Walk-Through Weapons Screening Systems for Mass Casualty Threats

Market Survey Report

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FOREWORD

The National Urban Security Technology Laboratory (NUSTL) is a federal laboratory within the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T). Located in New York City, NUSTL is the only national laboratory focused exclusively on supporting the capabilities of federal, state, local, tribal, and territorial responders to address the homeland security mission. The laboratory assists responders with the use of technology to prevent, protect against, mitigate, respond to, and recover from homeland security threats and incidents. NUSTL provides expertise on a wide range of subject areas, including chemical, biological, radiological, nuclear, and explosive detection, personal protective equipment, and tools for emergency response and recovery.

NUSTL manages the System Assessment and Validation for Emergency Responders (SAVER®) program, which provides information on commercially available equipment to assist response organizations in equipment selection and procurement. SAVER publications provide information on equipment that falls under the categories listed in the DHS Authorized Equipment List (AEL), focusing primarily on two main questions for the responder community: "What equipment is available?" and "How does it perform?" The SAVER program works with responders to conduct objective, practitioner-relevant, operationally-oriented assessments and validations of commercially available emergency response equipment. Having the right tools provides a safer work environment for responders and a safer community for those they serve.

NUSTL is responsible for all SAVER activities, including selecting and prioritizing program topics, developing SAVER knowledge products, and coordinating with other organizations to leverage appropriate subject matter expertise. NUSTL conducted a market survey of commercially available walk-through weapons screening systems for public venues. This equipment falls under the AEL reference number 15SC-00-PPSS titled "Systems, Personnel/Package Screening".

SAVER reports are available at www.dhs.gov/science-and-technology/saver-documents-library.

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System Assessment and Validation for Emergency Responders ®

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EXECUTIVE SUMMARY

Entertainment venues, cultural centers, transportation hubs, and similar "soft target" locations where people gather present unique security challenges due to their inherent accessibility and high throughput. Walk-through weapons screening systems capable of detecting concealed mass-casualty threats without impeding pedestrian traffic flow could deter attackers and enhance public safety in these crowded areas. Unlike airports or courthouses where entrants and their bags are individually screened for small and large threats, publicly accessible venues would use systems designed to primarily detect larger weapons that could cause mass casualties. Such systems allow an individual to walk through the device without stopping or removing bags, coats, or shoes.

Between February 2023 and January 2024, the Systems Assessment and Validation for Emergency Responders (SAVER) program conducted a market survey of commercially available walk-through weapons screening systems suitable for use at public venues. This market survey report is based on information gathered from manufacturer and vendor websites, internet research, industry publications and a government-issued request for information that was posted on the System of Award Management website. Performance of these products and information included in this report have not been independently verified by the SAVER program. The 15 systems included in this report are designed to detect weapons capable of causing many fatalities rather than smaller-sized, close-proximity weapons (e.g., knives, smaller handguns). The report includes systems that use one of two types of technology: metal detection or imaging.

Ten systems detect metallic threats based on their electrical conductivity and magnetic permeability. Of these, five are active metal detection systems that use circuitry to generate a magnetic field between side panels that define a portal to detect both ferromagnetic and non-ferromagnetic metals. Five are passive metal detection systems that use the earth's magnetic field and primarily detect only ferromagnetic metals. Most of the metal-detection-based systems provide the operator with an indication of the location of the threat object. Some products have additional capabilities such as providing a video image of the person screened. Products weigh from 17 to 334 pounds. A few may be portable for short term operations; most are transportable and suitable for longer-term applications, while one is designed to be integrated with building structure for semi-permanent installation. Prices provided for four of the ten systems ranged from $5,000 to $19,000.

Five systems use imaging principles to detect concealed objects based on their reflective properties rather than their conductivity and can detect metallic and non-metallic threats, screening people as they are moving. Of these, two are configured as portals and actively generate millimeter waves (MMW) to illuminate a person being screened. Three systems operate in a stand-off configuration with no portal, two of which are based on passive MMW detection, sensing thermal radiation emitted by the body to detect objects concealed under clothing. The other stand-off system uses active "non-imaging radar" to illuminate the person being screened. Prices provided for four of the five systems ranged from $80,000 to $300,000.

The purpose of this market survey is to provide public safety and emergency response agencies with information to guide them in making operational and procurement decisions. When making equipment selections agencies should consider capabilities and limitations in relation to their mission and operational needs, as well as potential impacts associated with integration with information technology infrastructure, data management, and their concept of operations.

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1.0 INTRODUCTION

Locations where large numbers of people gather may be vulnerable to violent attacks with the potential for mass casualties. Cultural centers, transportation hubs, entertainment venues, and similar "soft target" locations present unique security challenges due to their inherent accessibility and high throughput. Walk-through weapons screening systems that can detect concealed, mass-casualty threats without impeding pedestrian traffic flow could deter attackers and enhance public safety in crowded areas. The deterrence objective for such systems differs from those installed for routine screening at entrances to limited-access areas, such as airline passenger terminals or secure government buildings, where entrants stop to have their bags screened separately through an X-ray scanner. The systems included in this report are designed to detect weapons capable of causing many fatalities (e.g., large guns) rather than smaller-sized, close-proximity weapons, such as small knives. Some screening systems are designed to be transportable for short-term applications, while others are appropriate for long-term installations.

Between February 2023 and January 2024, the System Assessment and Validation for Emergency Responders (SAVER) program conducted a market survey of commercially available walk-through weapons screening systems suitable for use at publicly accessible sites. This market survey report is based on information gathered from manufacturer and vendor websites, internet research, industry publications and a government-issued request for information (RFI) that was posted on the System of Award Management website.[1] The performance of these products and information included in this report have not been independently verified by the SAVER program. Due diligence was performed to develop a report that is representative of products in the marketplace.

The products included in this report screen for threats based on either metal detection or millimeter wave (MMW) imaging and are designed to have capabilities to:

- detect large, concealed weapons carried by pedestrians
- allow individuals to continue walking without stopping during the screening function
- provide an alert to the system operator upon detection of a potential threat
- have a means to discriminate smaller threats and innocuous items so as not to alarm
- allow bags, purses, or parcels to be screened while being carried or worn by an individual (for metal detection systems)
- allow individuals to be screened without requiring divestment of innocuous (nonthreat) metal objects, such as those carried in pockets or bags, prior to screening (For some imaging systems, objects may be required to be carried openly in their hands during screening.)
- be used at venues and events where large crowds gather and it is not practical to impede pedestrian traffic flow, such as metropolitan public transit centers, cultural institutions, and entertainment centers.

While some of the systems included here can optionally be configured for use in other applications, highly sensitive systems designed for use at correctional facilities, airports, secure government buildings, and similar controlled-access venues are covered in other SAVER publications. [1]

[1] See https://sam.gov/opp/80760f4d96ca45aba80d1f89f96fdced/view.

