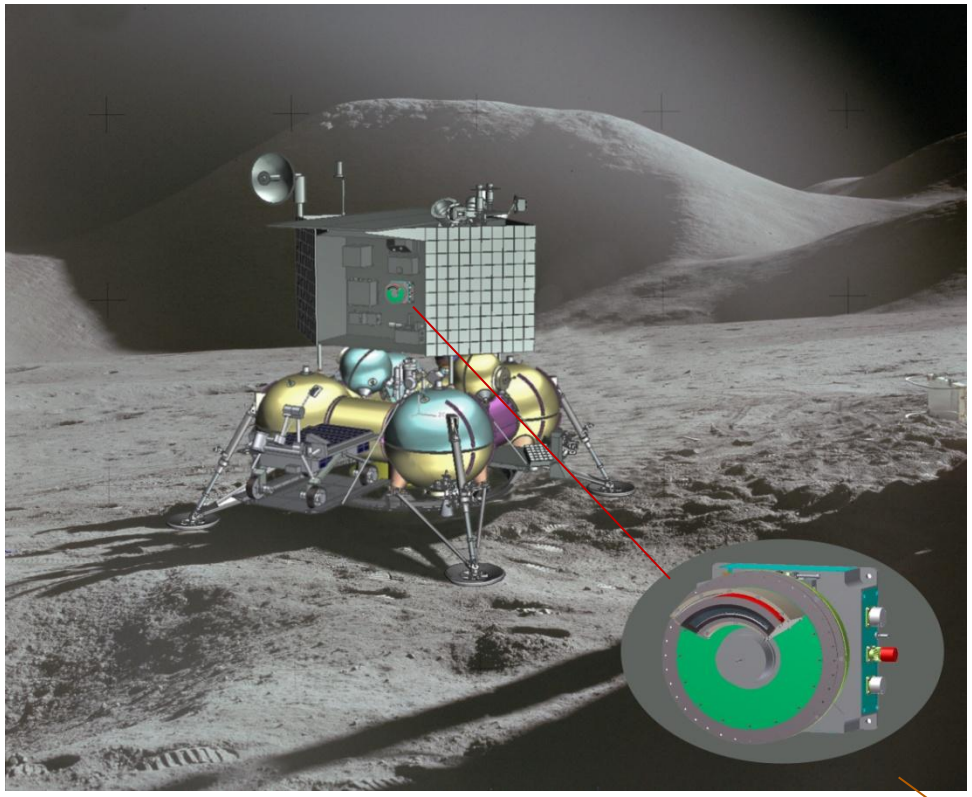
2nd Scientific objective 2: Investigation of solar wind interaction with lunar surface and lunar exosphere in polar regions

