Application Note 410000052-A

See-Through Measurements of Illicit Substances in Commercial Containers with the TacticID®-1064 ST

The TacticID®-1064 ST is a 1064 nm handheld Raman system designed for law enforcement officials, first responders, and customs and border protection officers for rapid field identification of illicit materials such as narcotics, explosives, and other suspicious materials. The TacticID-1064 ST has dedicated software and hardware designed to measure materials through both transparent and opaque containers. These through-barrier measurements remove the need for active sampling of potentially dangerous compounds, such as fentanyl, leading to safer operations and reduced wait time for clear results. The 1064 nm laser is also an advantage for analyzing fluorescent or impure material. A Raman system with a 785 or 830 nm laser may generate fluorescence from these samples, which can overwhelm the Raman signal and make identification impossible. In this application note, we'll explore some of the capabilities of the TacticID-1064 ST.

EXPERIMENT

The TacticID-1064 ST is equipped with a See-Through (ST) mode scan function that allows users to identify chemicals behind thick and opaque barriers with the use of an ST sampling adapter (Figure 1). A hit quality index (HQI) is used to match the unknown sample to a library spectrum. The HQI calculation ranges from 100 (best match) to 0 (worst match). The system employs an automatic integration time. The laser power is adjustable, but was set to 90% for these measurements. The number of hits can also be adjusted.

Materials tested:

- Fentanyl - highly toxic opioid that is often mixed with heroin and other street drugs
- N-acetylanthranilic acid – US DEA List I controlled drug precursor, used in synthesis of methaqualone, highly fluorescent with 785 nm excitation
- Caffeine - stimulant often used as a cutting agent in drug manufacturing

Containers:

- manila envelopes
- padded shipping packages
- high-density white polyethylene (HDPE) bottles

Figure 1. TacticID-1064 ST measuring a sample through a manila envelope with ST adapter

RESULTS

Fentanyl citrate powder inside a thin, plastic bag was placed inside of a manila envelope and tested with the TacticID-1064 ST. Fentanyl citrate was successfully identified directly through the manila envelope with an HQI of 85.0 (Figure 2).

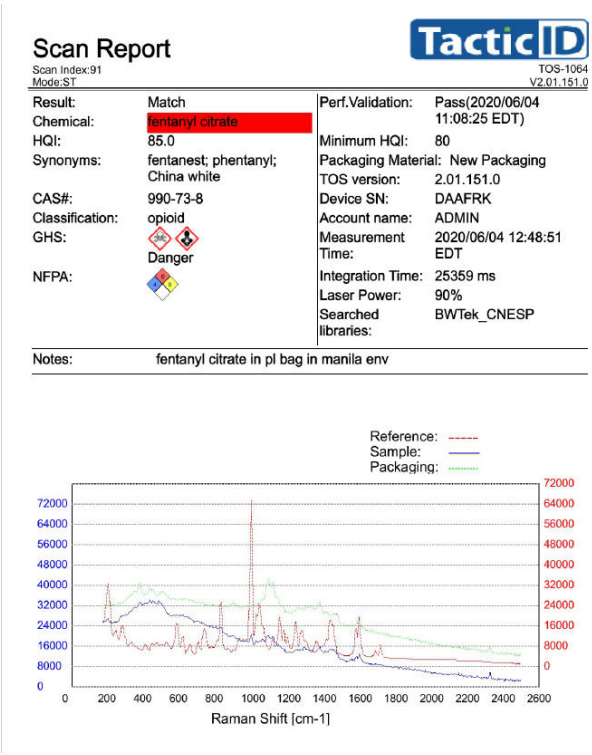

Figure 2. Fentanyl match report for sample measured through manila envelope

N-acetylanthranilic acid is a light brown compound that is used in the synthesis of methaqualone and mecloqualone, both Schedule I drugs. According to the International Narcotics Control Board (INCB), 10.4 metric tons of N-acetylanthranilic acid has been seized globally since 2000. When measured with a 785 nm laser, the Raman signal is completely overwhelmed by the generated fluorescence (Figure 3, red trace), making identification impossible with Raman. The 1064 nm laser of the TacticID-1064 ST does not generate fluorescence (Figure 3, blue trace), and a good Raman spectrum can be collected and used for identification against the spectral library.