2.0 WALK-THROUGH SCREENING SYSTEMS OVERVIEW

Walk-through screening systems may be deployed at any venue that routinely screens people entering the facility. Security personnel may use these systems to detect anything that is considered a threat item or contraband that is not allowed to be brought into the facility. Some examples of such items are firearms, large knives, and explosive devices. This market survey report details products that are intended for "soft target" locations, such as concert halls or museums, which have high foot traffic and more lenient security restrictions than higher security facilities, such as airports or courthouses.

2.1 Applications

Routine security screening at the entrance to airport passenger terminals, government buildings, and other secure locations typically involves a walk-through portal to detect items that may be concealed on a person's body while their possessions are inspected separately using an X-ray scanner. This procedure slows pedestrian traffic flow but can enhance public safety by reducing the likelihood of an attack by various sized threats. While such systems are suitable for secure facilities, they are less practical for other types of vulnerable locations with very high pedestrian traffic flow, such as metropolitan transit centers and entertainment venues.

In recent years, alternative weapons screening systems have become available that would minimize traffic flow impedance by screening individuals while they wear or carry their possessions. These systems are designed to detect large handguns or improvised explosive devices (IEDs) that could cause mass casualties, while not alarming on smaller threats such as pocketknives and innocuous metal objects.

Each venue has unique security screening challenges. Key capabilities to consider are:

- the threat-level deterrence objective compared to the size of items the system is capable of detecting
- its discrimination ability (what objects will be ignored)
- the device's recommended maximum throughput rate.

For example, security officials will need to consider how to balance trade-offs in the size of threats that can be detected amid the types of innocuous items expected to be encountered for a particular application (such as screening commuters vs. concert attendees). Other operational considerations include the potential for interference from the external electromagnetic environment, system transportability, the system's environmental tolerance if operated in outdoor areas, and the number of personnel needed to operate the system.

2.2 Current Technologies

The products included here employ one of two technologies to screen people for weapons: metal detection or imaging. Metal detection systems use the conductive and magnetic properties of metals to discover potential threat objects. Imaging systems reveal concealed objects and may flag them as potential threats based on their optical properties relative to the background (typically a human body). Sections 2.2.1 and 2.2.2 explain how the technologies work; section 2.2.3 discusses key capabilities; and section 2.2.4 covers additional features and product selection considerations that may be relevant for various applications.

2.2.1 Metal Detection

Metal detection devices rely on the interaction of a metal object moving through a magnetic field. When a metal object encounters a changing magnetic field, an electrical current is induced to flow in that object, which then generates its own magnetic field.[2] One type of metal detection device, an active metal detector, generates a magnetic field that can subsequently interact with a moving metal object. Another type of metal detection device is the magnetometer, or passive metal detector, which relies on the presence of the earth's magnetic field.

Active Metal Detectors use electrical circuits to generate radio frequency electromagnetic waves that create a magnetic field between two side panels or columns that establish a portal.[3] An active walk-through metal detector (WTMD) portal may or may not have a cross-piece at the top. The field can be varied continuously or pulsed. The WTMDs use transmitter coils to generate a magnetic field that interacts (via inductive coupling) with metal objects passing through them. Various configurations are possible, for example, the "transmission" circuit generating the magnetic field may be contained in one side of the portal with the detectors in the other side; transmission may be on one side with detectors on both sides; or transmission and detection circuits may be positioned on both sides.

Active WTMDs have complex magnetic field distributions because of the number, size, and overlap of the coils. The layout of the coils creates detection zones in the portal area and also maximizes field uniformity within the portal. The interaction of the metal object with the WTMD-generated field is detected by the WTMD and, if the electrical signal corresponding to this detection is greater than a user-set threshold value, the system will provide an alarm. The magnitude of the detection signal caused by the object is proportional to its mass, geometry, and orientation relative to the WTMD-generated magnetic field, and its electromagnetic properties (i.e., electrical conductivity and magnetic permeability). The shape of the metal object is important because the object may interact with more than one zone of a WTMD. For example, for two metal objects of the same material and same mass, the one with the larger shape (for example, a metal sheet or plate) is expected to cause a larger detection signal than the one with the smaller shape (like a metal sphere). The signal magnitude is also proportional to the object's orientation relative to the field: the induced current will be larger if the magnetic field is perpendicular to the surface of the object. [2] [3]

[2] The current induced to flow in the object is called an "eddy current." Eddy currents can also be induced in non-metallic conductive materials, but they are much weaker.

[3] The frequencies used to generate the magnetic fields in WTMDs are typically in the 100 Hz to 10 MHz range (this corresponds to long wavelengths, on the order of about 100 feet to 1.9 miles). www.nist.gov/mml/materials-measurement-science-division/security-technologies-group/metal-detection.

Active metal detectors can detect both ferromagnetic and non-ferromagnetic metals. Still, the type of metal affects metal object detectability due to its electromagnetic properties. For example, iron, some types of steel,[4] nickel, cobalt, and some of their alloys are conductive metals that are also magnetic. These are called "ferromagnetic" materials and typically produce a stronger signal than non-magnetic metals. While the term "ferrous," meaning "containing iron," is commonly used in descriptions of different types of metals that may be detectable by WTMDs, "ferromagnetic" is more technically accurate. This is because some grades of stainless-steel contain iron but are not magnetic (called "austenitic"),[5] and are typically more difficult to detect than other steels and highly conductive metals. [4] Copper, aluminum, zinc, and brass are examples of "nonferromagnetic" metals, which are electrically conductive but not magnetic and are detectable while the induced current is present. In some systems, the variations in the magnitude of the detection signals from different metals can be leveraged to set the system selectively alarm for some items of interest while not alarming on others.

Passive Metal Detectors (Magnetometers) do not have transmitters or coils to generate a magnetic field but instead use the earth's static magnetic field. These systems that rely on the geomagnetic field typically use sensitive sensor circuits called "gradiometers" to detect distortions in the geomagnetic field as a ferromagnetic object passes by the sensor. Magnetic metals such as iron and ferromagnetic grades of steel may generate detectable signals in passive metal detectors. Non-ferromagnetic metals such as copper, aluminum, zinc and brass with low magnetic permeability are difficult to detect for most passive metal detection systems.

Localization: Many active WTMDs and passive magnetometers use distinct sensors to localize the position of a detected object within the area of a portal (Figure 2-1). The number of detection zones varies among products; the systems in this report that offer zonal detection range from 4 to 66 zones. Typically, the location of a detected object is indicated to the operator by light emitting diodes (LEDs) visible on the vertical side panels of a portal (and in the horizontal cross piece, where applicable). In some systems, zone sensitivities can be set separately, so the system can be tuned to be more or less sensitive to specific areas of the body, for example, to take into account where threat objects may most likely be concealed in a particular screening situation. [1]

Figure 2-1 Illustration of detection zones in WTMDs

Image Credit: SAVER TechNote (2009)

[4] Steel is an alloy of iron and carbon, with other elements used in various combinations to attain properties suitable for different applications. Stainless steel, designed to be corrosion resistant, is available in various grades. Despite containing iron, some grades of stainless steel are non-magnetic due to their molecular structure, for example those designated "304" and "316", and tend to produce a weaker signal in WTMDs.
[5]For more information, see https://en.wikipedia.org/wiki/Austenite.

