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Phobos Sample Return mission

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Abstract

The main goal of the mission is delivery of samples of the Phobos surface material to the Earth for laboratory studies. The drive for Phobos investigation is strongly supported by the need to understand the basic scientific issues related to the Martian moons both as the representatives of the family of the small bodies in the Solar system, primordial matter of the Solar system (what many believe they are) and as principal component of the Martian environment: Other goals are in situ studies of Phobos (regolith, internal structure, peculiarities in orbital and proper rotation), studies of Martian environment (plasma, fields). The payload includes a number of science instruments: gamma and neutron spectrometers, gas-chromatograph, mass spectrometers, IR spectrometer, seismometer, plasma package.

Scenario of the mission includes the Earth-Mars interplanetary flight, orbiting around Mars, several corrections the orbit to form a orbit very close to the Phobos orbit and keeping synchronous orbiting with Phobos. The spacecraft will encounter with Phobos from this synchronous orbit and will land at the Phobos surface. After the landing the sampling device of the spacecraft will collect several samples of the Phobos regolith and will load these samples into the return capsule mounted at the returned spacecraft. This returned spacecraft will be launched from the mother spacecraft and after the Mars-Earth interplanetary flight with reach the terrestrial atmosphere. Before enter into the atmosphere the returned capsule will be separated from the returned spacecraft and land at the Earth surface. The mother spacecraft at the Phobos surface carrying onboard scientific instruments will implement in situ the experiments during about one year after kickoff the returned spacecraft. We want to study the characteristics of the Martian satellites, and understand their origin what may give a clue to the formation of satellite systems of the other planets.

Scientific goals of in situ Phobos exploration, the payload, the mission scenario and the current status of the project will be described.