

## Developing a test model of Laser-Induced Breakdown Spectroscopy for mounting lunar and planetary rovers

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JAXA is currently planning the moon lander SELENE-2 project, a follow-on mission of SELENE. This project involves the dispatch of a lunar rover to investigate the lunar surface and rocks. JAXA has nominated Laser-Induced Breakdown Spectroscopy (LIBS) as instrument for mounting rovers. The LIBS determines the elemental compositions right on-the-spot. The Curiosity rover, part of NASA's Mars Science Laboratory mission, used LIBS to obtain the spectra of rocks present on the Mars surface.

The LIBS instrument uses a powerful laser pulse and induced plasma. The plasma emits energy in the form of photons. The analysis of the plasma via spectroscopy enables the determination of the elemental composition.

Test model LIBS uses a lens to obtain the breakdown threshold of the energy density and can automatically set the target at a focal point within 1.0-1.5 m.

We developed a software for the test model LIBS. We also attended the field-roving test of one of the prototype lunar and planetary exploration rovers, Micro-6, at Mt. Mihara on Izu ?shima in the Izu Islands in Tokyo from October 28 to November 3, 2012. We conducted a successful rock-surface breakdown using LIBS. Furthermore, we carried out this operation via radio communication. However, we could not always set the focal point target via auto-focus because the charge-coupled device (CCD) camera causes electronic saturation, probably the result of the difference in reflection of the target rock. To address this issue, we developed a new program that automatically adjusts the exposure time of the CCD camera and provides a new method for auto-focusing.

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