2.2.2 Imaging-Based Detection

Screening systems that reveal concealed objects by their reflective properties rather than their conductivity can detect both metallic and non-metallic objects. Imaging-based detection systems are known as "millimeter wave" (MMW) devices and may be active or passive, as described below. In most of the active MMW systems currently used to screen airline passengers, the person being screened is required to stop walking and remain stationary for a few seconds after complete divesting of carried objects. For the active MMW products included in this report, however, people being screened do not have to stop; the millimeter waves are directed at them as they enter, pass through, and leave the system. To keep this distinction clear, this report uses "walk-through imaging systems" to describe both active and passive image-based screening systems.

The passive MMW systems included in this report are designed to screen people from greater distances and have lower resolution compared to most active MMW systems. Their area of inspection is dependent on the field of view of the sensor and the standoff distance from the person being screened. The image size and resolution determine the size of objects that can be detected. Most passive MMW detection systems are not expected to reveal objects concealed inside parcels.

Active millimeter wave screening systems direct electromagnetic radiation that can penetrate clothing but not the human body. Typically, they use wavelengths ranging from 2 mm to 100 mm, which correspond to frequencies ranging from 150 GHz to 3 GHz respectively. The system may construct two- or three-dimensional images from the reflected and transmitted waves that show the outline of the body and can reveal objects concealed under clothing. Image analysis software may then be used to process the scanned body image, for example an automated threat recognition (ATR) algorithm could be used to identify anomalies that could be weapons. For privacy protection, a generic body outline is typically displayed to the operator in place of the individual's body shape. Therefore, though the principle of detection is based on finding an anomaly in an image, the operator may never view the MMW image.[6]

Passive millimeter wave screening systems sense a part of the spectrum of thermal radiation that is naturally given off by the human body with wavelengths of about 1.2 mm; this is called "black body radiation." Concealed items on an individual may block this radiation and have a different thermal emissivity or temperature than the human body. This allows the passive MMW system to differentiate between the human and concealed objects. The system may generate an image to show the size, shape, and location of the concealed item for the operator to determine if it is an object of interest or may provide the operator with a color-coded indicator that a threat is detected. The passive MMW systems in this report are operated as stand-off devices—meaning people are screened at various distances from the detector—rather than while walking through an area configured as a portal.

[6] One screening system is described as "non-imaging radar". It is included in the imaging product section of this report because its detection principle is not based on metal detection and is similar to that of imaging systems.

Passive MMW systems differ from thermal imagers that sense the infrared (IR) portion of the electromagnetic spectrum, ranging from 0.001 mm to 0.025 mm. Those wavelengths do not pass through clothing. Instead, a thermal image illustrates differences in surface temperature: a thermal image of a person shows the intensity of the IR energy radiated by their clothing and not by the objects underneath clothing. However, the temperature of the clothing is dependent on the transfer of heat from the human body to the clothing, so if an object impedes that transfer, it may be possible to see temperature anomalies in an IR image that are indicative of a concealed threat. Thermal imaging is not typically used for weapons detection (though some WTMDs also offer optional thermal imagers for health screening).

Figure 2-2 shows the ranges of electromagnetic radiation wavelengths used in image-based and metal-based weapons screening applications to illustrate the distinctions between metal and image-based detection within the wider context of the electromagnetic spectrum used in some other applications.

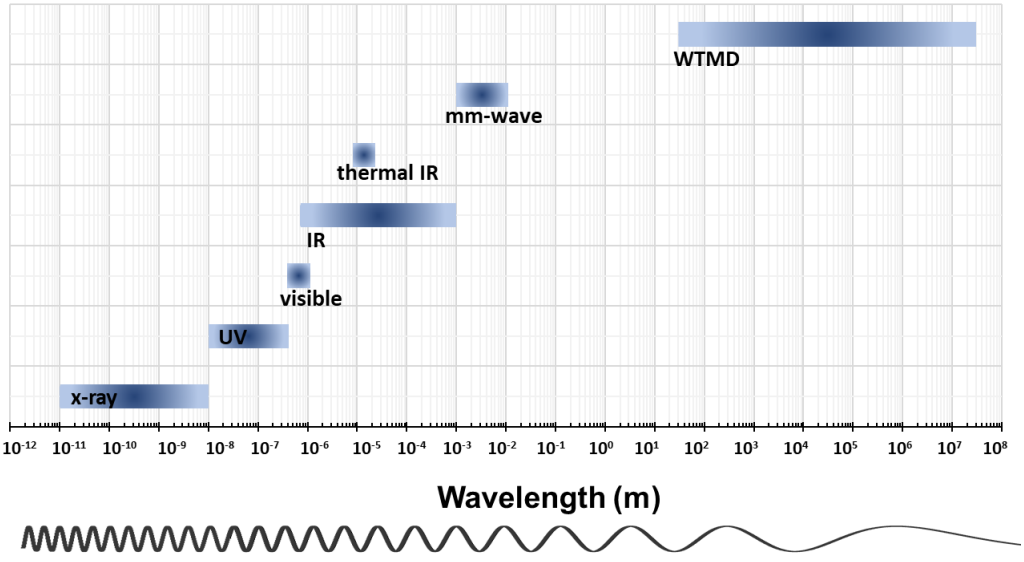

Figure 2-2 Graph of electromagnetic radiation wavelengths on logarithmic scale

Shorter wavelengths are plotted on the left of the horizontal axis and longer wavelengths on the right. The range of wavelengths used in weapons screening systems is spanned by the bar shown at the top, for active WTMDs, and by the bar below that for millimeter wave imaging systems (active and passive). Bars representing other spectral ranges are shown for comparison: IR, visible to the human eye, ultraviolet, and X-ray.

2.2.3 Key Capabilities: Detection, Discrimination, and Screening Throughput

Three key parameters are used to define the capability of walk-through weapons screening systems, and they are interdependent:

1) detection: the probability of detecting a threat object of a specified size
2) discrimination: the ability to discriminate (not alarm for) nonthreat objects

3) maximum recommended throughput: the rate at which the system performs those functions.

These interdependent parameters are defined and discussed in more detail below.

