

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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