Analyze That episode transcript

PackEye XS - Covert Detection for Real-World Public Safety

This transcript has been lightly edited for clarity, readability, and length. The content reflects the original discussion and technical intent of the speakers.

Erik: Hi, everybody. I'm Erik Larmore. I'm the product manager for the radiation portables portfolio at Thermo Fisher Scientific. I'm excited today to be joined by Mark Deacon to talk a little bit about the new product that we're launching, the PackEye XS, on this video series, Analyze That. Mark, would you be willing to give a brief introduction of yourself?

Mark: Hi there, my name's Mark Deacon, and I've worked for Thermo Fisher for more years than I'd like to remember. I'm the technical manager, and I have been responsible for keeping customers happy with backpacks and RadEyes for many, many years.

Erik: All right. Thank you, Mark. Let's go ahead and jump into the questions. To start off, what is the PackEye XS Radiation Detection Backpack used for? Who uses it in the field? And how does the PackEye XS help protect communities from radiological threats in real-world deployment environments?

Mark: In general, the PackEye XS is used for radiation threat detection in dynamic environments such as parking lots, trains, crowds, and large events.

The primary field users are mostly law enforcement and teams related to security, especially counter-terrorism and border security missions. Fire and hazmat teams, as well as bomb squads, also use it for mobile, wide-area monitoring and often support those law enforcement operations.

As far as helping protect communities, this product finds radiological threats early, or before there is actually an incident, so teams can respond before a hazard reaches the public domain. It is often used alongside other radiation tools to create a broader circle of protection around an incident or event.

Erik: What kinds of scenarios or operations call for covert radiation detection instead of more visible detection instruments?

Mark: That's a good question.

It is best suited for searches where teams need to look for unknown threats without drawing attention to the operation. Although security is sometimes very visible to show a deterrent, when you want to do radiation detection especially, you want to get very close to the problem.

Typical scenarios include sports events, races, political events, transit environments, and other public venues where you want to be close in the crowd, part of the crowd, and not cause a problem with the public. It is very useful when operators need to get physically closer to that threat in order to improve detection confidence.

Obviously, it also allows plainclothes personnel, not necessarily in uniform, to blend in instead of signaling a visible security response. It also helps avoid confusion with other partner agencies that may misread somebody wearing a bulky backpack, maybe with cables and things sticking out of it or other obvious gear, during joint operations.

Erik: And how does that ability to operate covertly improve the safety or success of the operation overall?

Mark: The first thing is that covert operation helps prevent unnecessary panic in crowds during routine screening or surveillance. It also makes it harder for an adversary to spot and work around the detection posture, which also gets called a moving curtain.

That moving curtain concept means having detectors spread around an area instead of in one fixed, obvious place, which might be easy to avoid. With a low-profile form factor, it looks like ordinary gear. I can show you that it is just a very small pack and looks like ordinary gear that anybody might use to carry books, a laptop PC, or something like that.

Erik: Great. Would you walk us through a typical mission from initial patrol to first alarm, all the way through confirming and identifying the source? What does that workflow look like?

Mark: Absolutely. The mission usually starts with the equipment being issued. Very often, it is issued to relatively untrained or even completely untrained people. They will get that unit, check its battery status, and confirm the settings before deployment.

Then they usually perform an initial site sweep or survey to learn the background and identify any natural hot spots before the main operation begins. Maybe there is a particular item that has some naturally occurring radioactive material, and you want to identify that before the event starts.

The unit, when you switch it on, learns both the background level and the background spectrum to ensure that operators have a reliable baseline. We can then set some very low alarm levels on top of that.

Operators are trained to watch for two basic alarm types: natural and artificial. The backpack can tell the difference between the two. If they get an alarm and it is a natural

alarm, that prompts them to make a quick common-sense check of the surroundings and make sure that makes sense. With an artificial alarm, other people will almost immediately be called in and the problem or threat will be investigated further.

Once the backpack makes the detection, a smaller unit like the RadEye SPRD, which can be part of the kit, might be used to further identify the isotope and therefore the type of threat being presented. That allows us to trigger the secondary follow-up without freezing the whole scene. You do not have to hold somebody there for a really long time while you find out that maybe they had a medical uptake.