Detection: A system's *detection capability* should be specified for a particular class of potential threat objects, conventionally defined based on their size. For example, a standard threat classification method (described in section 2.6) for active WTMDs uses eight size classes [5]. Weapons screening systems may offer multiple pre-defined sensitivity settings that the user can select from to determine the size of the object that will trigger an alarm. The detection capability is defined as a probability of detection for a specific class of potential threat objects at a specific throughput rate.

For technical clarity in comparing products, the *detection probability* should be specified for a particular class of threat objects, a specified throughput rate, and also a statistical confidence interval. The *confidence interval* provides an indication of how thoroughly the system was tested. Detecting a threat object on a single trial does not mean that a system has a 100% probability of detection for that object; rather, the probability of detection must be determined by taking repeated measurements. The number of required measurements scales with both the detection probability and with the confidence interval. For example, to determine a 95% average probability of detection with a confidence level of 90% would require 32 repeated tests (see Table A1.1 in ASTM F3566-22 [5]). In practice, most product specifications do not include the confidence interval, but this concept is applied in testing for conformance to standards.

Discrimination: Systems that are tuned to detect large or medium sized objects discriminate smaller objects so that they have a lower probability of alarming on small weapons and innocuous metal objects. The capability of weapons screening systems to discern larger threat objects from such other metal objects reduces traffic flow disruptions. The term "false alarm" is the current standard terminology used for alarms on smaller or innocuous items that the system is configured to discriminate.[7] As explained in section 2.6, a *false-alarm probability* of less than 15% is considered acceptable for standard-compliant WTMDs.

Maximum recommended throughput: The highest rate at which people can pass through a weapons screening system involves the walking speed of the person being screened, the response time of the detection components, and how quickly the system resets and is ready to screen the next person. Weapons screening product specifications may quote a maximum recommended throughput rate in terms of the number of people scanned per hour, meaning that this is the rate at which it has a specified *detection probability* for a class of threat objects.

The technical definition of *maximum throughput* used in a WTMD performance standard is the walk-through-rate for which the system would alarm 95 times for 100 people carrying a weapon of the size that the system is configured to detect. [5] For example, as explained in section 2.6.1, an acceptable throughput rate for standard-compliant WTMDs is at least 3,000 people per hour for larger weapons and 1,500 for smaller weapons. (See Section 4.4.3.1 of ASTM F3566 -22 [5].)

[7] Used in the current ASTM standard F3566-22 published in 2022. Pending revisions of the standard may use other terminology to further differentiate false positive-alarms, true positive-alarms, false negative-alarms, and true negative-alarms. Standards are covered in Section 2.6 of this report.

The *actual throughput rate* will depend on user-specific operational factors such as traffic control methods and response procedures. Hence, product specifications that quote throughput as a multiple of the throughput of other systems are imprecise and difficult to interpret. For example, it is not clear if a specification quoted as "2–3 times the throughput of conventional WTMDs" includes delays associated with divestment (i.e., removing clothing, possessions, or bags) that are expected with "conventional" WTMDs. The effects of checkpoint design, operational procedures, number of lanes, divestment requirements, and other such site-specific considerations in which a weapons screening system is installed yield an "effective throughput" for security screening at a particular location or venue that is lower than the maximum rate.

2.2.4 Additional Features and Other Considerations

In addition to detection capabilities, several other features are important to consider in the selection of weapons screening systems. Their significance may vary for different applications and deployment situations. The descriptions provided here are not all inclusive; special-purpose and agency-specific use cases are likely to have unique requirements with additional considerations beyond those discussed here.

Directionality: The operation and function of a weapons screening system may be bi-directional or one-way. Some systems, particularly imaging systems, are designed to accept pedestrian traffic flow in a single direction. Most active WTMDs and magnetometers are bi-directional, but in one of the systems included here (section 3.5), a different security setting can be applied for exit flow versus entrance flow.

Environmental protection: Depending on the venue, weapons screening systems may need to be deployed indoors, outdoors, or in a protected outdoor setting. Environmental protection is usually specified by an ingress protection (IP) category, which comprises two numbers, the first for solid particulate intrusion protection and the second for moisture protection. Operating temperature may also be a consideration.

Integrated photo or video: Some systems include an optical camera to record video or still images of people being screened.

Interference (electromagnetic and vibrational): Ambient electromagnetic fields may affect the performance of a weapons screening system. Metal detectors can be susceptible to changing external electromagnetic fields caused by the movement of nearby large metallic objects such as elevators, trains, or metal doors. Their performance can also be affected by proximity to large, static ferromagnetic materials such as iron support beams. Both metal detectors and imaging systems may be susceptible to mechanical vibrations and external EM frequencies within their operating frequencies. In some cases, interference may be mitigated by system electronics. Since these factors are product- and setting-specific, users should consult with the manufacturer to identify potential sources of interference and recommendations for installation distances.

Law enforcement requirements: Weapons screening systems for deployment in public areas may have additional capability requirements related to documentation for law enforcement applications that are not addressed in this report, such as indication of threat levels, statistical confidence intervals or evidentiary data storage requirements.

Multiple lanes: In settings with wide entrances, the deployment of multiple portals in close proximity may be desired, however, the manufacturer should be consulted for optimal adjacent lane placement or operating frequencies to minimize potential interference.

Object localization: Some systems indicate where a detected object is located on a person, which may facilitate alarm adjudication.

Portal accessibility and medical devices: The American Disability Act minimum width to accommodate wheelchairs and walkers is 32 inches where the portal passageway is up to 24 inches deep. A 36-inch separation is required for deeper passageways.[8] A related consideration is potential public concerns regarding effects of screening on implanted medical devices.

Proportional alarm indication: Some systems may be capable of providing an alarm indication proportional to the size or an aspect of the material composition of an object (such as the type of metal in WTMDs or its reflectivity, emissivity, or size in imaging systems).

Staffing requirements: The number of people needed to operate a system may vary depending on the system design and the location of operator controls. For example, if the alarm indicator is positioned away from the portal, additional personnel may be needed to monitor and direct the people being screened.

Transportability: In some applications, a weapons screening system may be temporarily deployed for a single day or a few hours, such as for special events at public venues or random screenings at transportation hubs. The degree of required transportability will vary by use-case, the layout of the location, and the number of personnel involved. For example, transport up and down stairs, in wheeled carts, or by vehicles may be needed. The ability to operate on battery power may also be a factor in short-term use cases.

2.3 Use of Grant Funds for Certain Telecommunications and Video Surveillance Equipment or Services

The John S. McCain National Defense Authorization Act for Fiscal Year 2019 (NDAA), Pub. L. 115-232, Section 889 (NDAA) prohibits the use of federal funds, including loan and grant[9] funds, to obtain or acquire certain telecommunications technologies manufactured by certain entities or to enter into contracts with entities that use those technologies. The Office of Management and Budget (OMB) published regulations at 2 C.F.R. § 200.216 to clarify the application of the NDAA to the use of federal grant funds to procure or obtain certain telecommunications equipment or services.

