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A Combined Microscope and Near-IR Spectrometer

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The combination of an optical microscope and a near-IR spectrometer is extremely mass and volume efficient since they share multiple essential elements.

The microscope of this instrument is able to provide images of a planetary surface at a resolution around 6 microns (or 3 times higher than any other optical experiment currently planned). The low resolution near-IR spectroscopy channel provides compositional information about small features (e.g. veins) in rock interiors.The device has a working distance of 12 mm and uses a set of 15 light-emitting diodes which surround the optical aperture to illuminate the sample in 4 colors and in the near-IR. The target is brought into focus using a translation stage. For surface roughness larger than the focal depth (40 microns) images at different distances are combined (onboard the lander or on ground) to produce a fully focussed frame. The stacking algorithm extracts depth information at the same time and thus produces a digital elevation model of the target.

We describe the scientific objectives and give a brief summary of the instrument design. We also present measurements of terrestrial samples for illustration and to show, that the instrument can provide a wealth of interesting results.