In the beginning of today's ***SafetyNews*** we would like to draw your attention to the **LaborExpo** 2024 exhibition. Visit us at our **booth A4**, where you will find a wide range of instruments from the field of CBRNe detection. You can test all these instruments on site. We will also be showcasing one of our world firsts at this exhibition**, the XplorIR Multi-Component Quantitative Vapor and Gas Analysis using a handheld FT-IR spectrometer**. We dare say that XplorIR brings the same revolution to the field of gas analysis in First Responders as the first handheld Raman spectrometer, the Ahura First Defender, once did. Details of this innovation can be found below in this Safety News.

RMI's booth features more than 30 exhibited devices, a large part of which is dedicated to security applications and CBRNe detection. In this section you will find the following equipment on display:

1. **GELSIGHT Mobile** - unique 3D microscope for field forensic analysis
2. **Pendar X10** - unique Stand OFF Raman spectrometer with the ability to measure from distances up to
   200 cm and hardware fluorescence suppression
3. **ProSpector 3 MAX** - the most powerful handheld ED XRF spectrometer on the market today, special
   applications for forensic and customs analysis, field analysis of unknown hazardous samples...
4. **ThreatID** - mobile "suitcase" FT-IR spectrometer with ATR and gas cell
5. **TruDefender FTX** - mobile "handheld" FT-IR spectrometer with ATR from Thermo Scientific
6. **XplorIR** - New unique mobile "handheld" FT-IR spectrometer for automatic identification and quantification of gases and vapours including mixtures (5600 substances in the database)
7. **Gemini** - Combined mobile FT-IR/Raman spectrometer with flexible armoured probe and ATR from Thermo Scientific
8. **FirstDefender RMX** - pocket-sized powerful Raman spectrometer with armoured probe for safety applications from Thermo Scientific
9. **1064Defender** - handheld Raman spectrometer for security applications with 1064 nm laser excitation

10. **NIRLAB** - handheld NIR spectrometers for quantitative analysis of cannabis products (THC, CBD, CBG content, water activity...) and quantitative analysis of selected drugs
11. **MX908** - mobile mass spectrometer for security applications - trace analysis very hazardous substances
12. **MobileDetect** - intelligent presumptive colorimetric drug testing using modern technologies for automatic objective evaluation

First of all, we would like to draw your attention to the newly available upgrade for Pendar X10 and MXG08.

Users of Stand OFF **Pendar X10** Raman spectrometers can install (if they have not already done so) the new software and library. The new library already contains more than 8250 substances with a main focus on hazardous substances, drugs, explosives and their precursors as well as other important groups (white powders, industrially used substances, pharmaceutical chemicals and others). The library now contains more than 350 fentanyl derivatives and a number of precursors for the production of fentanyls. In addition to the expansion of the library, the algorithms for automatic focusing on the sample surface and for measurements in thick glass containers have been further optimized, the analysis has been accelerated and the algorithms for resolving spectrally very similar samples have been improved.

We have a new upgrade (version 3.5) for **MXG08** users. This is a larger and more substantial upgrade that brings a number of improvements (moving from version 3.4.X to the next generation). **Please contact us to obtain the upgrade.**

- The individual Mission Modes have been optimized to achieve maximum performance for the category of substances and the measurement mode used (direct gas phase measurement, trace detection and identification with the Thermal Desorption Module, Aerosol analysis with the Aero Module). The ionization conditions, the use of CID (collisionally induced ionization) and the mass ranges analyzed (for both positively and negatively charged ions) were optimized. The MX908 thus not only achieves excellent detection limits, but also maximum selectivity. Highly reliable identification and differentiation of all types of VX and Series A substances (Novichok). In conjunction with thermal separation during thermal desorption and the use of advanced chemometric algorithms, the MX908 is also capable of finding low concentrations in more complex samples - for example, finding highly toxic Fentanyls and Nitazenes in tablets down to concentrations of
  1 % or, more recently, to identify synthetic drugs in mixtures with MDMA
  (e.g. 2C-B in MDMA - this variant is becoming more and more common, even in the Czech Republic).
- The procedure for automatic cleaning of the Aero module has been improved.
- The graphical interface has also been improved. During the initialization of the measurement mode, the symbolic icon of the selected Mission mode is now also

shown for clarity. The operator thus always has an overview of the selected Mission mode during the entire analysis process.