Effective August 13, 2020, federal grant recipients and subrecipients (i.e., **non-federal entities**) are prohibited from obligating or expending loan or grant funds to procure or obtain[10] the following "covered telecommunications equipment or services":

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities)

For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by:

- Hytera Communications Corporation

[8] See Guide to the Americans with Disability Act Accessibility Standards Section 403.5.1, available at Chapter 4: Accessible Routes (access-board.gov).
[9] This also includes cooperative agreement funds.
[10] Nor may they extend or renew a contract to procure or obtain, or enter into a contract to procure or obtain the covered equipment or services.

- Hangzhou Hikvision Digital Technology Company
- Dahua Technology Company
- or any subsidiary or affiliate of such entities
- Other entities identified by the Secretary of Defense

The restriction also applies to systems that use the covered equipment or services as a substantial or essential component, and to subsidiaries or affiliates of those listed above[11]. See www.federalregister.gov/d/2020-17468/p-877.

Costs associated with covered equipment and services are "unallowable" for grant funding. Grant recipients are responsible for ensuring funds are used only for allowable costs, and would be obligated to refund the government for unallowable costs. The Federal Emergency Management Agency (FEMA) issued FEMA Policy #405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim) for further guidance on the Section 889 prohibitions. Additionally, OMB issued frequently asked questions (FAQs) on the topic.

For **federal** entities, FEMA published interim rules amending the Federal Acquisition Regulation[12].

2.4 Cybersecurity Considerations

Some weapons screening devices can be linked with other building security systems to allow them to be monitored remotely or to send alert notifications to either a security operations center or an access control system. Also, some systems may require firmware or software updates right out of the box before becoming operational, and/or periodic updates once they are operational. All of these scenarios will require internet and perhaps local area network or virtual private network connectivity.

If internet and network connectivity is needed to operate the system, coordination may be needed with the facility's information technology (IT) department for cybersecurity review and approval. The IT department will need to consider how to best integrate the weapons detection systems' proprietary software, hardware and cloud-based applications used to receive updates and to share and store data. Following the Federal Bureau of Investigation's Criminal Justice Information Services (CJIS) Security Policy [6] and the Cybersecurity & Infrastructure Security Agency's Cloud Security Best Practices [7] to ensure that necessary software, hardware and cloud-based applications are implemented, maintained and backed up in a secure manner is recommended.

[11] As well as telecommunications or video surveillance services provided by entities or using equipment described above.
[12] www.federalregister.gov/documents/2019/12/13/2019-26579/federal-acquisition-regulation-prohibition-on-contracting-for-certain-telecommunications-and-video and www.federalregister.gov/documents/2019/08/13/2019-17201/federal-acquisition-regulation-prohibition-on-contracting-for-certain-telecommunications-and-video.

2.5 Emerging Technologies

A DHS Center of Excellence, the Soft Target Engineering to Neutralize the Threat Reality was established in 2021 to develop adaptable solutions to detect and mitigate targeted violence. Led by Northeastern University working with other academic institutions, research includes the exploration of networked, pole-mounted sensors to detect unusual, concealed metal objects via imaging radar, or items with characteristic chemical signatures such as from gun oils or propellants. [8] Research and development are also underway in the commercial sector for walk-through portal systems that would combine metal and image anomaly detection.[13]

2.6 Standards

The terminology used and the concepts addressed in testing and performance standards provide an accepted framework to characterize system capabilities. Standards developing organizations coordinate formal, consensus-based processes for stakeholders from industry, government agencies, test laboratories, and end-users to determine requirements and laboratory test methods to consistently ensure that products are fit for purpose. While some standards are the basis for formal certification programs, even where there is no formal certification program, manufacturers may cite conformance to particular standards in their product specifications.

Publicly available standards relevant to walk-through metal detection and imaging weapons screening systems are summarized in section 2.6.1 and 2.6.2, respectively.[14] Standards for safety for exposure to electromagnetic fields are summarized in section 2.6.3. For IP of enclosures, see section 2.6.4 and Appendix A. Additional standards not covered here may also be applicable.

2.6.1 Walk-through Metal Detector Standards

The primary standard useful to public safety organizations in defining their requirements for active metal detection weapons screening systems is ASTM F3566-22.[15] It was published by the standards organization ASTM International in 2022[16] and is to be the basis for a new WTMD verification program. The standard does not address passive metal detection systems. ASTM is also launching a conformity assessment program based on this standard, described in ASTM F3356-19a. At the time of this report's publication, no U.S. standards for passive WTMD screening systems were found. Other standards previously published by the U.S. National Institute of Justice (NIJ) are superseded by the ASTM F3566. Since they are still cited by some manufacturers, however, the older NIJ standards are also briefly summarized below.

[13] For example, Xonar's multi-sensor security system is described as AI-empowered, using machine learning to distinguish between weapons and everyday objects regardless of metal content. See xonar.com.
[14] Some federal agency components (such as the Transportation Security Agency and the Federal Protective Service) have their own performance standards and testing programs to meet agency-specific requirements which are not publicly available.
[15] Another ASTM publication, "Standard Guide for Installation of Walk-Through Metal Detectors C1238 – 97," is currently being updated.
[16] Formerly known as the American Society for Testing and Materials, ASTM publishes voluntary consensus technical standards for many types of products.

ASTM F3566- 22 *Standard Performance Specifications and Test Methods for Walk-Through Metal Detectors* [5]: This standard describes baseline technical performance requirements for systems used to find metal contraband concealed on people. It includes tests for the probability of detection for eight object size classes representing different threat levels. The tests use "exemplar" test objects that replicate metal weapons. They also use exemplar innocuous objects for a cell phone, belt buckle, and watch to test the discrimination performance for systems capable of detecting in the four larger object size classifications. ASTM F3566-22 provides precise specifications for the shapes, dimensions, and materials used in construction of the exemplar test objects. Most of the size classes include both ferromagnetic and nonferromagnetic metals.[17] A summary of some of the parameters of the test objects are shown in Table 2-1.

WTMD systems may meet requirements for one or more object size classes. The baseline acceptable performance requirements for the two larger threat size classes are the levels most relevant for this report, as summarized Table 2-2 (where some smaller threat sizes are also shown for context). The ASTM F3566-22 test methods include descriptions of nine test measurement locations within the portal,[18] various test object orientations, and speeds.

