Jonathan James examines unobtrusive ways to screen members of the public as they enter large public spaces to ensure maximum security

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People go through security screening before the start of Star Wars: The Force Awakens

In the light of recent tragic events in Paris and elsewhere, security professionals worldwide are facing an unprecedented broadening of requirements to screen people for concealed threat items. The evolving nature of the threat is driving requirements to want to screen people over an increasingly diverse range of operational security scenarios and locations.

People screening requirements now cover a broad swathe of applications, ranging from high volume, high throughput public places such as transport hubs, shopping malls and cultural sites or events, through to visitor and employee screening at key asset or VIP sites and infrastructure locations. Recent incidents have highlighted the growing danger of person-borne threats, typically hidden weapons and explosives. This includes metal and non-metal objects, plastics, liquids, ceramics, wood *etc.* – indeed, anything that may be an offensive weapon.

Ionising security screening technologies – such as X-ray backscatter – may have their place in highly secure locations, where the legal framework may permit their use, but are unsuitable for wider deployments for obvious regulatory and health and safety reasons. The high volume of screening would have an impact on health for example.

Active millimetre wave screening solutions have been deployed at airport landside/airside security checkpoints. These are typically large telephone booth-sized cabins in which the person stands stationary during the screening process while being illuminated with low levels of electromagnetic waves (millimetre waves). Images of the person and concealed objects are formed using the waves reflected from the person, (rather like the formation of a radar image). Throughput limitations, size and inability to screen at a distance or covertly, and the fact that this is active technology with similar health implications, has prevented its wider adoption for public screening applications.

Image-based screening technology must also not violate the privacy of the individual through the display of detailed anatomical images. For this reason, X-ray backscatter and active millimetre wave screening cabins, display the output image as a mannequin or 'avatar' image rather than the raw display output.

In most public applications it would be preferable for security screening technology to be visually unobtrusive; ideally it should be 'invisible' to the public. Security screening must not present any barrier or 'bottleneck' that restricts the free flow of people in public areas. It

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must be compact and mobile, discreet, or even covert and capable of screening people at a distance as they move about their business.

Passive screening technologies that have the ability to screen people at a distance and in real time have been developed over the past 10 years. Two passive technologies have emerged: millimetre wave and terahertz. Both operate as receivers only. Camera units collect low-energy millimetre wave or terahertz waves naturally produced by all objects and people. Nothing is emitted by the camera units during the screening process so they are totally harmless.

It is important to understand the distinction between passive and active screening technologies; there is much confusion in the definition of people screening technologies in the media and on the internet. This is compounded by widespread incorrect online labelling of X ray, active millimetre wave and passive terahertz images.

Passive screening technologies emit zero energy; they are intrinsically safe. The nearest analogy to passive screening technologies is the passive infrared sensor widely used to trigger floodlights, burglar alarms *etc.* Differences between millimetre and terahertz waves are mostly academic and unimportant from an operational security perspective. Strictly speaking, the terahertz waves used for security screening should be referred to as 'sub-millimetre waves'.

Terahertz waves are of shorter wavelength than millimetre waves. The key operational security advantage of this is that terahertz screening systems are more compact, portable and, therefore, suitable for covert deployment.

One feature of terahertz waves is fundamentally very advantageous for operational security use. Glass windows are opaque to terahertz waves and transparent to millimetre waves. Passive terahertz security screening systems are deployed without changing the local environment. This enables mobile terahertz screening solutions to be set up in minutes in different locations. Terahertz security screening solutions are widely used in areas with large plate glass windows – a common feature of large public spaces.

Conversely, passive millimetre wave systems require removal of external sources of millimetre waves and cannot be operated in locations with windows or sky lights without re-tuning to suit the changing environment; they are influenced by ambient millimetre wave levels due to prevailing weather conditions, cloud cover *etc.*

One of the most pressing requirements is the need to screen people for concealed automatic weapons and PBIEDs (person-borne improvised explosive devices), and to do so in high footfall, high throughput locations such as retail shopping malls, sports stadia or cultural events.