And one very nice news, the new version 4.5 also includes localization into Czech language.

Five new priority drugs have been added to the library (available in Drug Hunter Mission mode). These substances were selected based on requests from the agencies listed below, as well as the number of occurrences in Reachback files submitted by users from around the world (for substances that were not automatically identified by the instrument, but only after manual analysis of the mass spectra).

- United Nations Office on Drugs and Crime (UNODC)
- U.S. DEA National Forensics Laboratory Information System (NFLIS)
- European Monitoring Centre for Drugs and Drug Addiction

Name of substance	Classification	Description and relevance
4-fluoro MBDM BINACA also known as: 4F-MDMB-BUTINACA	Synthetic cannabinoids	4-fluoro MBDM BINACA is a Convention on Psychotropic Substances Act 1971 in the United States is a Schedule I country and in the United Nations in Schedule II. In the United States and has been reported in Europe since 2018. This synthetic cannabinoid caused a fatal cases when used alone and in combined with alcohol.
CH-PIATA also known as CH-PIACA		CH-PIATA appeared in 2022 as part of a new subclass of synthetic of cannabinoids that was created to to circumvent the ban on traditional synthetic cannabinoids in China in July 2021. In is not currently a scheduled substance to the list.
ADB-BUTINACA		Since its inception in 2019, ADB-BUTINACA reported in 50 countries and territories all over the world. In 2022 and 2023, the the second most commonly reported synthetic cannabinoid in the entire United States, and with 1 092 and 785 reports respectively. In March 2023 Commission on Narcotic Drugs (UN) included in Schedule II of the Convention on Psychotropic Substances Act 1971.
N-cyclohexyl butylone also known as Cybutylon	Synthetic kathinony	N-cyclohexylbutylene is a new synthetic cathinone, which has been on the by early 2022 reported in nearly 180 Cases. It is reported that the new synthetic

		cathinones cause psychoactive and side effects.
Name of substance	**Classification**	**Description and relevance**
N-pyrrolidine protonitazene also known as Protonitazepyne	Synthetic Opioid/Nitazene	N-pyrrolidinoprotonitazene was first reported in January 2023 and was the third most common nitazene compound reported that year. It has been identified in combination with other drugs of abuse and recent data have shown it to be more potent than fentanyl.

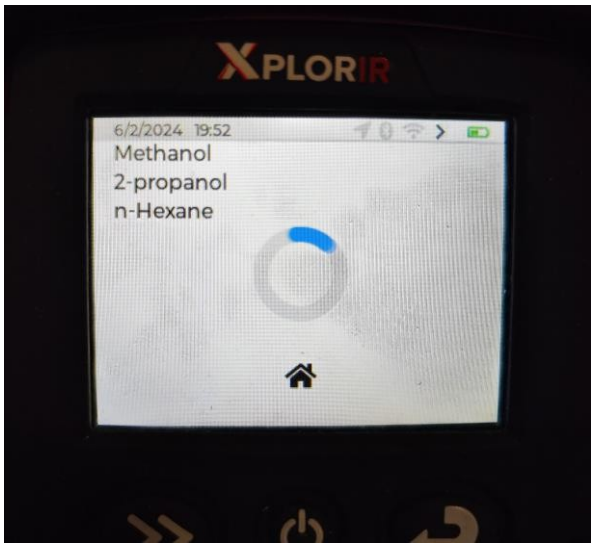
New Automatic quantitative multicomponent analysis of gases and vapours with XplorIR handheld FT-IR spectrometer

This innovation will have its world premiere simultaneously at LaborExpo 2024 and at the major international conference *The* International *Hazardous Materials Response Teams Conference*, hosted by the International Association of Firefighters (IAFC) in Baltimore (USA).

