AN ULTRA-COMPACT IMAGING SPECTROMETER FOR THE LUNAR SURFACE: UCIS-MOON. A. A. Fraeman[1], H.A. Bender[1], I.M. McKinley[1], M.S. Gibson[2], C.D. Smith[2], R.O. Green[1], M.L. Eastwood[1], C.M. Sarture[1], D.R. Thompson[1], Q. Vinckier[1], P. Mouroulis[1], B.L. Ehlmann[3], and D.L. Blaney[1]
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Overview: We have developed an ultra-compact imaging spectrometer for landed missions to the Moon (UCIS-Moon) [1-3] under the Development and Advancement of Lunar Instrumentation (DALI) program. UCIS-Moon is a short wavelength infrared (SWIR) imaging spectrometer that will achieve spatial resolutions of millimeters to meters when mounted on the mast of a lunar lander or rover, or deployed on a tripod as a standalone instrument by Artemis astronauts. UCIS-Moon collects reflectance spectra from 600 – 3600 nm at 10 nm spectral sampling. Spectra from this wavelength range can be used to map common lunar minerals, OH species, molecular H_2O, water ice, and organics. Data from UCIS-Moon will therefore provide spatial and temporal information about lunar volatiles, minerals, and organics within their geologic context. The full UCIS-Moon instrument characteristics are summarized in Table 1.

Project status: A flight-ready version of UCIS-Moon has been built, cold-aligned, and calibrated in lunar relevant conditions (Figure 1). UCIS-Moon performance was within specification after four cold alignment cycles (Table 1). The instrument was calibrated using best practice characterization of uniformity, spectral and spatial response used for previous instruments such as High-resolution Volatiles and Minerals Moon Mapper (HVM3) and Mapping Imaging Spectrometer for Europa (MISE). Radiometric response was characterized using a National Institute of Standards and Technology-traceable lamp from 600-2500 nm, and in longer wavelengths, a custom thermally controlled black body installed into the vacuum chamber to eliminate interference from atmospheric water vapor (same as HVM3).

Table 1: UCIS-Moon instrument characteristics

Platform	Lunar lander/rover
Wavelength range	600-3600 nm
Sampling	10 nm
Spectrometer architecture	Offner
FOV	≥ 30 degrees
IFOV	1.15 mrad
SNR	>100 @ <2500 nm >50 @ >2500 nm
Spectral uniformity	≤9% measured (≤10% goal)
Spatial uniformity	≤10% measured (≤10% goal)
Along track FWHM (pixel)	≤1 measured (≤1.5 goal)
Cross track FWHM (pixel)	≤1.1 measured (≤1.5 goal)
Spatial response FWHM (nm)	≤12 measured (≤15 goal)
Mass	~6kg (including electronics)
Volume	4 x 5.75 x 2.4 cm
Power	~35 W (max), ~1.5 W (standby)

Future opportunities: The UCIS-Moon spectrometer built through the DALI program is suitable as a flight instrument for Class-D opportunities, such as a PRISM and Artemis III Deployed Instruments call.

Acknowledgments: This work was funded by a NASA Development and Advance of Lunar Instrumentation (DALI) program solicitation NNH18ZDA001N-DALI. This research was carried out the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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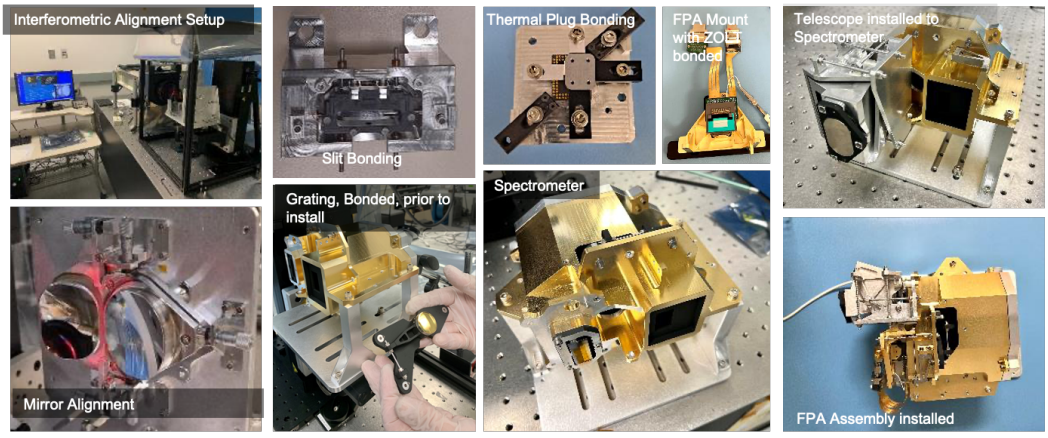

Fig. 2: UCIS-Moon warm assembly photos