Venera-D Lander payload instruments

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Descent and at Surface Science

Science Objective	Notional Instrument
Atmospheric Science	
L1. Atmosphere composition during descent, aerosols composition and microphysics UV-absorber	Multi-channel tunable laser spectrometer & Chemical analyses package (CAP)Gas Chromatograph Mass Spectrometer, Raman-LIDAR
L2. Atmosphere chemical composition at the surface	Chemical Analyses Package (CAP)Gas Chromatograph Mass Spectrometer
L3. Atmospheric structure and dynamics of lower atmosphere (meteorology)	Temperature-Pressure-Wind (TPW) package (accelerometer/altimeter, photometer, radiometer, radio science); LLISSE
L4. Physical properties of atmospheric aerosols	Raman-LIDAR
Surface Geology & Geophysics:	
L5. Surface structure and morphology	Imaging System (Descent imager; panoramic camera; microscopic imager)
L6. Surface elemental composition	XRD/XRF; CAP-LIMS; XRF mode of Mössbauer spectrometer Active Gamma-spectrometer (e.g. AGNESSA)
L7. Mineral phases	XRD/XRF; Mössbauer spectrometer
L8. Global and regional seismic activity	Seismometer
L9. Electromagnetic fields	Wave-package
Priorities: High Medium Low	

Notional LANDER PAYLOAD



- X-Ray Diffraction/X-Ray Fluorescent Analyzer (XRD/XRF)
- Mössbauer spectrometer + APXS mode
- **TV-** cameras (landing, stereo, panoramic, high res. up to 0.1 mm)
- Chemical Analysis Package (GCMS + LIMS)
- Raman (with synergistic LIDAR)
- METEO-Lander-Temperature-Pressure-Wind (TPW) Package
- Active Gamma and Neutron Spectrometers
- Multi channel tunable diode laser absorption spectrometer (MTDLAS)
- Infrared radiometer & UV-Vis spectrometer
- Long-Lived In-situ Solar System Explore (LLISSE)
- Devices for atmosphere and surface sampling





Instruments + structure – 120 kg Sampling device – 35 kg

Lander, preliminary arrangement of scientific payload (NPOL)



General view of the Soil Sampling System (SSS)

- 1 pyro cartridge assemblage
- 2 gas transfer tubes
- 3 the sample transfer mechanism
- 4 the vacuum tank
- 5 the drill
- 6 test stones

Principal scheme of the Soil Sampling System VB-02



Установка 1860 02

Further development of the SSS for the Venera-D

- 1. Multiple sampling:
 - a) the dust;
 - b) the stone crust (upper 2-4 mm);
 - c) the solid stone.
- 2. Soil preparation and distribution system inside the lander:a) to have a possibility to distribute the soil sample between
 - respective instruments (XRD/XRF, CAP, MS, APXS, ..?);
 - b) to refine the soil to the necessary shape for analysis (TBD).
- 3. Upgrade of mechanical and control units:
 - a) consider alternative drive options to reduce the weight;
 - b) consider the possibility of documentation of sampling;
 - c) consider alternative pumping methods to gain the necessary vacuum for analysis;
 - d) increase of a sample volume;
 - e) other.

Open questions related to Lander

- Modification of the entry profile to have higher detachment of the shield (to provide better sampling of the UV-absorber layer)
- Provision of a slower descent in the cloud layer
- How to know the Lander orientation after landing (rotation sensors, radio science, ...)?