This innovation is the result of more than a year of development by RedWave's team of experts and brings capabilities that have been sorely lacking in the First Responder portfolio. It will be used not only by firefighters, but also by accident and decontamination companies or large chemical companies. For the first time, we are getting our hands on **a mobile detector which, at a weight of 2.5 kg, enables fully automatic and reliable identification of 5,600 vapours and gases, now also in mixtures of up to six components** (FT-IR analysis of gases and vapours has a higher selectivity than analysis of liquid and solid samples). This is now also possible with continuous monitoring (always identified from a complete database of all substances in the library). **At the same time, quantitative analysis of more than 380 substances is also carried out** (to be extended to more than 1000 substances by the end of 2024). The information on the display is then refreshed every 4 s in monitoring mode, the analysis is fully automatic, the control of the whole instrument is by three buttons and is possible even in a heavy protective suit. Along with the list of detected substances, a graphical display of

the identification reliability and the concentration in ppm, the CO_2 concentration is also always displayed. The determination of the CO_2 concentration by FT-IR is very reliable and specific and is not burdened by errors as is the case with commonly used electrochemical sensors.

Last issue of **Safety News No. 35** (download here) was largely devoted to advances in automated vapour and gas analysis using **XplorIR** mobile FT-IR spectrometers, in particular dynamic background correction, which has greatly improved the continuous monitoring capabilities of handheld spectrometers. In continuous monitoring with a handheld FT-IR detector, transitions between different environments can occur, and thus the spectral background can change dramatically due to changes in air humidity and CO_2 content. This problem has been solved by new algorithms applied to the **XplorIR** instrument, and current improvements take this technology even further. In the event that an unknown substance is detected in the air, the spectrometer will automatically run an identification analysis, stop the pump, close the gas cuvette and read multiple spectra to achieve sufficiently low noise in the spectrum. The automatic multi-component analysis is then triggered and the software identifies the individual unknown substances (up to six components in the mixture). After 30 s, the preliminary composition/identification of each substance is displayed, as shown in the following figure.

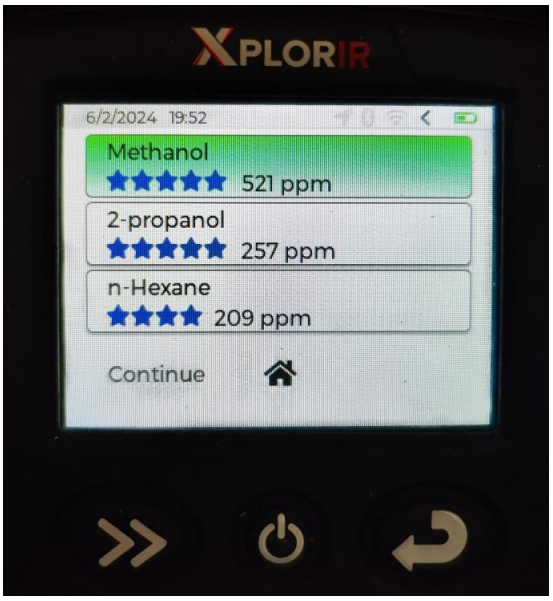


In the meantime, the spectrometer continues to read spectra to improve the final quality of the spectrum. After 60 s, a final analysis is performed, where the confidence of identification is displayed for each substance found (graphically, using stars). Newly designed multi-component analysis algorithms analyze mixtures of up to 6 components with high reliability. Unique is the ability to calculate the identification confidence (hit score) for each individual substance in the mixture.

