WHITE PAPER

Griffin 450 Mobile GC/MS with Docked X-Sorber

Griffin 450 Mobile GC/MS with Hydrogen Generator

Griffin 450 Mobile GC/MS with Docked X-Sorber in Mobile Lab

Explosives and Volatile Organic Compounds (VOCs)

INTRODUCTION

Real-time assessment of chemical threats is becoming more important in the field of forensics — from on-scene identification and sample collection to the analysis and confirmation of illegal substances. FLIR offers a wide variety of handheld sensors and detectors used for primary identification in the field. These tools allow crime scene investigators to make real-time decisions regarding personnel safety and critical evidence collection. As a compliment to its handheld detectors and sample collectors, FLIR also offers the Griffin™ 450 GC/MS which is used as a confirmatory tool in near-site mobile labs.

When used in the field, the Griffin 450 provides fast confirmation of real world threats. This white paper demonstrates the ability of the Griffin 450 to confirm the presence of explosives and volatile organic compounds (VOCs) with speed and accuracy. The paper also demonstrates the capability to analyze both liquid and air samples. The results indicate that the Griffin 450 is an ideal tool for forensics activities in defense, force protection, first response and law enforcement applications.

Two representative mixtures (explosives and VOCs) were analyzed by the Griffin 450. The Griffin™ X-Sorber was used to collect the vapor sample from a VOC mixture (see Figure 1) and then docked with the Griffin 450 for analysis. An autosampler was used to introduce a liquid sample containing the explosives mixture, making the processing of multiple samples easier in field-based applications.

EXPLOSIVES DETECTION AND PROCEDURE

ANALYTICAL METHOD 1

The explosives mixture was prepared containing methylene chloride and the following analytes:

- Triacetone triperoxide
- Nitroglycerine
- Pentaerythiritol tetranitrate
- Cyclotrimethylene-trinitramine

The mixture was transferred to a sample vial and then placed in the autosampler tray. Using the Level 1 interface included in Griffin System Software™ (GSS 3.7.5), a previously developed method was selected from the Method List (Figure 2). Once the method was selected, the autosampler automatically drew 1 µL of sample from the vial and injected the sample into the liquid injector in the Griffin 450. The Griffin 450 automatically analyzed the sample according to previously determined method parameters. The chemical confirmation results were displayed in GSS. The instrument conditions used for this method are described in Table 1.

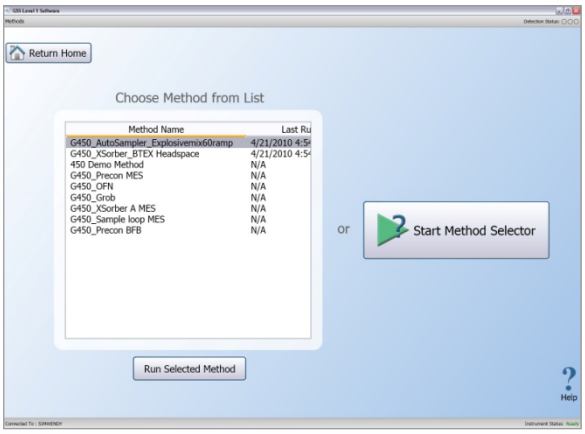

Figure 2. GSS Level 1 Interface – Method List

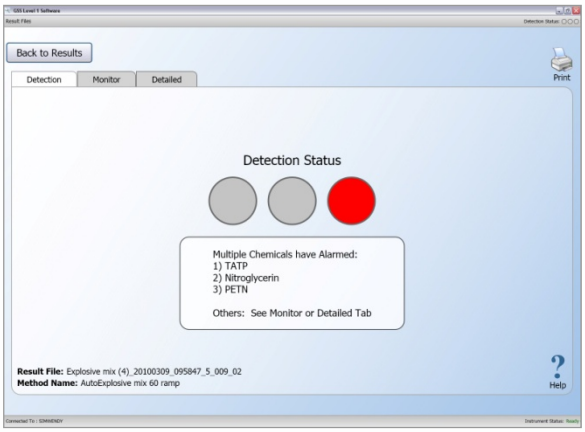

Figure 3. GSS Level 1 Interface – Detection Tab, Explosives Detected

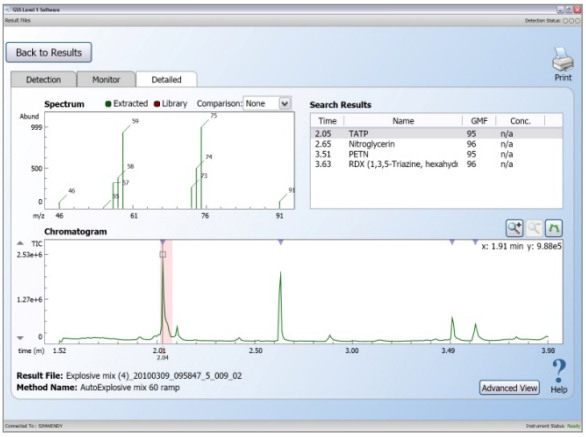

Figure 4. GSS Level 1 Interface – Detailed Tab, Explosives Detected

RESULTS AND DISCUSSION

All compounds in the mixtures were identified in less than four minutes. Upon detection of the compounds, GSS provided a visual alarm and the name of the compounds detected (Figure 3). GSS also provided a more detailed view of the chemical analysis containing chromatograms, mass spectra and retention times (Figure 4). The detailed information provides additional evidence and confirmation of the presence of explosives.