Erik: And I believe it also means that data can be pushed back through the app or via radio so that primary operators can get backup from a secondary expertise team sitting in mission control.

Mark: Absolutely. The backpack talks directly to the app and also logs events. If you do an identification with the SPRD part of the kit, that data is stored and can be sent back via the app very easily for reachback. Then you can get somebody with very powerful analytical equipment looking at that spectrum, looking at that data, and further analyzing it.

Erik: You touched on it a moment ago, but natural background rejection, what we call NBR, gets mentioned a lot. What problem does it solve in the field, and how does it change an operator's decision-making?

Mark: NBR separates natural background from potential artificial sources in the field and reduces its effect on what is going on. That allows us to set very, very low artificial alarms - alarms, in some respects, below background level - without driving false alarms from normal background changes.

That means we can keep that fantastic sensitivity even when the environment is changing, such as when you are moving in and out of buildings that have different background radiation environments that would otherwise cause false alarms. Operators also get an immediate artificial-versus-natural indication within a few seconds.

It is like a red light, green light situation. They get an alarm, but it tells them it is natural, which calls for a less intense response. If they see an artificial alarm, they can have a very strong and fast response. They get that artificial-versus-natural indication within seconds, without a long analysis period, so they can make an instant decision on picking somebody out in a crowd, maybe.

That changes decision-making because users know right away whether to keep screening, check the area, or escalate the response. This advanced NBR algorithm helps agencies see the radiation earlier without sacrificing confidence in the alarm due to too many false alarms.

Erik: In what ways do radiation detection backpacks like the PackEye XS complement other detection tools, such as handheld instruments or vehicle-mounted systems?

Mark: That's a good question. When you look at the suite of equipment that people might have, the backpack is going to be more sensitive than a small handheld because it has a bigger detector. So it supports standoff detection, in other words, detection from a little bit farther away.

That makes it well suited for walking down parking lots, walking through a train, searching a wider area, and approaching a possible threat before moving in for close localization. When you move closer for localization, you are more likely to use a small handheld to complement that, pinpoint the exact source in person, and obviously do an ID or search in a small area.

Erik: What about vehicle systems?

Mark: Vehicle systems tend to cover large areas. You can put a big detector on a vehicle system, but that vehicle cannot necessarily get close enough to localize the threat. Maybe it is good for generally going around a parking lot and finding a hit in a garage or near a particular vehicle. But the backpack is going to do a lot better job of actually searching out which particular vehicle it is in the parking lot and localizing that threat to a smaller area.

Vehicle systems are very useful. But again, proximity is everything when it comes to radiation detection. So a practical workflow is: vehicle first, then you get a hit. Maybe that vehicle is a boat. The person gets out with the backpack, does a closer search, finds out exactly where that situation is, and then uses a handheld for final localization.

Erik: Could you explain how the PackEye XS could be used as a checkpoint or a temporary portal?

Mark: Yes. You have very good sensitivity with a backpack, and it does not need any setup. One unit could be used as a single detector, or two units could be set apart from each other to make a portal on each side. You could monitor one or two units with the app and see the whole picture as a portal. It is a very simple and effective portal-like setup.

A single operator can monitor that checkpoint from their phone. The Bluetooth is very strong, so you could do it from 50 yards away if you wanted to. Most people usually want to be within a few yards so they can have good personnel control. Because the system is compact, teams could just leave the backpack anywhere, leave it in a Pelican case, or have it as something small and discreet.

A lot of people will put it on a small stand that is about three feet off the ground, on a hook, a small tripod, a table, or something like that. That gives you even better sensitivity because you reduce the effect of the background from the floor and also get

better geometry because you are in the middle of the area you are trying to survey.

That gives agencies a portal-style capability in minutes. You could just put one backpack down here, one backpack down there, fire up the app, link it to the units, and away you go without the long setup that fixed portals usually involve.

Erik: Thanks. If an agency already uses RadEye SPRDs, how does simultaneous connection with the backpack via the RadBridge mobile app streamline response on scene?