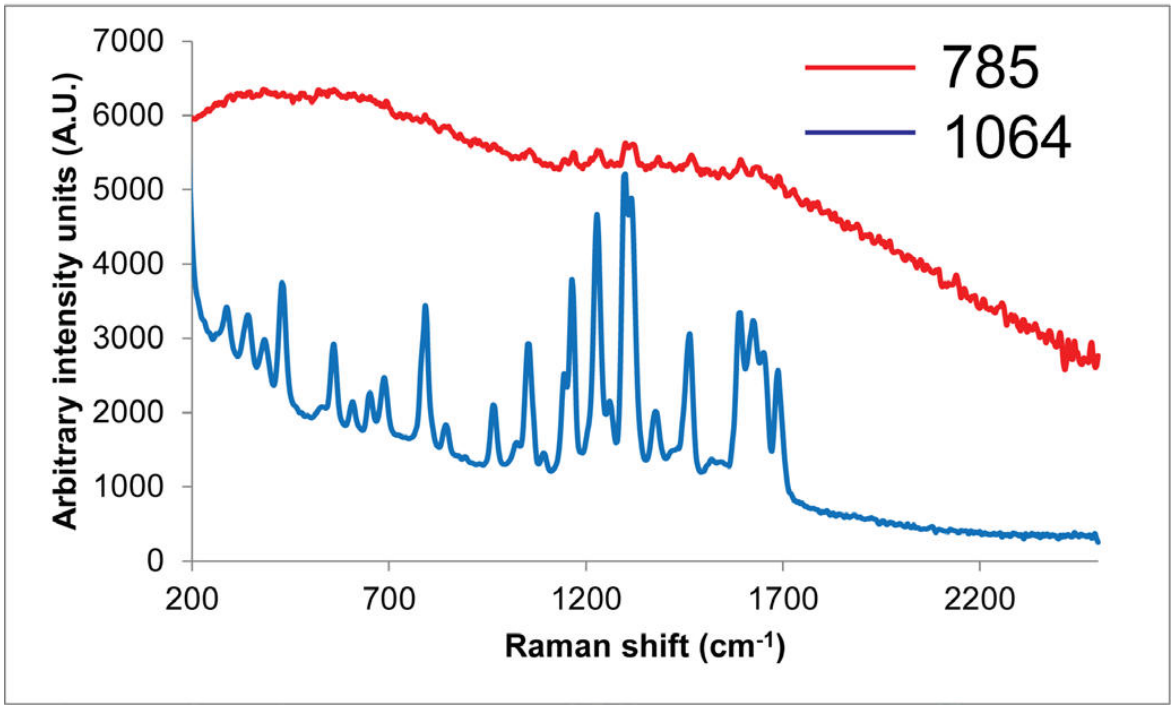

Figure 3. Comparison of Raman spectra of N-acetylanthranilic acid with (a) 785 nm and (b) 1064 nm laser excitation.

The ST mode on the TacticID-1064 ST was used to measure N-acetylanthranilic acid through a white plastic (HDPE) bottle with an HQI of 92.2 (Figure 4).