Table 1: Instrument Conditions for Analytical Method 1

GC Conditions: 40°C hold for 1 min, then increase at 60°C per minute to 220°C	
Autosampler	EST Analytical Cobra II L/S Autosampler
Column	Low thermal mass-gas chromatograph (LTM-GC) Rtx-TNT, 5 m x 0.18 mm x 0.2 µm
Carrier Gas	1 mL/minute helium
Injection Volume	1 µL

MS Conditions: ALC enabled with maximum ionization time at 150 ms	
Mass Scan Range	m/z 45-425
Detector Temperature	150°C
Injector Temperature	150°C

VOC DETECTION AND PROCEDURE

ANALYTICAL METHOD 2

A VOC mixture was prepared containing methanol and the following analytes:

- Benzene
- Toluene
- Ethyl benzene
- O-Xylene

It is interesting to note that, as a mixture, these compounds are typically found in petroleum derivatives. Separately, they can be used in the production of narcotics.

An X-Sorber was used to collect vapors from above the prepared mixture. The X-Sorber was then docked on the Griffin 450 for sample desorption and analysis. Using the Method Selector found in the GSS Level 1 interface, a short series of questions was answered which automatically prompted the appropriate method to begin (Figure 5). The Griffin 450 then desorbed the sample from the X-Sorber and performed analysis. Chemical results were displayed in GSS. The instrument conditions used for this method are described in Table 2.

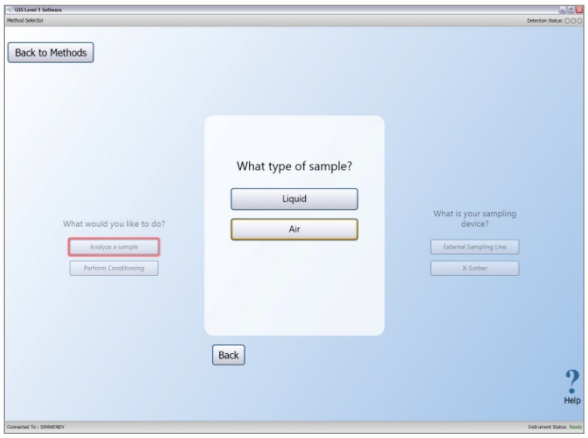

Figure 5. GSS Level 1 Interface – Method Selector

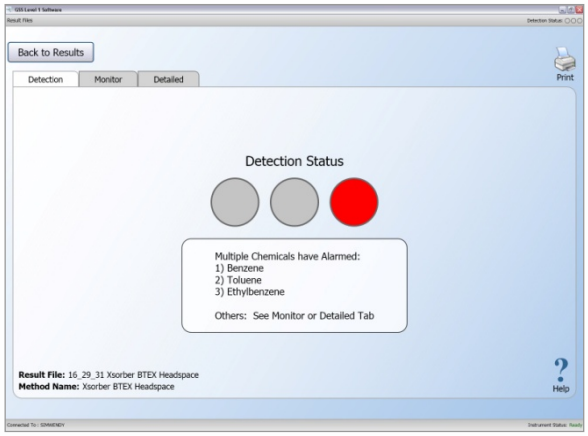

Figure 6. GSS Level 1 Interface – Detection Tab, VOCs Detected

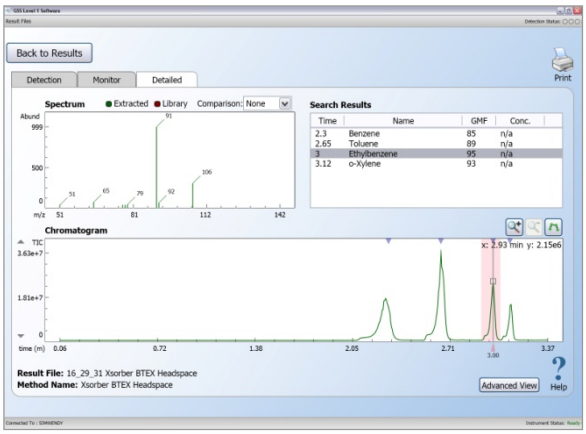

Figure 7. GSS Level 1 Interface – Detailed Tab, VOCs Detected

RESULTS AND DISCUSSIONS

All compounds in the mixtures were identified in less than four minutes. Upon detection of the compounds, GSS provided a visual alarm and the name of the compounds detected (Figure 6). GSS also provided a more detailed view of the chemical analysis containing chromatograms, mass spectra, and retention times (Figure 7). The detailed information provides additional evidence and confirmation of the presence of VOCs.

Table 2: Instrument Conditions for Analytical Method 2

GC Conditions: 40°C hold for 1 min, then increase at 60°C per minutes to 150°C	
Column	Low thermal mass-gas chromatograph (LTM-GC) Rtx-5MS 30 m x 0.25 mm x 0.25 µm
Carrier Gas	1 mL/minute helium
X-Sorber	Sorbent material Tenax TA

MS Conditions: ALC enabled with maximum ionizations time at 150 ms	
Mass Scan Range	m/z 50-425
Detector Temperature	150°C
Injector Temperature	200°C
Desorption Temperature	200°C
Transfer Time	1 minute