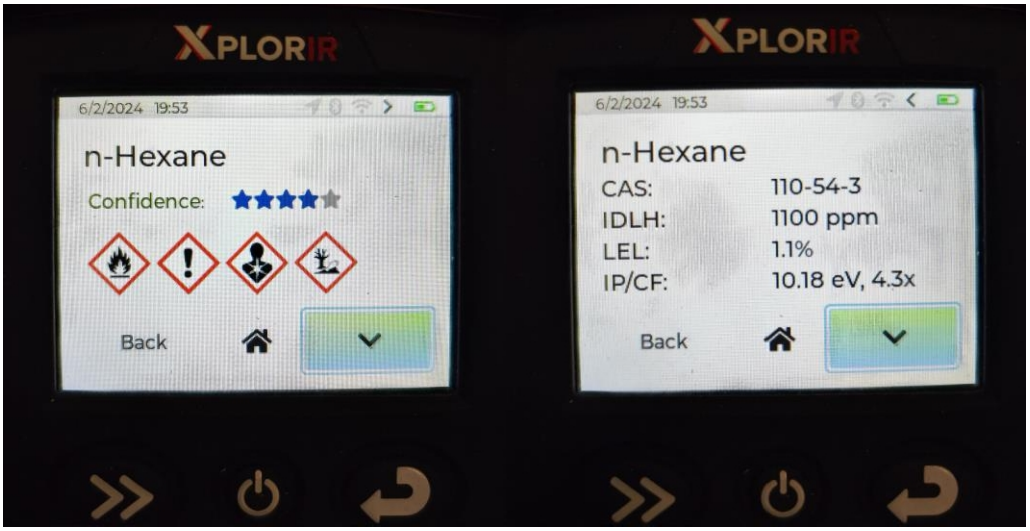
The figure below shows an example of the identification confidence display for hydrogen cyanide. We consider a substance to be identified if the Hit Score is greater than 0.8. In the case of gas phase analysis, Hit Score values are generally always lower than for solid and liquid phase analysis, which is due to the background variation discussed in our previous Safety News #35. Detailed information on multi-component analysis can be found in the attached application note.

Hydrogen Cyanide Detection - XplorIR		
Concentration	**Hit Score**	**Stars**
20 ppm	0.91	★★★★
15 ppm	0.86	★★★
10 ppm	0.83	★★

The concentration in ppm (for substances included in the quantitative analysis module) **is also displayed together with the identification of the substances**. The display is illustrative, the instrument uses a high resolution and high contrast display. It is thus easy to read in all lighting conditions even when wearing protective equipment.

