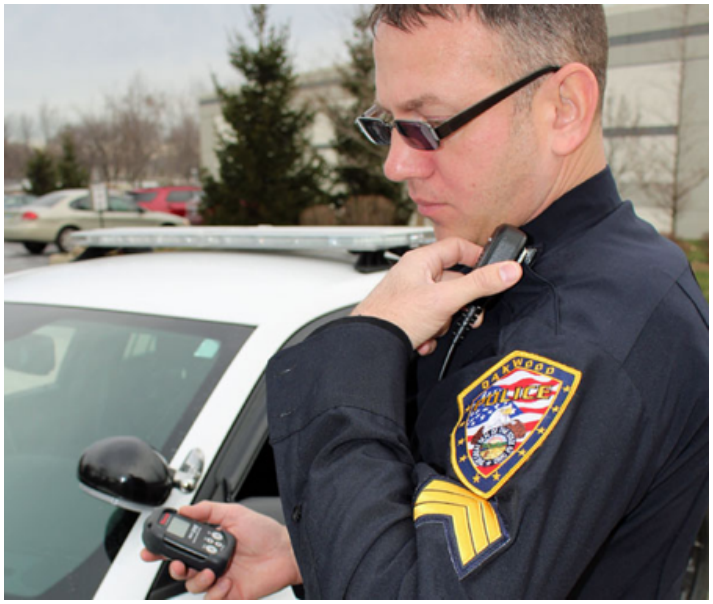
Yes, you can have Cheaper, Better & Faster Radiation Detection

Guest Editorial by Scott Masiella, Product Manager, Radiation Measurement and Security Instruments, Thermo Fisher Scientific



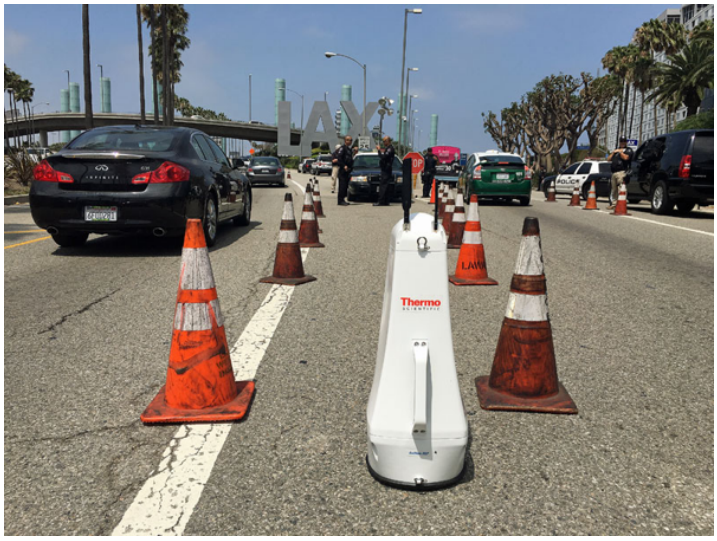
As costs are reduced and technology improves, more buildings and facilities with high-security needs will require the added protection that radiation detection provides.

President Barack Obama claimed at this year's Nuclear Security Summit that among the things that keep him up at night, the threat of terrorist attacks involving "dirty" bombs topped his list.

The unfortunate truth is that constructing a crude bomb containing a radioactive payload is well within the capabilities of technically advanced terrorists. The social, political and economic costs of even a small dirty bomb blast would be extremely high.

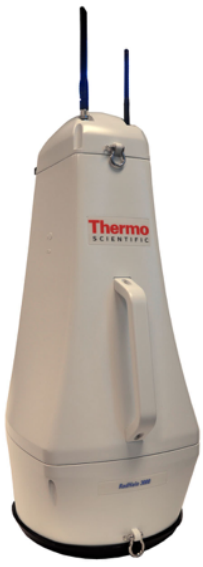
While radiation detectors have long functioned at nuclear facilities, border crossings and ports, now they are increasingly being positioned to protect government buildings and other key facilities as well.

