



Detection Capability Evaluation on Chang'e-5 Lunar Mineralogical Spectrometer (LMS)

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The Chang'e-5 (CE-5) lunar sample return mission is scheduled to launch in 2017 to bring back lunar regolith and drill samples. The Chang'e-5 Lunar Mineralogical Spectrometer (LMS), as one of the three sets of scientific payload installed on the lander, is used to collect in-situ spectrum and analyze the mineralogical composition of the sampling site. It can also help to select the sampling site, and to compare the measured laboratory spectrum of returned sample with in-situ data. LMS employs acousto-optic tunable filters (AOTFs) and is composed of a VIS/NIR module ($0.48\mu\text{m}$ - $1.45\mu\text{m}$) and an IR module ($1.4\mu\text{m}$ - $3.2\mu\text{m}$). It has spectral resolution ranging from 3 to 25 nm, with a field of view (FOV) of $4.24^\circ \times 4.24^\circ$. Unlike Chang'e-3 VIS/NIR Imaging Spectrometer (VNIS), the spectral coverage of LMS is extended from $2.4\mu\text{m}$ to $3.2\mu\text{m}$, which has capability to identify $\text{H}_2\text{O}/\text{OH}$ absorption features around $2.7\mu\text{m}$. An aluminum plate and an Infragold plate are fixed in the dust cover, being used as calibration targets in the VIS/NIR and IR spectral range respectively when the dust cover is open. Before launch, a ground verification test of LMS needs to be conducted in order to: 1) test and verify the detection capability of LMS through evaluation on the quality of image and spectral data collected for the simulated lunar samples; and 2) evaluate the accuracy of data processing methods by the simulation of instrument working on the moon. The ground verification test will be conducted both in the lab and field. The spectra of simulated lunar regolith/mineral samples will be collected simultaneously by the LMS and two calibrated spectrometers: a FTIR spectrometer (Model 102F) and an ASD FieldSpec 4 Hi-Res spectrometer. In this study, the results of the LMS ground verification test will be reported including the evaluation on the LMS spectral and image data quality, mineral identification and inversion ability, accuracy of calibration and geometric positioning.