



Griffin 460: GC/MS Analysis of Illicit Drugs,
Including Associated Usage Paraphernalia
Utilizing Prepress Sample Introduction (PSI) Probe

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INTRODUCTION

The fight against illicit drug trafficking is an ongoing battle for law enforcement personnel. Illicit drugs are known illegal substances scheduled accordingly by the Drug Enforcement Agency (DEA). Colorimetric test kits are commonly used by law enforcement for presumptive detection of unknown substances. These kits are offered in various formats, with some only being specific for particular classes of drugs such as opiates or amphetamines. However, real-world samples are extremely complex, often comprised of several different chemical components, and may only exist as trace residue on usage devices such as spoons or pipes. These factors make positive identification difficult when using test kits and can result in a false positive identification.

In March 2010, a Filipino national was arrested and held for five days following a luggage inspection at Australia's Melbourne Airport¹. The inspection revealed a 2.4 kilogram package of a powdered substance that was claimed to be iced tea. A drug detection canine initially alerted on the tea powder and presumptive identification via colorimetric test kits produced responses for amphetamines. Subsequent laboratory tests were performed on the package, which positively identified the "substance" as iced tea. As a result, the suspect was awarded \$5,000 AUS by the Australian director of public prosecutions.

FLIR Systems has developed a solution to this complicated analytical challenge, which includes its robust GRIFFIN™ GC/MS system and integrated PSI-Probe™ (Prepress Sample Introduction). This platform is able to conclusively identify a wide variety of illicit drugs in less than seven minutes, including opiates (heroin, morphine), hallucinogens (DMT, Salvinorin A), amphetamines, stimulants (cocaine, MDMA, MDPV), cannabinoids (marijuana, synthetics) and many other chemical classifications. These determinations can be made not only on bulk materials, but also via trace residues such as those left behind on crack spoons, water pipes, Ziploc® bags and syringes. Powered by the Griffin System Software™ Level I interface, designed for users with minimal knowledge of GC/MS, the FLIR solution is ideal for law enforcement personnel who require a rapid, high-confidence determination of chemical identity. No pipettes, solvents or derivatizing agents are required since the PSI-Probe relies on the simplistic Touch-and-Go (TAG™) technology (**Figure 1**). TAG offers a simple 4-step process to collect a solid or liquid sample and introduce it to the GC/MS.

- 1) Simply touch or tap the 4" pre-scored capillary to your sample.
- 2) Break it into the microvial.
- 3) Drop the microvial directly into the PSI-Probe.

¹ Retrieved on September 13, 2011 from <http://www.theage.com.au/victoria/drug-accused-woman-freed-after-substance-found-to-be-iced-tea-20100318-gh1r.html>.

4) Transfer to the injector for thermal extraction and subsequent GC/MS analysis.

With the simple press of the start button, sample analysis begins with ensuing real time detection of illicit substances. The nature of the TAG sample collection mechanism ensures preservation of the original sample for subsequent analyses that may be required for forensic admissibility in courtroom proceedings.

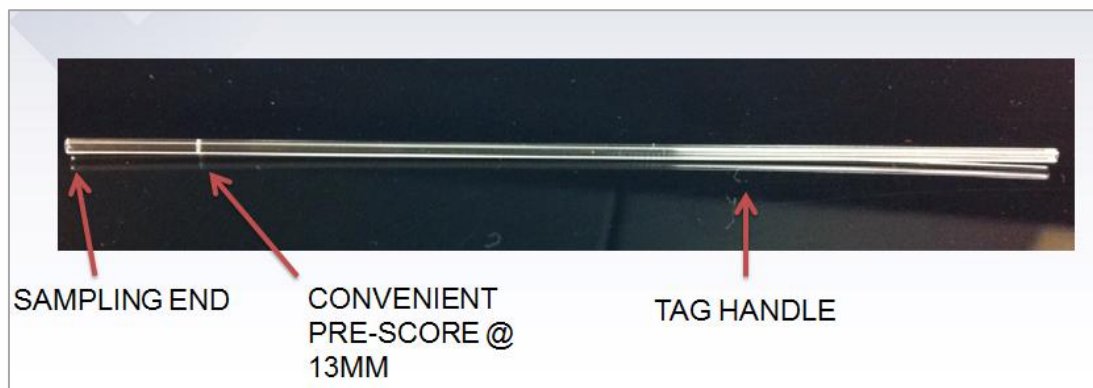


Figure 1: Sample analysis is as simple as pressing the sampling end of the TAG™ against the sample, then breaking off the sampling end inside of the PSI-Probe microvial.