Table 2-1 Threat Object Size Classification and Exemplar Test Objects from ASTM F3566-22

Size	Threats represented	Test object Ferromagnetic	Test object Non-ferromagnetic	Deterrence objective	Potential applications
1*	very large steel handguns, metal parts of IED (body-worn or bag-carried)	steel right-angle and two aluminum cylinders ~ 6" x 4" x 1" 8" long 3" diam		mass casualties at a distance	school, sports venue
2*	large handgun	steel right-angle ~ 5" x 3 x 1"	zinc right-angle ~ 5" x 3" x 1"	limited casualties at a distance	school, sports venue
3*	small handgun	steel right-angle ~ 3" x 2" x 1"	zinc right-angle ~ 3" x 2" x 1"	limited casualties at a distance	school, sports venue, transportation facility
4*	long knife blade 3"- 5", disassembled handgun	steel rectangular prisms ~ 5" x 1" (knife) ~ 3" X 1"	zinc rectangular prism ~ 3½" X 1"	limited casualties close proximity	school, transportation facility courthouse, jail
5	knife blade 3", disassembled handgun	steel ~ 3" x ¾"	zinc block ~ 2¼" x 1"	limited casualties close proximity	school, transportation facility, courthouse, jail

* Discrimination performance is tested for systems designed for size classifications 1, 2, 3, and 4. For Size-1, three exemplars representing a cell phone, belt buckle, and watch are used in discrimination testing. For Size-2, Size-3, and Size-4, only the belt buckle and watch exemplars are used.

[17] Ferromagnetic test objects are de-magnetized prior to use.
[18] These are based on "the size of the average male person," with locations corresponding to the left and right feet, hips and shoulders, and the groin, chest, and top of head.

Table 2-2 ASTM F3566–22 WTMD Baseline Acceptable Performance Requirements

Object Type	Detection Probability	Throughput (People per h)	Test Object Speed (meters/s)
Threat Size 1 and Size 2 (Large guns)	≥ 95%	≥ 3,000	1.0 ± 0.1
Threat Size 3 and Size 4 (Smaller gun, large knife)	≥ 95%	≥ 1,500	0.5 ± 0.1
Innocuous Item	≤ 15%	not specified	0.5 ± 0.1

This standard also includes tests for interference from external metal objects in the environment, using a metal panel to simulate proximity of a metal floor, wall, and a moving metal door, all of which could interfere with operation. It addresses safety, electromagnetic compatibility, environmental operating ranges, and mechanical durability. The complete standard is available at the ASTM website (www.astm.org/f3566-22.html).

ASTM F3356-19a Standard Practice for Conformity Assessment of Metal Detectors Used in Safety and Security. [9] This standard describes a new conformity assessment program for active walk-through metal detectors. Manufacturers will be able to submit their systems for evaluation by an independent, third-party organization. Those systems that meet the standard requirements will be included in an online listing of verified products,[19] will be authorized to use the ASTM Verification Mark, and will undergo annual testing to assess continued compliance. This conformity assessment can assist the end user in their selection process by reducing uncertainties associated with unverified vendor claims of equipment performance and incomplete or confusing information in product specifications. [10] newsroom.astm.org/newsroom-articles/astm-launches-conformity-assessment-program-security-screening-technologies-used.

NIJ Standard 0601.02 *Walk-Through Metal Detectors for Use in Concealed Weapon and Contraband Detection* [11]**:** The NIJ published this standard in 2003; while superseded by the ASTM F3566, some manufacturers continue to reference it.[20] NIJ 0601.02 defines three size classes for test objects and notes that some detectors may be designed to detect multiple size classes with appropriate sensitivity settings. Large test objects represent handguns; medium objects represent knife blades more than 3 inches long; and small objects represent hard-to-find items that could be used to cause injury or defeat security measures such as handcuff keys or a screwdriver bit. The standard also defines innocuous test objects for testing discrimination performance of the large object size and medium object size classes of WTMDs. The detection and discrimination performance requirements for the two largest classes of test objects are shown in Table 2-3.

[19] See www.seinet.org. At the time of this report, no WTMD systems were listed there.
[20] Although the NIJ web page indicates a revision of this standard is underway (https://nij.ojp.gov/active-nij-standards-and-comparative-test-methods), that is not the case. The ASTM F3566 supersedes the NIJ 0601.02. While some manufacturers continue to cite conformance with NIJ 0601.02, applying it to the evaluation of the performance of a WTMD is not recommended. [2]

Table 2-3 NIJ 0601.02 WTMD Performance Requirements

Object Type	Detection Probability	Throughput (people per hour)	Test Object Speed (meters/s)
Large (Gun) - Ferromagnetic steel - Aluminum - Zinc	100%	not specified	1.0 ± 0.05*
Medium (Knife) - Ferromagnetic steel - Aluminum	100%	not specified	1.0 ± 0.05*
Innocuous (Coins, belt buckle, eyeglasses)	≤ 20%	not specified	1.0 ± 0.1
* Requirement for 50 repeated trials; other speeds tested are: 0.2, 0.5, and 2.0 ± 0.05 m/s			

National Institute of Law Enforcement and Criminal Justice (NILECJ) -STD-0601.00 *Standard for Walk-Through Metal Detectors for Use in Weapons Detection* [12]**:** Published in 1974, this standard is still cited by some WTMD manufacturers. It describes five security levels, where levels 1 and 2 are for building surveillance applications and allow for people being screened to carry metallic items in their pockets (level 2) or pockets and hands (level 1) with a low false alarm rate. Applying this standard, which was superseded by NIJ 0601.02, which was then later superseded by ASTM 3566, to the evaluation of a WTMD may lead to inaccurate and incorrect conclusions and is not recommended. [4]

2.6.2 Millimeter Wave Standards

WTMD standards are not applicable for imaging systems. A standard for active MMW security screening systems is under development by an Institute of Electrical and Electronics Engineers (IEEE) working group (under the Accredited American Standards Committee on Radiation Instrumentation, N42) as described below. At the time of this report's publication, no U.S. standards for passive MMW security screening systems were found.

IEEE PN42.59 *Draft Standard for Measuring the Imaging Performance of Active Millimeter-Wave Systems for Security Screening of Humans* [13]: This standard will describe tools and methodologies for characterizing the images generated by active MMW systems. The scope is expected to address systems that use radiation from 3 GHz to 150 GHz (100 mm to 2 mm wavelength, respectively). It will focus on assessing the quality of images to be processed by an ATR algorithm. It will not specify minimum or baseline performance requirements and is unrelated to performance of any ATR algorithms. The standard is anticipated to be published in 2024.

2.6.3 Safety and Electromagnetic Compatibility

Screening systems may cite compliance with other standards for human safety. Often those standards are related to exposure to RF and electromagnetic energy and/or standards regarding electromagnetic compatibility.[21]

[21] Electromagnetic compatibility is the ability of electrical equipment to operate properly without causing interference to itself or other systems and without being susceptible to external interference.

