

Explosives Detection Through Opaque Containers with Agilent Resolve— a Handheld SORS System



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Introduction

The Agilent Resolve Raman handheld through-barrier identification system identifies materials concealed behind barriers such as colored and opaque plastics, dark glass, paper, and fabric using Agilent proprietary spatially offset Raman spectroscopy (SORS) technology.

This Application Note details how the Resolve system can easily differentiate benign West African palm oil containers from those containing home-made, commercial, and military explosive materials—all in approximately one minute, without any of the containers being opened.

Experimental

To conduct a Resolve system measurement, the user simply selects the container type. The tests described here are through-barrier measurements (Thick, Colored or Opaque is selected) (Figure 1).

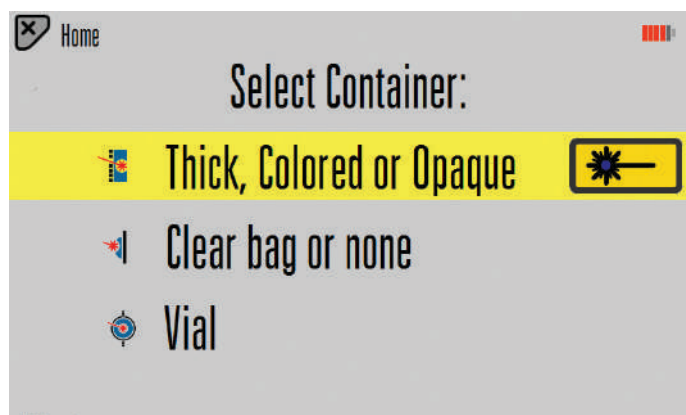


Figure 1. Selections for through-barrier, point-and-shoot, or glass vial measurements.

Use care and caution when scanning suspected explosive materials. The Resolve system can be operated using a scan delay or remote trigger. Laser power can also be reduced. (Figure 2).



Figure 2. Risk assessment screen for setting a time delay or reducing laser power.



Figure 3. Improvised Explosive Devices (IEDs) are frequently packed in opaque colored plastic containers.

The Resolve system was set up to record measurements in through-barrier mode. Samples were either full-size containers filled with the material in question (for example, palm oil) or a smaller package of the material in question taped to the inside of the larger container (for example, TNT). Some more sensitive samples (for example, TATP or primaries) were set up under explosive range conditions using around 5–10 g of material positioned behind a cutout of the same plastic barriers.

Primary explosive testing was carried out with assistance from Alford Technologies at Broadmead Quarry in Somerset (United Kingdom).

Examples of materials tested

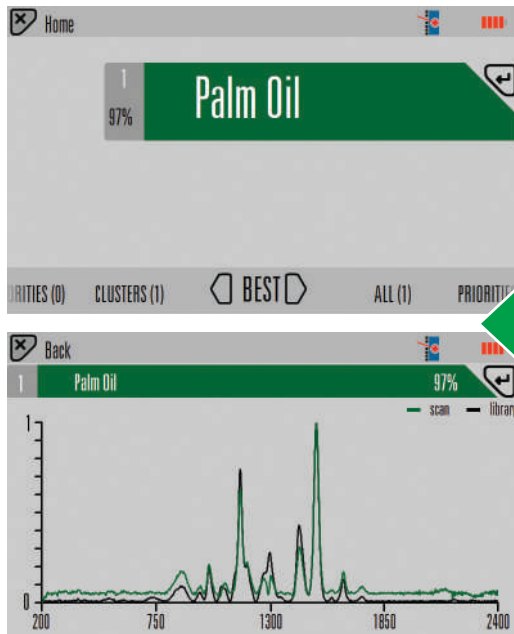
- TNT
- Semtex H
- Semtex A
- TATB
- Ammonium nitrate/sugar
- Ammonium nitrate/fuel oil
- PE4
- PE7
- PETN-based plastic explosives
- AN-based plastic explosives
- TATP
- HMTD
- Hydrogen peroxide/fuel
- Explosive precursors
- Primary explosives