FLIR INSTRUMENTATION

- GRIFFIN 460 GC/MS system
- Griffin System Software – GSS 3.9
- PSI-Probe

Gas Chromatograph Operating Conditions: Temperature program is 80° C hold for 0.5 min, then increase at 50° C per minute to 300° C, hold for 1.5 min. Method duration 6.5 minutes.

Column	LTM-GC Rtx-TNT, 5m X 0.18mm X 0.15µm (an LTM-GC DB-5MS, 15m X .18mm X .18um may also be used)
Carrier Gas	Helium, 1 mL/min
Injector	300C, 90% split

Mass Spectrometer Operating Conditions

Mass Scan Range	m/z 40-425
Analyzer Temperature	150° C

SAMPLE ANALYSIS

Samples were provided by local law enforcement personnel who confiscated a variety of drug residues and paraphernalia on an opportune drug raid. Samples included a scorched spoon that was presumed to have been used with methamphetamine or crack cocaine, two Ziploc bags containing trace powder residues, a psychedelic pipe containing burned residue, a bag containing plant material, a coat hanger coated with crystalline residue, and a blood crusted syringe. All samples were collected and introduced via the PSI-Probe with TAG and then analyzed using the Griffin 460.

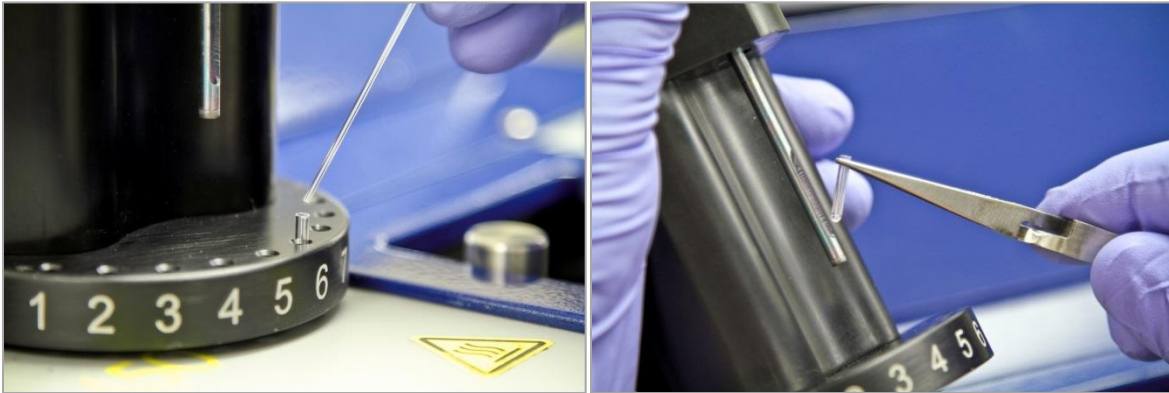


Figure 2: No solvents, dilutions or wet chemistry is required when using the FLIR PSI-Probe.

As shown in **Figure 3**, GC/MS analysis of residue from the burned spoon revealed the presence of residual cocaine and methylecgonidine, a pyrolysis product formed when crack cocaine is smoked, in under 3.5 minutes. The trace nature of these residues would have made determination via conventional solvent extraction GC/MS very challenging and time-consuming.