If you take the example of a luxury retail mall, they typically have many entry points ranging from the large visually attractive main pedestrian entrances to escalator or lift entrances from car parks or public transport networks. Retail locations, cultural and sports stadia must remain open and welcoming to the public. Security screening technology cannot be visually intimidating to the public. Flexibility of installation is therefore a critical requirement.

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Increasing security to screen people for threats in such locations has hitherto meant using 'stop and search' tactics, or airport-style security. This is inappropriate for the retail environment and inconvenient for members of the public as it may delay their movement. For these reasons, the deployment of active airport style 'body scanning' equipment is widely considered to be unsuitable within the retail environment.

The real-time standoff screening ability of passive terahertz screening systems has, therefore, found use near the entrances to shopping malls. Terahertz waves pass through many common materials that are visually opaque; passive terahertz systems have, therefore, been covertly deployed in shopping malls behind plastic panels and similar materials. The standoff imaging ability has enabled them to be deployed either as floor, wall or ceiling-mounted units in diverse public screening scenarios. Images are displayed in real time to remote security control operators over existing standard Ethernet Local Area Networks or wirelessly.

Other entrances to retail malls – from car parks or public transport through escalators or lifts – form natural 'pinch points' that can be used to guide people within the field of view of passive screening systems. These can be overt or discreet ceiling, floor or wall-mounted units, or fully covert units concealed within wall cavities behind plastic panels or elsewhere.

The same type of application can apply to cultural sites or sporting events. These are typically characterised by defined entry points, turnstiles or ticket entry points.

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These are natural 'hesitation points'. People can be screened by pairs of passive terahertz units simultaneously screening both the front and rear as they pass through.

In summary, operationally viable security solutions for screening people must fulfil the following six requirements. They must be passive and not violate the privacy of the individual. They need to be compact and portable for covert and rapid mobile deployment. They will need to screen people in real time as they move, and not introduce 'security bottlenecks' that impede the free flow of people. They need to be able to screen people at a distance ('stand-off screening') and they need to be able to screen for a wide range of concealed objects; non-metal, liquid, metal. Finally, the need to be able to integrate with wider video management systems including facial recognition software.

Many cultural or VIP events are temporary. This necessitates the deployment of compact mobile screening points. Passive terahertz technology is intrinsically low power. Mobile screening units with integral battery power have been deployed for mobile use in various locations for this use. In most circumstances this is normally a compliant subject search situation, by this we mean that the person knows that they are being screened. Passive screening technology is typically deployed in conjunction with existing or legacy security equipment, such as X-ray baggage screening units or walk-through metal detector gates. In these cases, the use of passive screening adds a degree of unpredictability and an extra layer of security to existing security infrastructure and protocols.

For highest security detection efficiency, with a single passive screening unit, the subject may be asked to make four quarter turns, pausing briefly at each. Alternatively, if protocols or throughput requirements do not permit this, pairs of units are used to simultaneously screen people as they pass through the entry/exit checkpoint. In this scenario, the units are frequently positioned either side of existing walk-through metal detectors.

Passive terahertz technology is deployed in this manner around the world for visitor and employee's entrance/exit screening at Government departments. Pairs of units at each entrance have, for example, been used to screen all staff attending international summit meetings.

Diplomatic protocol can prevent the overt screening of visitors in VIP locations. In these circumstances the person cannot be asked to divest, or stand stationary for a moment. In these scenarios, two or four units are strategically positioned to screen VIP delegations as they pass through the entrance area. Covert or discreet deployment is usually the case here. At one international summit meeting, passive terahertz screening units were even discreetly deployed in flower displays.

Left: X-ray screening systems such as this airport checkpoint one at MILIPOL Paris are unsuitable for wider deployment due to health and safety issues

Below: ThruVision allows screening to take place in an unobtrusive way and without causing delay