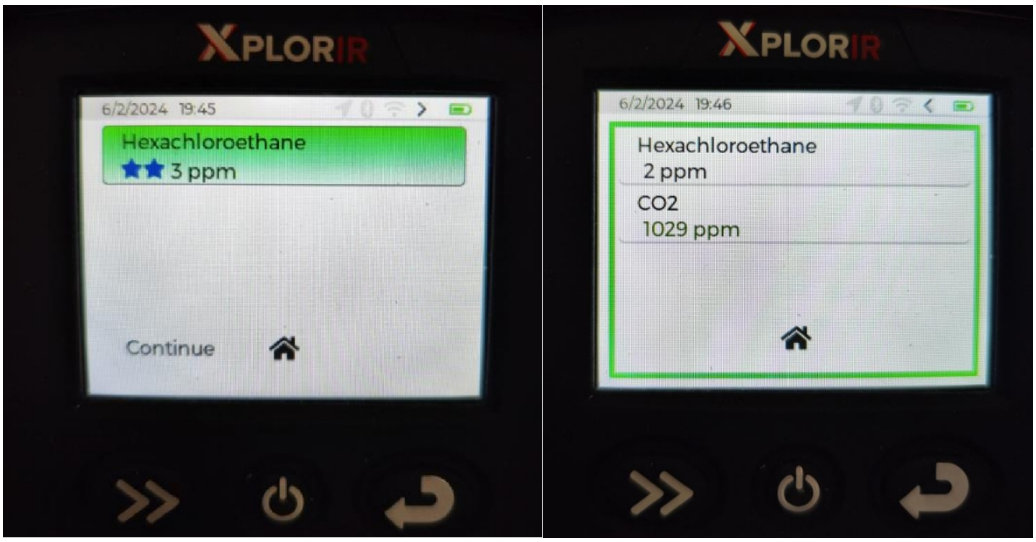


For each substance found, you can view more detailed information



If Continue is selected, the spectrometer starts the pump and continues to monitor continuously, resetting the results after 4 s. The **XplorIR** uses a unique gas cell that has a small volume and multiple beam passages. The effective optical path is therefore 2 m. Due to its small volume, the cell responds very quickly to concentration changes (units of seconds). The long optical path in turn ensures good detection limits (in conjunction with dynamic background correction, which very effectively improves the signal-to-background spacing). The following figure shows the automatic identification of Hexachloroethane at a concentration of only 3 ppm. The most sensitive peak of this substance is also very well "masked" by the spectral background, yet the identification limit is only 2 ppm. The following figure then shows the form of the display

results in continuous monitoring mode (after selecting Continue), when the information refreshes every 4 seconds.



If you want to try the **XplorIR** mobile detector, visit us at our stand **A4** at LaborExpo or contact us. The instrument is available at our company.

Interesting webinars

The problem of gas mixture analysis using **XplorIR** FT-IR spectrometers was dedicated to the next episode of **THE HAZMAT GUYS** podcast (here).

The company 908Devices has been very active in organizing interesting webinars on a number of interesting and topical topics recently. Below you will find links to the webinars. Due to the nature of the webinars and the information they contain, registration is always required. There are no restrictions for those from the Czech Republic and Slovakia, after a simple registration you can immediately view the webinar recording.

Suspect Fentanyl Mail Analysis and Best Practices

Watch a quick webinar on analyzing suspicious fentanyl shipments to learn best practices for screening suspicious shipments.

https://908devices.com/resource/suspect-fentanyl-mail-analysis-and-best-practices/

Responding to Chemical Warfare and Pharmaceutical Based Agents

A useful webinar for First Responders in the CBRN field. You will get the latest information on dangerous chemical threats, chemical weapons and drug-based agents.

In addition to traditional chemical warfare agents such as G/V agents and blister agents, new unconventional chemical threats such as fentanyl and other pharmaceutical-based agents, as well as A-series agents (novichokes), are emerging. This webinar will take you through the latest tactics, detection techniques and procedures for both existing conventional agents and emerging threats. It includes examples from actual incident response.

https://908devices.com/resource/on-demand-webinar-responding-to-chemical-warfare-and-pharmaceutical-based-agents/

Deadly Drug Investigations

If you are interested in what the Opioid Crisis means in real police practice, we recommend this webinar. Presented by people from the DEA and Overdose team, everything is shown through real cases and investigations. The U.S. has dedicated large sums of money to managing this problem since 2020, it is very important for us to draw on their data and experience. It is likely that this problem could quickly spread to Europe. Given the intense involvement of drug cartels and the massive production that has rapidly reduced the price of Fentanyl tablets, there is a high risk of rapid spread among socially excluded communities or in areas of low economic performance. For example, the price of a single tablet of counterfeit Oxicodone has already fallen to 50 cents on the 'wholesale' market, according to the latest DEA data

https://908devices.com/resource/mx908-webinars-fentanyl-and-other-deadly-drug-investigations/#sign-up

Staying Ahead of the Curve: Navigating Emerging Drugs for Law Enforcement

Learn about the different classifications of drugs and the reasons why new substances such as xylazine and medetomidine are becoming increasingly common. Stay one step ahead and get to grips with these new trends in the drug scene.

https://908devices.com/resource/staying-ahead-of-the-curve-navigating-emerging-drugs-for-law-enforcement/

Maximizing Decon Efficiency: Solutions for Fentanyl and Other Drugs

Watch this webinar to learn how First Line Technology and 908 Devices products work together to provide a robust decontamination solution.

https://908devices.com/resource/maximizing-decon-efficiency-solutions-for-fentanyl-and-other-drugs/