



BELA: The first European Laser Altimeter for Planetary Exploration

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Laser altimetry is a powerful technique to measure the topography of planetary surfaces, and has become a standard technique for terrestrial applications, both from satellites and aircrafts. NASA has demonstrated the feasibility and the value of laser altimetry for planetary exploration with MOLA. The first European laser altimeter for application beyond the Earth is currently being developed by a Swiss/German consortium, and is selected to fly to Mercury on BepiColombo (MPO). In addition to the development of a laser transmitter, a receiver and a rangefinder system, BELA has to cope with the severe environment in orbit around Mercury. BELA follows the direct detection principle, and uses a 50 mJ Nd:YAG laser to fire laser pulses of about 5 ns duration towards the surface of Mercury. The backscattered laser photons are collected by a 20 cm telescope. Range finding is performed by digital filtering. A link budget calculation proves that such a system is capable to provide global coverage of the Hermean surface with a precision in altitude that is limited by the spacecraft's attitude control. We present the baseline configuration of the instrument, and show selected elements as breadboards. Tests with breadboards of a baffle, a telescope and a return pulse simulator are in an advanced state and will be discussed. The instrument will use about 45 W power and will contribute 12 kg to the S/C mass. The data that BELA will acquire will be analyzed in combination with Stereo Camera images to generate digital terrain models, and in combination with radio science data to understand crust thickness, interior structure and dynamics, gravity field and tides.