U.S. and European standards cited by some products in this market survey report (MSR) include:

- **CE Marking** (indicates compliance with European Union (EU) health, safety and environmental protection standards)
- **EN 55035:** *Electromagnetic compatibility of multimedia equipment – Immunity requirements*
- **IEEE C95.1-2019**, *IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 to 300 GHz*.
- **International Commission on Non-Ionizing Radiation Protection (ICNIRP)** "Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz-10kHz)"
- **IEC 61010-1**:2010+A1:2016: *Safety Requirements for electrical equipment for measurement, control, and laboratory use – Part 1: general requirements* (also labeled EN, UL (Underwriters Laboratory), Canadian Standards Association (CSA))
- **IEC 61326-1**: *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements* (also labeled EN)
- **IEC 62368-1**: *Audio/video, information and communication technology equipment – Part 1: Safety requirements* (also labeled UL, EN and CSA)
- **International Standards Organization (ISO) 14117:** *Active implantable medical devices (Electromagnetic compatibility [EMC])* (also labeled ICNIRP)
- **EU Directive 2002/95/EC,** commonly referred to as the "Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) Directive"
- **Title 47 Code of Federal Regulations Part 15 (47 CFR 15):** Federal Communications Commission (FCC) Rules and Regulations for Radio Frequency Devices.

Additional standards not listed here may also be applicable.

2.6.4 Environmental Enclosures

American National Standards Institute (ANSI)/International Electrotechnical Commission (IEC) IEC 60529-2020, *Degrees of Protection Provided by Enclosures* also known as the IP Code [14]: This standard defines specifications for international IP ratings. Ratings are given as the initials "IP" followed by two numbers, the first a code for the degree of protection from solids and the second from the degree of protection against water provided by a technology's enclosure. IP ratings for the systems in this market survey will be listed in sections 3 and 4. Most of the products in this report that specify an IP rating have a first digit of either 5 (dust protected) or 6 (dustproof). For the second digit, they have one of the following three ratings: 5 (protected from low pressure water jets from any direction), 6 (protected from high pressure water jets), or 7 (protected from temporary immersion in water). One product has an IP rating of 20, which means it is protected from ingress of fingers or similar objects and is not protected from water.

An explanation of IP ratings and how to read them is available from the IEC at www.iec.ch/ip-ratings. A similar guide is included as this report's appendix.

2.6.5 Other Standards

Other standards cited by some manufacturers included in this report are the following:

- **DHS Support Anti-Terrorism by Fostering Effective Technologies Act,** which encourages development of effective anti-terrorism products and services by providing legal liability protection for providers of Qualified Anti-Terrorism Technologies.
- **Americans With Disabilities Act (ADA),** which requires doorways to have a minimum width of 32 inches.
- **European Telecommunications Standards Institute (ETS) 300-019-2-2:** *Environmental Engineering; Environmental conditions and environmental tests for telecommunications equipment; Part 2-2: Specification of environmental tests; Transportation* (also labeled EN). This standard details requirements for safe transportation of electrical equipment.

3.0 PRODUCT INFORMATION: METAL DETECTION SYSTEMS

This section provides information on 10 weapons screening systems that use metal detection. (Section 4.0 provides information on walk-through screening systems based on imaging principles.) Products are listed alphabetically by manufacturer. The information is based on manufacturer and vendor descriptions of their products in response to a SAVER RFI, except for one product marked with an asterisk where information is from their website only. Product capabilities have not been independently verified by the SAVER program.

Below are definitions of the product information in Table 3-1, listed in column order.

MSRP: Manufacturer's suggested retail price rounded to the nearest U.S. dollar with all necessary components, including user interface and software. "NP" means the price was not provided by the vendor.

Magnetic Field: Indicates whether the system is active ("A"), relying on a magnetic field generated by the product, or passive ("P"), using Earth's magnetic field. For active systems, the operating frequency of the electromagnetic field is shown, if provided by the manufacturer.

Ferromagnetic: Indicates whether system is designed to detect metals that are magnetic, such as iron, nickel, cobalt, and some classes of steel. "Y" is used for "yes."

Non-Ferromagnetic: Indicates whether the system is designed to detect metals that are not ferromagnetic, such as copper, aluminum, zinc, and brass; "Y" means it does, while "N" indicates it does not detect such metals.

Security Settings: Refers to the number of distinct pre-set sensitivity levels available for user to select. Some systems offer additional sensitivity options beyond the number listed in the table; these may underly the programmed settings and allow for fine-tuning (see product descriptions). Where two numbers are shown for a product, they correspond to alternate models. The letter "C," for "custom," means the security settings are not user-selectable but set by the vendor at installation to meet user requirements.

Localization Zones: Refers to the number of detection zones along the left side, right side, and, where applicable, the center portion of the portal screening area. A single number means the system indicates the detected object's location in one (vertical) dimension. The word "image" means the object location is indicated on an optical image of the person that is displayed to the operator and "none" indicates the product does not provide an indication of detected object location.

Throughput rate: Refers to the approximate maximum number of people that can be scanned per hour. Where two values are given, they correspond to alternate models of the product. (See individual product description in next section for details.)

Internet Required: Refers to whether the system must be connected to the internet during screening operations; "Y" means it is, while "N" means internet connection is not required for operation.

Optical Image: Refers to whether the system has the capability to provide an image of the person being screened when there is a detection alert; "Y" means it provides an image, "(Y)" means it is an optional capability with an external USB connected video camera, and "N" means the system does not use optical imaging. "NP" means information on this feature was not provided by manufacturer.

Top Crossbar: Indicates whether an overhead horizontal cross-piece connects the side panels; "Y" means one does, while "N" means the system does not have an overhead cross-piece.

Passage width: Refers to distance between the portal side panels, in inches (rounded down to the nearest whole inch); a range or "≤" symbol is shown where the passage width can be adjusted, and a second value (following the word "or") indicates that an alternate model is offered at that width.

Dimensions: Indicates the size in height, depth, and width (H x D x W) in inches of the entire portal when there is a top crossbar, or an individual side panel for systems with no top crossbar. Where dimensions of the two sides are not identical, a second set of dimensions is listed. For products wider at the bottom, dimensions are also shown for the base. Where cylindrically shaped columns are used, height and diameter (abbreviated "diam") are given, rounded to the nearest inch.

Weight: Rounded to the nearest pound, including batteries. Where one value is listed, it is for the complete portal unit including both sides, base, and top panel, where applicable. Where two numbers are listed, it is the weight of each free-standing side column; a range is shown where various models or configurations are offered (see product descriptions).

AC Power: Refers whether the system device can be powered by a wall outlet; the letter "Y" indicates it can. When one is listed, the number gives the length of the included alternating current (AC) power cord in feet (‘). "PoE" means the system gets power over ethernet cable.

Battery Type: Refers to the kind of rechargeable battery the system uses; "none" means the vendor does not offer a specific option for battery power. (Optional user-provided external power supplies are not included in table.)

Run time and Charge time: Refer to approximate number of hours the system will operate on battery power, followed by the approximate number of hours required to fully (re)charge the battery. "NA" means that the system does not come with batteries. "NP" means information was not provided by the vendor.