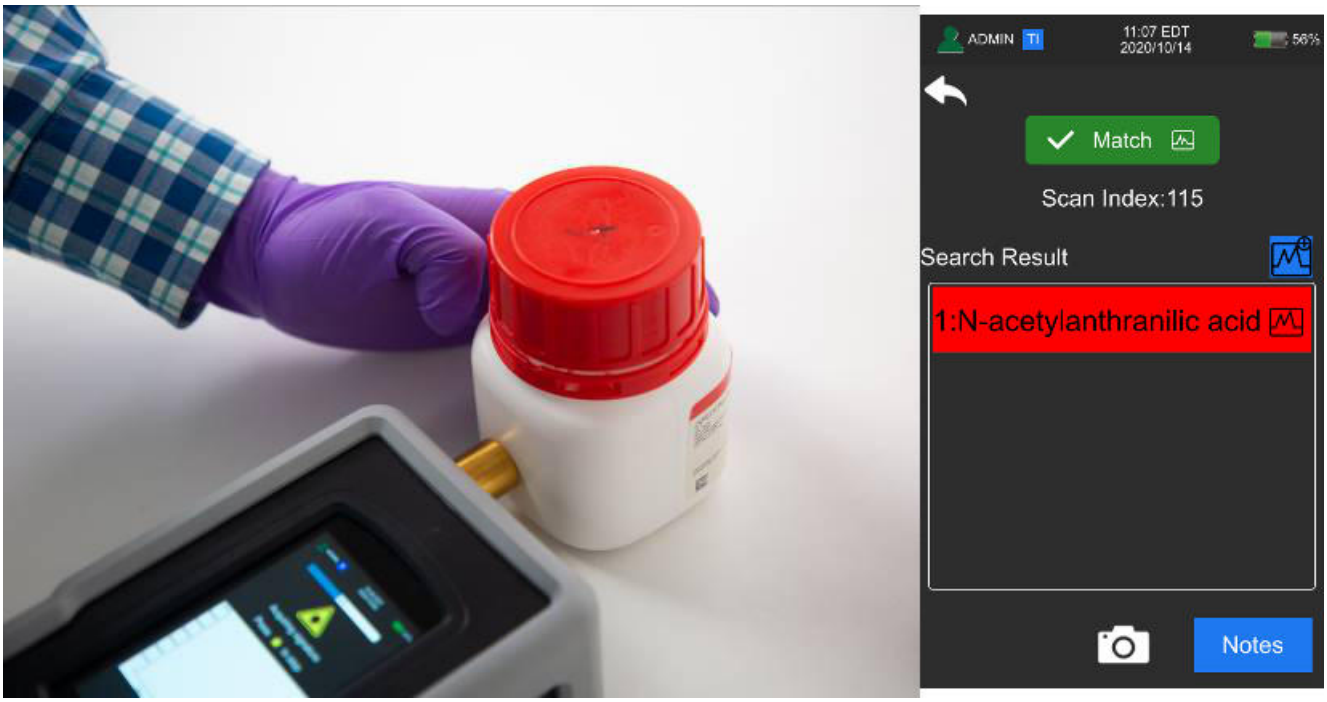

Figure 4. TacticID-1064 ST measurement through HDPE bottle and match result for N-acetylanthranilic acid

Caffeine in a white plastic bottle was placed inside a white padded shipping package for analysis (Figure 5). In this case, the caffeine must be identified through both the plastic and the padded package.

The ST mode on the TacticID-1064 ST was able to successfully identify the caffeine through the padded package and plastic bottle with an HQI of 91.3.

Figure 5. Measurement of white HDPE bottle of caffeine inside white padded package

CONCLUSION

The TacticID-1064 ST puts operator safety first, removing the need to actively sample from opaque packaging in order to identify illicit substances. The 1064 nm laser excitation removes fluorescence issues generally associated with 785 nm Raman systems.

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CONFIGURATION

TacticID-1064 ST

Le TacticID®-1064 ST est un appareil d'analyse portable Raman 1 064 nm pour une identification rapide sur le terrain d'explosifs, de stupéfiants et d'autres matières suspecte. La capacité « See-through » (transparence) du TacticID-1064 ST peut analyser des échantillons de manière non destructive à travers un emballage opaque et transparent, avec un niveau de menace d'échantillon affiché en évidence pour les premiers intervenants, le personnel de sécurité, les forces de l'ordre, les démineurs, les douanes et la protection des frontières, et les équipes de gestion de matières dangereuses pour leur permettre d'agir rapidement avec un minimum de contact avec l'échantillon.

Le TacticID-1064 ST utilise la spectroscopie Raman éprouvée, en combinaison avec la technologie brevetée STRaman®, permettant aux utilisateurs d'obtenir une identification exploitable en temps réel de produits chimiques inconnus, de stupéfiants, de médicaments, d'explosifs et de nombreuses autres substances, meme à travers des barrières opaques, réduisant considérablement l'incertitude opérationnelle et le temps de réponse.

Le TacticID-1064 ST, avec une excitation laser à 1 064 nm et un adaptateur ST pour les applications « see-through » (transparence), exploite une vaste gamme d'échantillons, délivrant un spectre sans fluorescence, sans brulure d'échantillon, permettant aux utilisateurs d'identifier les matériaux sombres et colorés, les échantillons de rue difficiles, les mélanges et les matériaux hétérogènes directement à travers l'emballage.

Ce système IP68 dispose d'un écran haute luminosité avec écran tactile et/ou interface matérielle par boutons pour faciliter l'utilisation, meme à travers un équipement de protection.