Ground Test for Multispectral Camera of China’s First Mars Mission

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China’s first Mars exploration mission will be launched in 2020 with an orbiter and a rover. Multispectral Camera (MC) is one payload onboard the rover. The main tasks of MC are to obtain multi-spectral images of the landing site and reconnaissance area of the rover, and to assess the mineralogy and composition of Mars surface. Multispectral imaging of MC is achieved via eight narrowband filters with their central wavelength at 480nm, 525nm, 650nm, 700nm, 800nm, 900nm, 950nm and 1000nm. The designed MC field of view is 24 degrees and spatial resolution is higher than 0.15mrad.

In this study, we test two different experimental setups. The first one was dedicated to qualitatively evaluate the capabilities of MC in acquiring high quality images by observing the surface texture and structure of differing natural rocks at varying distance. The second one was to quantitatively assess the quality of the mineral spectra obtained by MC via comparison with that obtained simultaneously by a standard commercial equipment (ASD FieldSpec 4) under the same viewing geometry. The rock samples used for imaging capacity test include granite, rhyolite, basalt, andesite and peridotite. The mineral samples used for spectra quality evaluation include olivine, orthopyroxene, gypsum, chlorite, siderite and goethite. All these mineral and rock samples have been found on the Mars surface and are expected to be encountered when the rover reconnaissances.

Our results show that the images obtained by MC are quite clear. Detailed rock surface texture and structure such as vesicular and fluidal structure can be adequately captured by MC. RGB color composite image (R:650nm, G:525nm, B:480nm) of the rock targets generally consists with human perception. In addition, mineral spectra measured by MC agree well with that obtained by ASD. Absorption features of each mineral can be evidently revealed by the MC data, and the MC has the capacity to fully characterize the albedo and spectral shape of each mineral.