Next-generation detectors are making it possible for security professionals to consider installing smaller, faster and more reliable detection and response systems where cost and logistical constraints may have previously discouraged their implementation.



RadHalo in use at LAX

The technology has advanced and is designed to detect even the smallest threat to a high-profile facility. With that in mind, security personnel overseeing major international and political events in the U.S. are focused on establishing sophisticated yet unobtrusive radiation detection systems.



RadHalo

Small is beautiful

Once bulky, expensive and difficult to use, radiation detectors are benefiting from information technology innovations.

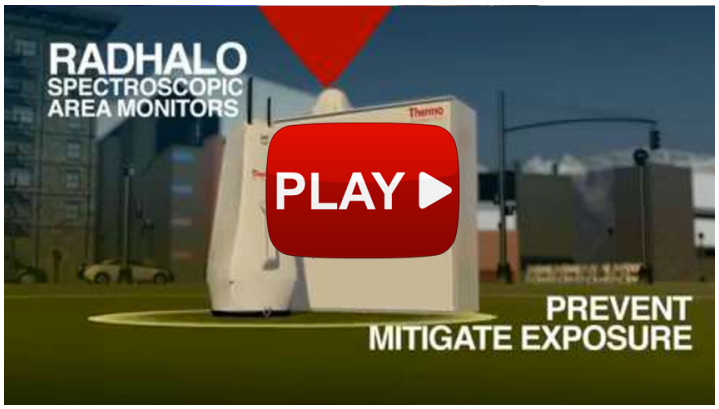
These innovations include small form-factor chipsets that control smart phones, improved signal

processing algorithms, and, more recently, multi-function, high-resolution scintillation detectors. Small form-factor chipsets from the smart phone world have revolutionized several other industries.

Machine-to-machine communications and the Internet of Things, eReaders, gaming consoles, drones, smartwatches and, now, radiation detectors use the new system-on-a-chip (SOC), designed to control the critical functions they offer.

The benefit of these small, yet powerful integrated circuits is that they allow many mathematical calculations to occur in a very small space. So, the computing power necessary for accurate radiation detection can be packaged in a much smaller unit.

The algorithms that identify which form of radiation is present are sophisticated and require a lot of computing power.



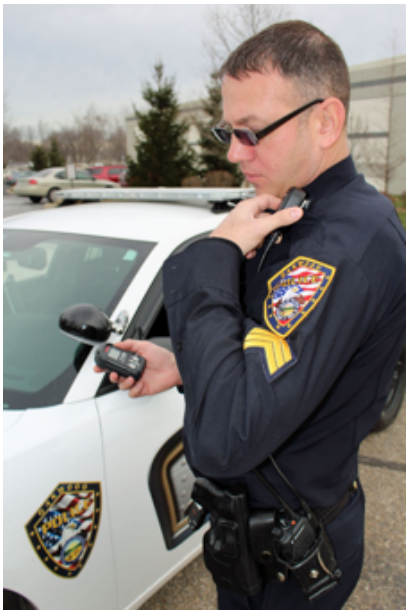
(Courtesy of Thermo Scientific)

In the past, a truck full of computers would run what now can fit inside a portable detector the size of a pack of cards. Smaller is better, because detectors are now more mobile—even wearable— and, therefore, less obtrusive and far easier to deploy.

Positive detection… then what?

Just how complicated is radiation detection? Why would it require millions of petaflops?

The most innovative detectors don't just alert security personnel as to whether or not radiation is present. They also can discern whether the source is part of normal background radiation or non-local as well as whether that radiation is being shielded.



In addition, detectors can distinguish between several different kinds of radioactive materials. This is an important distinction, because security personnel will react quite differently based on which isotope is reported.

Radioactive isotopes such as technetium-99 are commonly used in medical procedures and can trigger an alarm.

For example, a security officer using a sophisticated, high-resolution detector at the entry gate for a government agency office or parking lot would be able to quickly determine whether a visitor attempting entry was carrying a dirty bomb or, instead, had just undergone a medical diagnostic procedure.

