tune continuously over one octave by changing the RF acoustic frequency applied to the device.

An infrared (1.2–2.5 μm) Acousto-Optic Imaging Spectrometer (AImS) has been designed that closely conforms to the surface composition mapping objectives of the Pluto Fast Flyby. It features a 75-cm focal length telescope, infrared AOTF, and 256 × 256 NICMOS-3 focal plane array for acquiring narrowband images with a spectral resolving power (λ/Δλ) exceeding 250.

We summarize the instrument design features and its expected performance at the Pluto-Charon encounter.

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THERMAL ANALYZER FOR PLANETARY SOILS (TAPS): AN *IN SITU* INSTRUMENT FOR MINERAL AND VOLATILE-ELEMENT MEASUREMENTS. J. L. Gooding[1], D. W. Ming[1], J. E. Gruener[2], F. L. Gibbons[2], and J. H. Allton[2]. [1]Code SN, NASA Johnson Space Center, Houston TX 77058, USA, Code C23, Lockheed Engineering and Sciences Co., Houston TX 77058, USA.

TAPS offers a specific implementation for the generic thermal analyzer/evolved-gas analyzer (TA/EGA) function included in the Mars Environmental Survey (MESUR) strawman payload; applications to asteroids and comets are also possible [1]. The baseline TAPS is a single-sample differential scanning calorimeter (DSC), backed by a capacitive-polymer humidity sensor, with an integrated sampling mechanism [2]. After placement on a planetary surface, TAPS acquires 10–50 mg of soil or sediment and heats the sample from ambient temperature to 1000–1300 K (Fig. 1). During heating, DSC data are taken for the solid and evolved gases are swept past the water sensor. Through groundbased data analysis, multicomponent DSC data are deconvolved [3] and correlated with the water-release profile to quantitatively determine the types and relative proportions of volatile-bearing minerals such as clays and other hydrates, carbonates, and nitrates (Fig. 2). The rapid-response humidity sensors also achieve quantitative analysis of total water [4]. After conclusion of soil-analysis operations, the humidity sensors become available for meteorology.

The baseline design fits within a circular-cylindrical volume

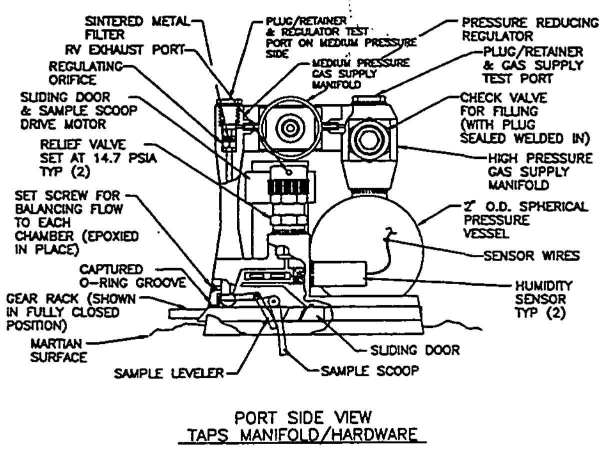

Fig. 1. TAPS Mark-1B packaging concept.

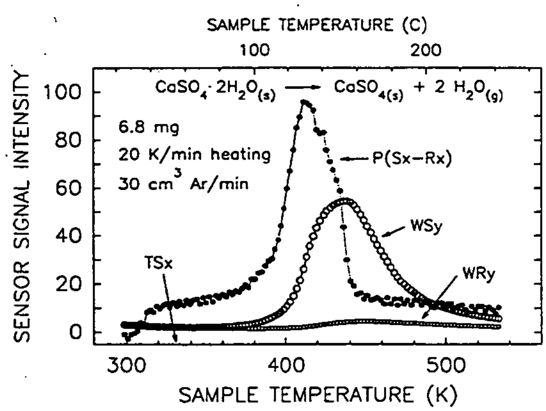

Fig. 2. Simultaneous DSC [(P(Sx-Rx) spline] and evolved-water [WSy spline] data from analysis of gypsum by the TAPS Mark-1 sensor testbed.

<1000 cm³, occupies 1.2 kg mass, and consumes about 2 Whr of power per analysis. Enhanced designs would acquire and analyze multiple samples and employ additional microchemical sensors for analysis of CO_2, SO_2, NO_x, and other gaseous species. Atmospheric pumps are also being considered as alternatives to pressurized purge gas.

References: [1] Gooding J. L. (1989) in *Proc. 18th North Amer. Thermal Anal. Soc. Conf., Vol. 1* (I. R. Harrison, ed.), 222–228. [2] Gooding J. L. (1991) *LPSC XXII*, 457–458. [3] Gooding J. L. (1991) in *Proc. 20th North Amer. Thermal Anal. Soc. Conf.* (M. Y. Keating, ed.), 329–334. [4] Gooding J. L. et al. (1992) in *Proc. 21st North Amer. Thermal Anal. Soc. Conf.* (W. Sichina, ed.), 477–481.

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IMAGING SPECTROMETERS USING CONCAVE HOLOGRAPHIC GRATINGS. J. Gradie[1] and S. Wang[2], [1]Terra Systems, Inc., 169 Kuukama Street, Kailua HI, 96734, USA, [2]SETS Technology, Inc., 300 Kahelu Avenue, Mililani HI 96789, USA.

Imaging spectroscopy combines the spatial attributes of imaging with the compositionally diagnostic attributes of spectroscopy. Imaging spectroscopy is useful wherever the spatial variation of spectral properties is important, such as mapping spectrally distinct compositional units on surfaces (planetary, terrestrial, medical, industrial), spectral emission and absorption of gases and surfaces (planetary, etc.), or regional spectral changes over time.

Imaging spectrometers produce a series of spatial images at many wavelengths in a number of ways: (1) a single-spot field of view that is step-wise scanned over the spatial field while the wavelengths (or wavenumbers) are scanned sequentially (single-detector element), (2) a single-spot field of view that continuously scans the field of view while sampling all wavelengths simultaneously (a linear-array detector), (3) a slit that continuously scans the field of view while sampling all wavelengths simultaneously (a two-dimensional array detector), or (4) frames of the full field of view taken at sequential wavelengths.

For spacebased remote sensing applications, mass, size, power, data rate, and application constrain the scanning approach. For the first three approaches, substantial savings in mass and size of the