

Determining Surface Volatile Composition with the Laser Absorption Spectrometer for Volatiles and Evolved Gas (LASVEGAS)

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The Laser Absorption Spectrometer for Volatiles and Evolved Gas (LASVEGAS) is a low resource (1.3 kg, 13W, 0.5W-hr, 1242 cm⁻³) in situ instrument capable of quickly identifying and measuring a large inventory of astrobiologically and geochemically relevant molecules in Ocean World ices, liquids and gases via a well-understood, low-resource, and extremely sensitive in situ infrared (~3.5-11 μm) laser spectroscopy technique. The novelty and power of LASVEGAS is its broad IR wavelength coverage and its ability to produce a complete, high resolution (~0.0033 cm⁻¹), line resolving absorption spectra over the entire 3.5-11 μm range with large signal-to-noise, instead of over just one or two individual gas absorption lines. Thus, the instrument has the ability to identify the full range of molecules with absorption features above the instrument detection threshold. For most molecules of interest, that detection threshold is ~10 ppbm, and often orders of magnitude better, from a sample of 5 mg or less (Figure 1). The high resolution spectrum is generated in approximately two minutes. LASVEGAS is currently undergoing technology maturation from TRL-4 to TRL-6 under the NASA MatISSE Program. The current status of the instrument and traceability from notional Europa surface science goals will be presented.