Mark: The main thing is that we can look at the backpack and the SPRD at the same time, on the same app, on one screen. That means users do not have to flick between apps or use two different devices for the two different modes of operation.

That supports a fast ID workflow because you can get a hit with the backpack and immediately trigger the RadEye SPRD to do an ID from the app, without even having to get the detector out of the pocket of the device.

That means teams can work from a more central or remote position instead of having to manage those devices separately. The combined view helps operators enhance their preliminary decisions about what to do next and what calls to make to see if they need a secondary response. It also helps users quickly recognize medical sources versus findings that might need a more serious response.

Erik: What benefits do users gain from the integration with the RadBridge mobile app compared to the simpler data viewing tools of the previous generation? How does the RadBridge mobile app enhance teamwork between operators and command centers during a mission?

Mark: Compared with earlier simple data views, RadBridge gives users a much better picture of multiple instruments and what they are seeing at the same time. Teams can monitor two devices at once. The most likely combination is a backpack and an SPRD, but it could be two backpacks in the same operation.

Alarm events are easy to capture. You get a hit, and maybe you do not have all the details of the hit. You can go in, look at the alarm events, and share that information with supervisors. That could be just on the radio, or it could be firing that alarm event back via the app for rapid reachback.

That allows remote personnel to view the snapshot, interpret the event, and guide operators because those remote people might have an overall view of the situation or just more expertise. The result is faster secondary analysis and better teamwork between the field users and the command or support personnel.

Erik: With respect to training and staffing, how quickly can a new user become confident, and what best practices reduce cognitive load during a live search?

Mark: That is what everybody loves about the PackEye XS. New users can become operational very quickly, usually with less than 10 minutes of instruction. Very often, this is what happens: they have a trailer full of equipment handed out to people who have never seen it before, and within 10 minutes, they are good to go.

Startup training is simple. Basically, they power on the unit, see how it learns the background, learn how to recognize the different alarm types, and optionally compare it with the app. They do not have to, but they can compare it with the app. Then they are told what decisions they need to make and what operating procedures they need to follow depending on which alarm they get.

The display is very, very familiar. We have two bar graphs: an orange one for gamma and a blue one for neutron. Anybody who picks one up understands hotter, hotter; colder, colder. It is very easy and a familiar display philosophy.

This matters for real-world events because the equipment is often handed out very quickly at the start of an event. They do not have a lot of time to do extensive training, and they are handing it out to teams of mixed experience.

The nice thing is that the cognitive load stays low. There are lots of studies on this. When you have a lot of technology, screens, and information, it is difficult to take it all in. What is nice is that both on the app and on the unit, the data is displayed very clearly and the cognitive load stays low.

Erik: That is really important to help operators stay focused on the mission instead of constantly dealing with technology.

Mark: Absolutely.

Erik: How do teams plan for 24-hour missions with power packs, and what tips keep operators mission-ready?

Mark: The unit has a battery that lasts a long time, so that is a good start. It also has a regular USB-C cable, and that makes charging straightforward with common chargers. If users have a regular cell phone charger, they can plug into that and charge the battery inside, or use off-the-shelf accessories. That is nice.

Teams will confirm that the units are fully charged before deployment and include power checks in their pre-mission routine. As we discussed, when they fire the units up, they will see what the battery level is. The nice thing is that external battery packs can extend the runtime. If you are getting low, you can hook up an external pack just like the ones you use for charging a cell phone externally, and the PackEye XS supports hot swapping.

That means users do not have to stop, lose any results, or start a new survey. If they see the power is going low, they can just hook up that battery and the unit continues

working. It will charge the internal battery from the outside power source. Hot swapping is very important in the field. No break is required in the survey.

Fast and easy field charging means that if operators feel they need to top up, they can charge the device, and it charges very, very quickly. If they have an external power source, they can run it on that external power source. They could even do it when they hook it up to a computer. If they are operating in a situation where the computer can be used, or they are getting data out of the device, they are actually going to be charging it while they operate the computer.

External power is also important in a way that people do not necessarily think about right away: cold-weather deployments. The electronics inside the backpack can be used in very cold temperatures, and the detector is very good in cold temperatures. But on many products, the limitation is power.

