Chanover, N.J.; Glenar, D.A.; Uckert, K.; Voelz, D.G.; Xiao, X.; Tawalbeh, R.; Boston, P.,; Boston, P.; Brinkerhoff, W.; Getty, S.; Mahaffy, P., "Miniature Spectrometer for Detection of Organics and Identifiaction of their Mineral Context", International Workshop on Instrumentation for Planetary Missions, Greenbelt, Maryland, LPI, No. 1683, p. 1142. October 10-12, 2012.

On future landed missions to Mars and small solar system bodies, efficient sample pre-screening will be necessary to select interesting targets for further analysis by analytical instruments with very limited time and power resources. Near infrared spectroscopy is well suited for rapid and non-invasive identification of mineral classes, and the possible presence of organic molecules. A small spectrometer on the surface also enables ground-truth for orbiting reflectance spectrometers operating at overlapping wave- lengths [1, 2]. Here we describe a miniature acousto-optic tunable filter (AOTF) point spectrometer that is tunable from ~1.6 - 3.6 μm. It identifies minerals associated with aqueous environments at sample scales of ~ 1 mm, as well as organic molecules and volatiles (notably H_2O and CO_2 ice), where they are present.

AOTFs have previously been used on board MarsExpress [3] and Venus Express [4] as integral components of their IR spectrometers. They are inherently rugged, radiation-hard, rapidly tunable and can operate at cryogenic temperatures, so they are a suitable choice for miniature landed-spectrometers. Our group also has a demonstrated history of developing and using AOTF devices for planetary science imaging applications [5- 10].

Our new point spectrometer can be combined with other diagnostic instruments as part of a landed instrument package. It is presently being integrated with a laser-desorption time-of-flight mass spectrometer LDTOF developed at GSFC, and will prescreen samples for evidence of organics before the laser desorption step and subsequent mass spectrometer measurement. The addition of AOTF technology has the potential to enable significant near-IR spectroscopic diagnostic capability without exceeding the resources of a small surface laboratory.