Measurements and Results

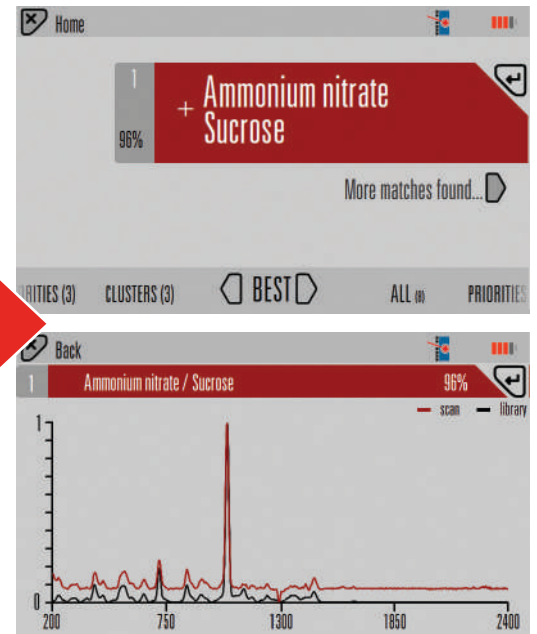
- Scan times are adjusted automatically based on the Raman signal strength, but typically take approximately 60 seconds.
- The single best match result is presented—other modes are available.

- Library items can be tagged as priorities when searching for specific materials. Priority matches display in red—all other matches display in green.
- All four tests easily identified the concealed material. In each case, the measured spectrum is a high-quality match with the library spectrum, despite being measured through the plastic container (Figure 4).

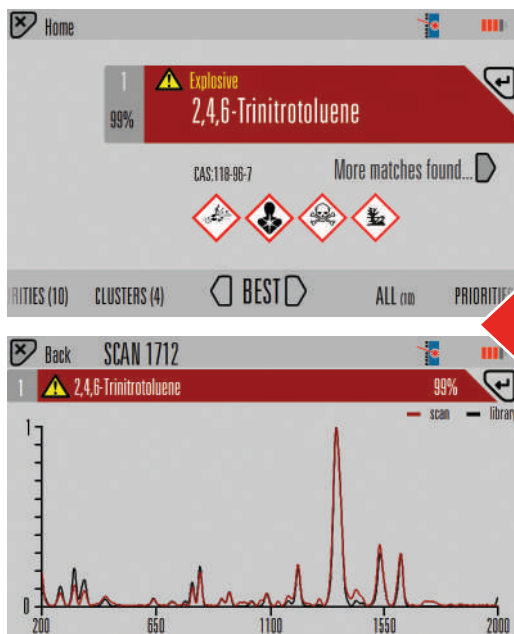
Palm Oil



Ammonium nitrate/Sucrose



TNT



Semtex H

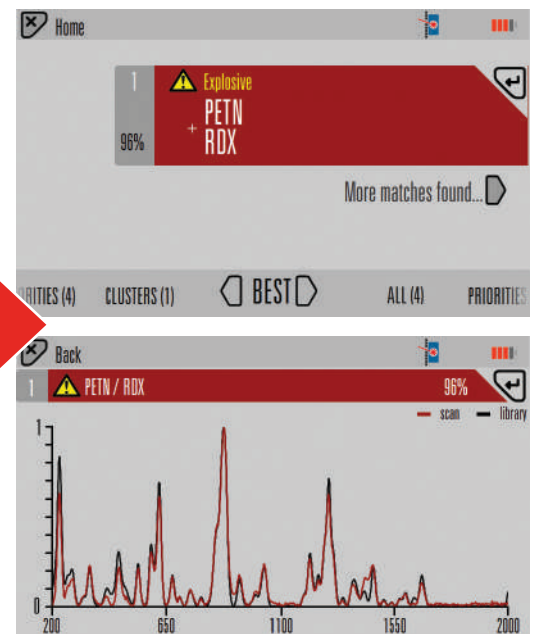


Figure 4. Results from four measurements conducted through yellow and blue plastic containers. Priority matches display in red; all other matches display in green.

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