SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (4)

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DYNAMIC AND MORPHOLOGIC STUDIES OF THE MARCOPOLO-R BINARY ASTEROID SYSTEM BY LASER ALTIMETRY

Abstract

The MarcoPolo-R mission, currently under study in the context of ESA's Cosmic Vision M-class Missions Program, is foreseen to rendezvous with a binary Near-Earth Asteroid and to return a sample from the asteroid to Earth. Before sampling, the spacecraft will orbit the asteroid pair to undertake a comprehensive study of the objects by a host of remote sensing techniques. One of the main instruments is the "Laser Rangefinder". The instrument will derive global shape models of the two objects and study their mutual orbital motion and rotations. Also, surface roughness and albedo for both objects (at the Laser wavelength) will be studied. The laser altimetry technique permits to derive a dynamical model of the binary system and high-precision Digital Terrain Models (DTM) within a few months. DTMs will

provide invaluable information for the landing site selection. Furthermore ranging will be used during the approach and landing phase for real-time altitude and vertical velocity information. In addition, during dedicated calibration sessions, two-way range measurements to terrestrial ground stations are to be carried out. Both types of measurements combined will help studying gravity field parameters of the asteroid and will help maneuvering the spacecraft in the irregular gravity fields of the two objects. A first assessment study of the laser ranger instrument is conducted by an international team which include researchers from Germany, Switzerland, Italy and Russia. The study focuses on the assessment of technical approaches that would reduce the mass, size and power requirements. The presentation will show innovative technical aspects that characterize the laser altimeter in the scenarios of MarcoPolo-R, which will permit us to make major contributions to the science goals of the mission.