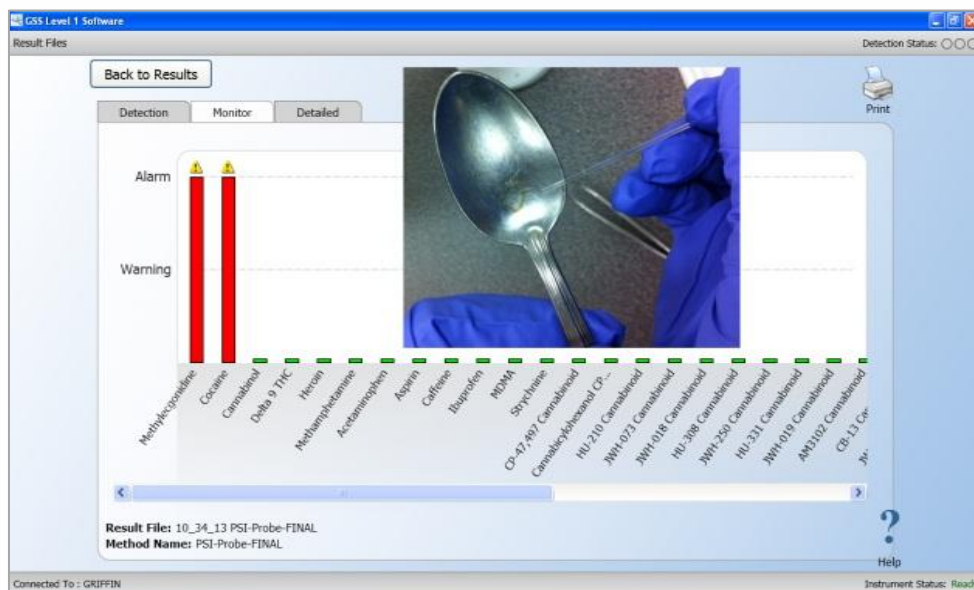


Figure 3: Resulting alarm for methylecgonidine and cocaine displayed in GSS Level I.

The powder residues from the Ziploc bags were separately analyzed and determined to contain dimethyltryptamine and cocaine, respectively. **Figure 4** shows the mass spectrum for dimethyltryptamine displayed in GSS Level II. Dimethyltryptamine is a natural occurring chemical in the human body and plants, but can be reproduced and used for its powerful hallucinogenic effects.

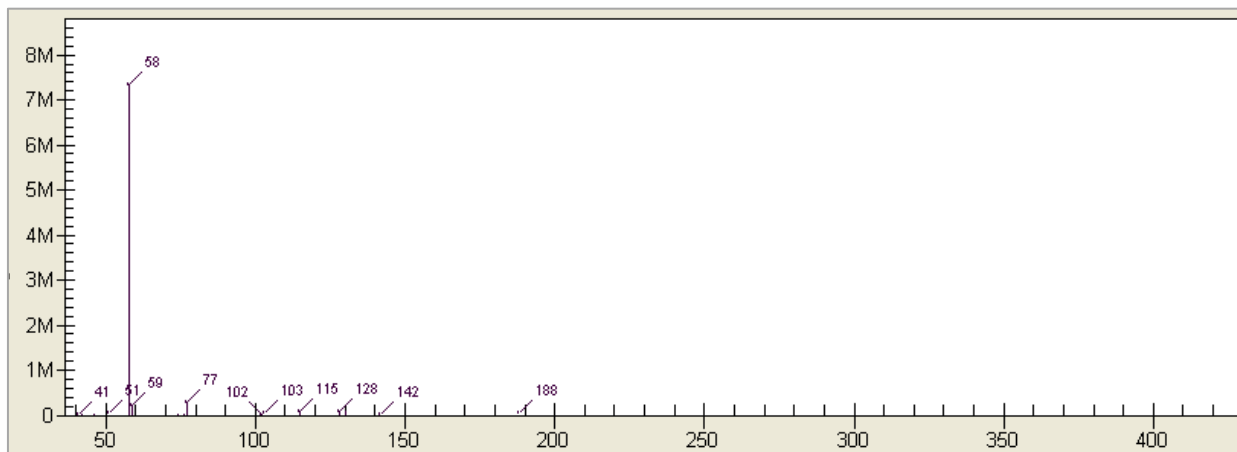


Figure 4: Griffin Cylindrical Ion Trap Mass Spectrum of Dimethyltryptamine.

Analysis of burned residue inside of the pipe (**Figure 5**) confirmed the presence of cannabinol, a psychoactive cannabinoid contained in marijuana. Delta-9-tetrahydrocannabinol (THC), the active ingredient in marijuana, was not detected, presumably due to burning. Delta-9-THC was readily detected, however, in the sample of plant material that had also been confiscated (**Figure 6**).



Figure 5: Cannabinol was detected in the burned residue from this pipe.



Figure 6: Both Delta-9-THC and cannabinol were detected in this plant material.



Figure 7: Analysis of the crystalline material on this coat hanger revealed the presence of both cocaine and levamisole.

PSI-Probe GC/MS analysis of the crystalline material found on the coat hanger (**Figure 7**) revealed the presence of both cocaine and levamisole. Conventionally, levamisole is used as a worming agent for livestock in veterinary medicine. Unfortunately, it has also gained popularity as a cutting agent used in cocaine distribution. Adding bulk and weight to the sample, use of levamisole as a cutting agent in cocaine has grown from 69% of cocaine samples seized by the DEA in 2009² to 82% by April of 2011³. Levamisole is implicated in neutropenia, a serious condition in which the user is more susceptible to infections due to decreased white blood cell counts, as well as vasculitic skin necrosis.

Although no apparent residues or liquids were visible inside of a confiscated syringe that was crusted with blood, Griffin System Software positively alerted for the detection of methamphetamine (**Figure 8**).

