

## Automatic techniques for Sample Analysis at Mars (SAM – MSL) onboard pyrolysis data production

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### Abstract

The Sample Analysis at Mars (SAM) instrumental suite [1], onboard Curiosity rover, is searching for organic matter at the Mars surface. It is composed of three instruments including a pyrolysis-gas chromatograph-mass spectrometer (pyr-GC-MS) allowing analysis of almost the same quality than laboratory instruments.

Two main difficulties arise: there is no Martian operator present during the few hours of analysis, and the amount of transmitted data and the other MSL consumables are limited.

In order to maintain high-quality and high-performance GC-MS measurements, several techniques are used in scripts executed by SAM, and its onboard software. In particular, the data from the TCD (Thermal Conductivity Detector) are treated with an autozero system, which keeps a very good temporal resolution and a nice definition of the chromatographic peaks (Fig. 1). In the meanwhile, the MS (Mass Spectrometer) uses a technique called "SmartScan" to detect the peaks out the background noise, and zoom on a particular range of the spectrometer in order to have a better peak resolution (Fig. 2).

These techniques help to maintain the science objectives even if SAM has to operate within the technical limits (energy, data flow restrictions) of the Mars Science Laboratory project.

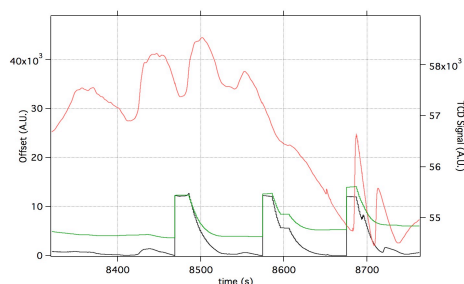


Figure 1. TCD signal (in red), offset (in green) and measured signal (in black).

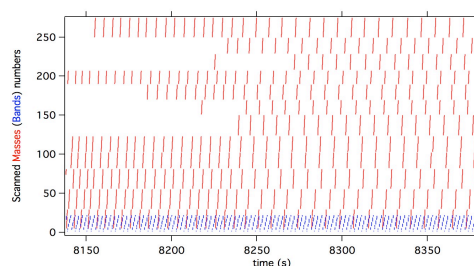


Figure 2. QMS Smartscan: masses effectively scanned if the signal is above a threshold limit.

### Acknowledgments

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### Reference

[1] Mahaffy P.M. et. al. (2012) Space Sci Rev, 170 (401–478)