What is nice is that if you use an external battery pack and that battery pack is kept warm, you can use it in very cold-weather deployments. That means that even if you are at the extreme low end of a temperature specification, the power and the life of the backpack are not reduced.

Erik: How does Helium-3-free neutron detection influence sustainment and logistics for agencies planning multi-year deployments?

Mark: Helium-3 has been used as a standard neutron detection technology for a very long time. It is very effective and efficient, but it has some practical application problems. The first one is shipping. Helium-3 tubes are at pressure. Even if they are below a minimum pressure, they still have to be declared. So a Helium-3-free system reduces the shipping and declaration burden associated with those Helium-3 systems.

It simplifies sustainment and logistics for agencies managing multi-year deployments because there is nothing worse than having to fill out a whole bunch of paperwork every time you move everything. Obviously, shipping them from one place to another is a lot easier without that burden.

It also avoids the need to have very high-voltage circuits and sensitive amplifiers in the detector architecture. You have to have that with Helium-3, and that ends up being a reliability problem. If you get rid of Helium-3, that improves your field robustness with humidity, wet conditions, and other harsh operational environments.

It is also a better fit for police and fire users who regularly operate around radios and other sources of interference because the electronics associated with Helium-3 can often generate false alarms from radio sources.

Erik: What are the most common misconceptions about backpack detectors? And what is the first thing users say after their initial field exercise?

Mark: The common misconception is that backpack detectors have to be heavy, bulky, and complicated to use. The first thing many users comment on is how light and small the PackEye XS is.

After a full day in the field, users often appreciate that they can keep wearing it comfortably instead of wanting regular breaks or wanting to put it down. They also comment on the operational simplicity. We talked about the displays earlier, but also how easy it is to start the unit, understand the alarms, and get moving quickly. That simple display reduces the amount of thought required during live operations.

Erik: What were some of the biggest limitations of the previous PackEye GN2 model that inspired the redesign into the PackEye XS?

Mark: The previous PackEye GN2 had a strong-performing detector, but the bag looked overstuffed. It was larger, heavier, and the whole system was less covert. External cables were a major drawback because they made the system much more conspicuous and less streamlined in the field.

The XS addresses those issues by eliminating those cables and fitting the smaller electronics into a much more normal-looking backpack. The newer platform is about half the weight of the old PackEye GN2 and roughly two-thirds the size of that older model. The redesign also improved sensitivity; it has a better detector inside, so the change was not only about size and ergonomics.

Erik: If an organization owns older PackEye units, what does an upgrade path to XS look like considering interoperability, training continuity, and the practical gains they can experience on day one?

Mark: For organizations already using older PackEye units, the transition to the XS is designed to feel very familiar. Training continuity is strong because the operating logic and the display approach stay close to the previous generation. So there is nothing extra really to learn. That means experienced users can often pick up the XS and be productive almost immediately.

The RadBridge app adds practical day-one gains by making data sharing and interoperability much simpler. Teams that already use SPRDs, the RadEye SPRD, can also connect them on day one rather than replacing their existing identification workflow.

Erik: Looking forward, how do you see technologies like the PackEye XS influencing the next generation of field radiation detection and emergency response tools?

Mark: The PackEye XS points toward the next generation of field tools being more versatile, more connected, and easier to deploy. The system can support multiple use cases: on-body search, vehicle support, temporary portal screening, and mobile wide-area monitoring.

Its covert and lightweight form factor makes distributed moving curtain deployments more practical for real events. Simple training and intuitive operation help agencies scale that capability across their mixed-experience teams. The PackEye XS represents flexibility, versatility, connectivity, and operational simplicity.

Erik: Thank you so much, Mark, for all your detailed answers today. And everybody listening, thanks for joining us. You can learn more about the PackEye XS by visiting thermofisher.com/PackEyeXS. You can also learn more about Thermo Fisher Scientific's expanded radiation detection portfolio by visiting thermofisher.com/radiationmeasurement and signing up for our newsletter to receive product updates and educational content. Thank you.

Visit thermofisher.com/PackEyeXS