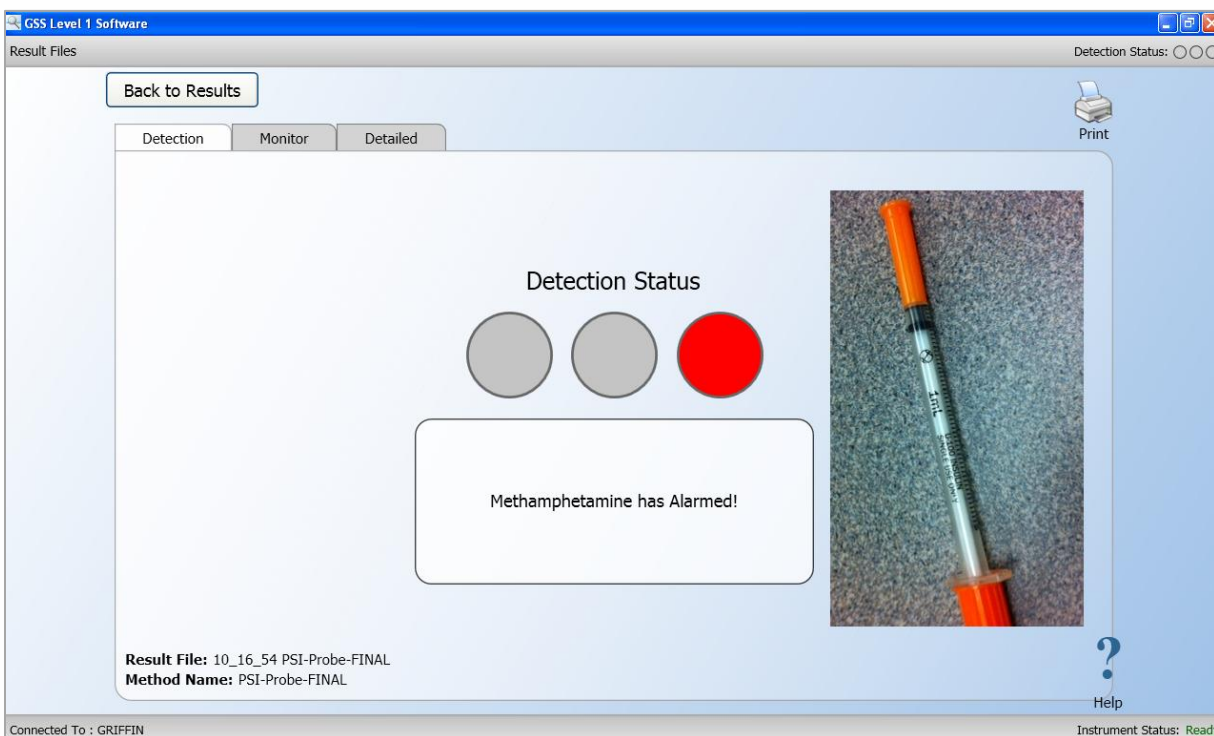


Figure 8: Methamphetamine was detected in this seized syringe.

² Centers for Disease Control and Prevention (CDC) (December 2009). "Agranulocytosis associated with cocaine use - four States, March 2008-November 2009". MMWR Morb. Mortal. Wkly. Rep. 58 (49): 1381-5. PMID 20019655.

³ Moisse, Katie (2011-06-23). "Cocaine Laced With Veterinary Drug Levamisole Eats Away at Flesh". ABC News. Retrieved 2011-06-23.

RESULTS AND DISCUSSION

Illicit drug trafficking will continue to be a difficult challenge for law enforcement personnel. Drug samples are extremely complex, but the FLIR solution offers a clear answer for real time identification of a variety of illicit substances seized by law enforcement personnel.

Paraphernalia/Specimen	Detected Component(s)
Burned Spoon	Cocaine, Methylecgonidine
Powder Residue #1	Dimethyltryptamine
Powder Residue #2	Cocaine
Pipe Residue	Cannabinol
Green Plant Material	Delta-9-THC, Cannabinol
Coat Hanger	Cocaine, Levamisole
Syringe	Methamphetamine

The GRIFFIN GC/MS and PSI-Probe, in combination with the simplicity of Level 1 Griffin System Software, uniquely positions this analytical platform to be used by virtually anyone. Compared to colorimetric drug identification kits, the FLIR solution takes the guess work out of sample analysis, with both retention times and high confidence mass spectral data required for alarming within GSS. Evidence is also preserved for additional chain of evidence forensic analyses that may be required for future courtroom admissibility.

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