



## **Chemistry composition analyses of site area of Russian interplanetary probe Phobos-Grunt by neutrons and gamma-rays spectrometer NS HEND.**

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The Neutron Spectrometer HEND (NS HEND) is developed for studying elemental composition of Phobos regolith. Composition of shallow subsurface of Phobos could be investigated by observations of nuclear gamma-ray lines and neutrons, which are produced by galactic cosmic rays. The “forest” of nuclear lines in the spectrum of gamma-rays represents the content of each particular chemical element in the subsurface. The flux of thermal and epithermal neutrons characterize the content of hydrogen in the shallow subsurface.

The concept of NS HEND instrument is based on Russian instrument HEND onboard currently operating NASA's Mars Odyssey mission. Additional element of NS HEND instrument is gamma-ray spectrometer, which allows to measure gamma-ray lines together with neutrons. This gamma-ray spectrometer uses new innovative scintillation crystal  $\text{LaBr}_3$ , which allows to obtain perfect spectral resolution of nuclear lines (3% at 662 keV). Instrument also includes the set of three  $^3\text{He}$  proportional counters inside polyethylene and cadmium enclosures for measurements of thermal and epithermal neutrons and sensor with crystal of stilben for measurements of fast and high energy neutrons with energies from 0.5 MeV up 10 MeV). The total mass for this instrument is 3.8 kg and the power consumption is less than 8.0 W.

This instrument, as the part of the payload of “Phobos-Grunt” mission, will be able to characterize the composition of Phobos regolith, the content of natural radioactive elements K, U and Th, and also the content of hydrogen, which could be compared with the similar data for regolith samples, which should be returned back to the Earth by the return module of this mission.