Today, most detectors will identify the substance, but don't provide any guidance on what to do given its presence. In the future, detectors will be sophisticated enough to also inform security personnel about which actions to take given the material detected.

Integrated detection and action guidance reduce training costs and means that security designers can provide units to more people without worry-

ing about who can use them properly.

Faster, more accurate instruments

Increased accuracy reduces false positives and improves response times.

Accuracy relies on three factors:

- The ability of embedded algorithms to separate signal from noise and identify the specific fingerprint of a particular radioactive material;
- High resolution core detection technologies; and
- Calibration routines.

Getting all three right is key to performance, but is a significant challenge for portable detectors. In addition to better signal processing and algorithms, however, new, core detector technologies are being commercialized.

(Achieve definitive answers through pin-point accuracy with the Thermo Scientific RadEye SPRD. Courtesy of Thermo Scientific and YouTube)

High-resolution, multi-functional detector crystals, such as Cs2LiYCl6 (CLYC), reduce the number of counts required to accurately detect and identify radioactive materials.

This leads to detecting artificial gamma and neutron radiation up to 10 times faster while also reporting identifications in a much shorter period of time.

CLYC, when combined with the new algorithms, provides gamma spectroscopy (for radiation identification) and neutron spectroscopy (for automatic, radioactive sourceless stabilization and suppression of background neutrons from cosmic rays).

New detector systems are designed for ease of use.

Technological innovations are leading to a more intuitive user interface, while sophisticated on board diagnostic tools maintain factory calibrations without the need to return to the factory or own a large radioactive source. Maintenance has never been easier or cheaper.

Sleep at night

For professionals designing security systems to protect government facilities and other high-profile properties, radiation detection can now be achieved with higher accuracy and for far less initial capital than in the past – all without having a PhD in physics.

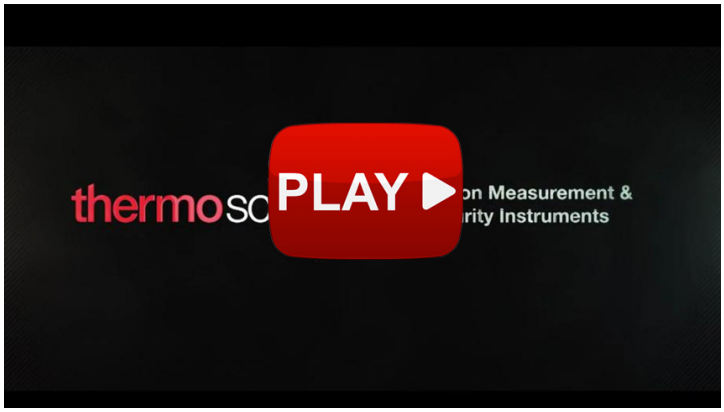
As costs are reduced and technology improves, more buildings and facilities with high-security needs will require the added protection that radiation detection provides.

Incorporating such protection into their current practices will allow our leaders – and citizens across the country – to sleep a little better each night.

Thermo Fisher Scientific offers a wide range of

advanced handheld radiation detectors including those for gamma dose rate measurements and area monitoring.

These instruments can be utilized by law enforcement, military, and environmental organizations to selectively detect and track specific types of radiation sources.



(Courtesy of Thermo Scientific)

The RadEye family of instruments encompasses a wide range of applications, but they're all small, easy to use, and provide excellent measurement performance at minimal power usage.

All functions may be accessed, even with protective gloves and the LED alarm is visible both, when holding the devices and stowing them on a belt or holster.

About the Author

Scott Masiella, product manager, radiation measurement and security instruments, Thermo Fisher Scientific

Leveraging his strong technical background and market knowledge, Scott Masiella, manages product roadmap, new technology direction, new product introductions, pricing and P&L for all software applications, portable handheld instruments, man portable instruments, and vehicle bound radiation detection and identification systems.

Masiella, with over a decades experience in advanced spectroscopy at Thermo Fisher, is responsible for developing new products based on identifying market challenges, evaluating market trends, size, and potential to determine technology and product focus.