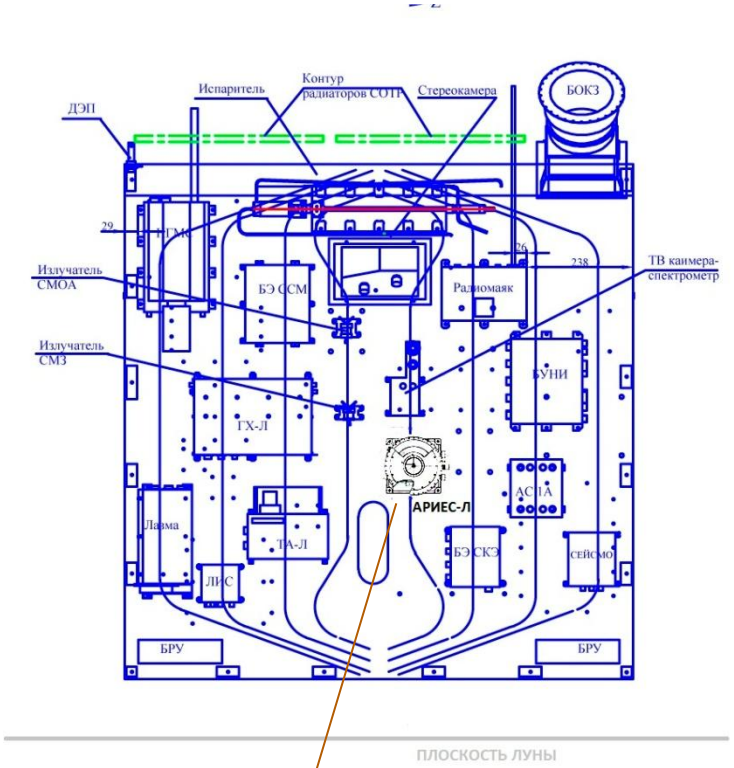
3D model of ARIES–L





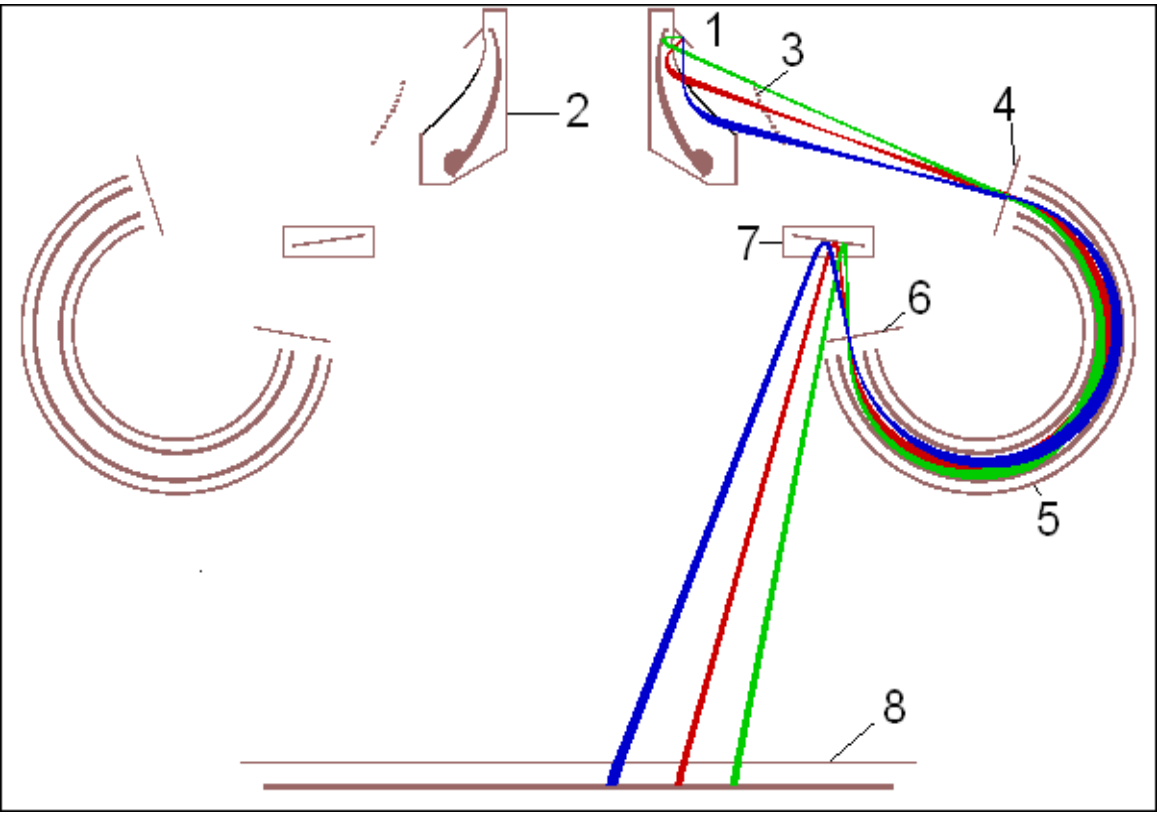
Location of instrument on the spacecraft





ARIES-L

ARIES–L. Electro optical scheme



1. Entrance slit
2. Electrostatic mirror M1
3. Electrostatic shutter (gate)
4. Electrostatic analyzer diaphragm (entrance)
5. Toroidal electrostatic analyzer
6. Electrostatic analyzer diaphragm (exit)
7. Deflecting mirror
8. MCP detector

Thank you for attention!

If you have any questions feel free to contact us
olegv@iki.rssi.ru − Pr. Oleg Vaisberg
zhuravlev_roman@iki.rssi.ru − Roman Zhuravlev
alexey.kozyura@astronel.ru − Aleksei Koziura