AOGS 2005

ESA'S SMART-1 MISSION AT THE MOON: FIRST RESULTS

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SMART-1 is the first of Small Missions for Advanced Research and Technology as part of ESA science programme "Cosmic Vision". Its objective is to demonstrate Solar Electric Primary Propulsion (SEP) for future Cornerstones (such as Bepi-Colombo) and to test new technologies for spacecraft and instruments. The spacecraft has been launched on 27 sept. 2003, as an Ariane-5 auxiliary passenger. SMART-1 orbit pericenter is now outside the inner radiation belt. The current status of SMART-1 will be given at the symposium. After a 15 month cruise with primary SEP, the SMART-1 mission has been captured at the Moon in November 2004, and arrived on 27 February 2005 into science orbit for a nominal six months plus one – year extension.

We present first results from SMART-1's science and technology payload, with a total mass of some 19 kg, featuring many innovative instruments and advanced technologies. A miniaturised high-resolution camera (AMIE) for lunar surface imaging, a near-infrared point-spectrometer (SIR) for lunar mineralogy investigation, and a very compact X-ray spectrometer (D-CIXS) with a new type of detector and micro-collimator which will provide fluorescence spectroscopy and imagery of the Moon's surface elemental composition. The payload also includes an experiment (KaTE) aimed at demonstrating deep-space telemetry and telecommand communications in the X and Ka-bands, a radio-science experiment (RSIS), a deep space optical link (Laser-Link Experiment), using the ESA Optical Ground station in Tenerife, and the validation of a system of autonomous navigation (OBAN) based on image processing.

SMART-1 lunar science investigations include studies of the chemical composition of the Moon, of geophysical processes (volcanism, tectonics, cratering, erosion, deposition of ices and volatiles) for comparative planetology, and high resolution studies in preparation for future steps of lunar exploration. The mission could address several topics such as the accretional processes that led to the formation of rocky planets, and the origin and evolution of the Earth-Moon system.

The SMART-1 observations will be coordinated with future lunar missions to answer open questions about comparative planetology, the origin of the Earth –Moon system, the early evolution of life, the planetary environment and the existence of in-situ resources necessary to support human presence (e.g. water, oxygen). With their science and technology results, these missions can be considered as preparatory missions for future robotic and human exploration of the solar system.

Keywords: Moon; planetary; science; technology; exploration; ESA; AOGS