IP and Operating Temperature: Refers to the IP rating, a measure of the system's imperviousness to dust and to water where IP56 means protected from dust and high-pressure water jets; IP65 means dustproof and protected from low-pressure water jets; IP66 means dustproof and protected from high-pressure water jets; and IP67 means dustproof and protected from temporary immersion in water. The IP rating is followed by the system's operating temperature range in degrees Fahrenheit. (Storage, battery use and charging conditions may have different temperature ranges, as specified in some product descriptions.)

Table 3-1 WTMD Product Comparison Matrix

Manufacturer and Product	MSRP	Magnetic Field (frequency)	Ferromagnetic	Non-Ferromagnetic	Security Settings	Localization Zones	Throughput (people/h)	Internet Required	Optical Image	Top Crossbar	Passage Width (inches)	Dimensions H x D x W (inches)	Weight (lb)	AC Power	Battery Type	Run Time Charge Time	IP Rating Operating Temperature
Berkeley Varitronics Systems, SafeHound	$15,000	P	Y	N	8	6, 6	1,800	N	N	N	32–48	70 x 13 x 7	17 17	Y 10’	gel cell	24h 3h	IP67* –40–158°F
CEIA, OPENGATE	NP	A	Y	Y	7	none	NP	N	N	N	27–39	72 x 6 diam 12 X 20 base	34 30	Y 6.8’	Li-ion M18	14h 2h	IP65 0–122°F
CEIA, PMD2 Plus/EZHD	NP	A	Y	Y	50	20, 20, 20	NP	N	N	Y	28–32	89 x 13 x 16	100	Y 10’	NP	14h 7h	IP66 –4–149°F
Evolv Technology, Express	NP	A 3-30 Hz	Y	Y	6 7	image	1,800 2,000	N†	Y	N	29 or 37 32 or 40	75 x 23 x 17 75 x 40 x 17	268–334	Y 13’	none	NA	IP56 –4–131°F
Garrett, Paragon	$8,995	A 3-30 kHz	Y	Y	23	22, 22,22	1,800	N	N	Y	30 or 32	87x 23 x 35	152	Y 10’	Li-ion	10–12h 6–8h	IP65 –4–131°F
Metrasens, Ultra	$18,995	P	Y	N	10	5	3,600	N	N	N	≤ 30	72 x 5 x 4	46	PoE	Li-ion	16h 3h	IP65 5–120°F
Passive Security Scan, Inc., Passive Portal	$5,000	P	Y	N	C	4, 4‡	1,200	N	(Y)	Y	30	84 x 2 x 38 30 base	29	Y 6’	12V Li-ion	12h 5h	NP 32–158°F
Rapiscan Systems, Orion Metor 900M	NP	A	Y	Y	200	20, 20, 20	3,000	NP	NP	Y	30	88 x 26 x 34	131	Y	12 V DC	10h NP	IP65 –4–140°F
SoundThinking, Inc., Safepointe	NP	P	Y	Y	C	none	7,200	Y	Y	N	84–144	38 x 16 diam	NP	PoE	none	NA	IP67 –40–122°F
Xtract One, SmartGateway	NP	P	Y	N	10	58§	2,400	N	Y	N	36–48#	54 x 10 x 10	40	Y	none	NA	IP65 14–122°F

Notes:
“NP” means the manufacturer or vendor did not provide information on this feature or attribute.
“none” means the product does not have this feature.
* IP67 rated components are used in SafeHound.
† Internet connection is not required for screening but is the preferred mode of operation for Evolv Express.
‡ Passive Portal also displays waveform data that can be used for front-rear localization.
§ Manufacturer estimate, noting that SmartGateway determines location algorithmically anywhere on the body.
# Manufacturer recommends that the SmartGateway be deployed at 36” width for optimal operation.

3.1 Berkeley Varitronics Systems, SafeHound

The SafeHound ferromagnetic weapons detection portal is designed to detect hidden guns and knives without false triggering on more common items such as belt buckles, jewelry, keys, and medical implants. Individuals can walk through the portal with bags, purses, and backpacks. This allows foot traffic to flow through the inspection portal for large sporting events, concerts, schools, courtrooms and any safe public or private gathering space. If there is a suspicious detection a secondary screening operation by security personnel is recommended to confirm a hidden weapon.

Figure 3-1 SafeHound portal and sensor zones

Image Credit: Berkeley Varitronics System

Figure 3-2 SafeHound lockable settings

Image Credit: Berkeley Varitronics System

The SafeHound is deployable as a single column or a wirelessly tethered two-column portal, freestanding or wall mounted. Both pole-like columns are independent but invisibly tethered with motion detection and background noise monitoring to ensure that scanning only occurs while people pass through the portal. Each sensor zone indicates the approximate ferromagnetic detection location to facilitate further manual searches.

It is designed for plug and play operations: setup including calibration is possible in 30 seconds, and no software or assembly is required. The system does not need to be connected to a computer for operation, nor is an internet connection required for screening operations. An option feature makes system settings physically lockable by key.

Column Dimension: 70” (H) x 13” (D) x 7” (W).

Passage Width: 32–48”, bi-directional traffic.

Column Weight: 17 lb. per column, 34 lb. for two-column portal system configuration.

3.1.1 Screening Capabilities and Features

Detection principle: Passive magnetic detection.

Threat objects detected: Ferromagnetic metals.

Innocuous objects discriminated: Depending on the sensitivity level setting, belt buckles, jewelry, keys, aluminum beverage bottles, medical implants, personal electronic devices, and cellphones. Non-ferromagnetic metals such as brass, bronze, copper will not be detected.

Security settings*:* Eight pre-programmed sensitivity levels represented by blue LEDs at bottom of sensor pole. Settings can be adjusted and locked according to intended use. Level 1 is the least sensitive (recommended for ferromagnetic-noisy environments), level 8 is most sensitive (recommended for environments requiring more thorough screening). Levels 3–5 are recommended for initial setups in new environments.

Maximum throughput: 1,800 people per hour.

Body coverage: Operational height up to 75" (6'3") for head-to-toe detection.

Other sensors: IR sensor for motion detection to ensure scanning only occurs as people pass through the portal.

Alert and indicators: Visible alerts correspond to the detection zone on portal columns with 360-degree visibility around the column. The brightness intensity of the LED during an alert depends on both the distance and the quantity of ferromagnetic material detected, which are influenced by the selected sensitivity in the settings. An LED that alerts at its maximum brightness has detected the strongest level of ferromagnetic material in close proximity. Audible and covert alerts are also available.

Object localization: Capable of localizing object detections. Six vertical detection zones for each sensor pole, which roughly correspond to head, shoulders/chest, waist, thighs, knees and feet. (12 zones total for two-pole setup indicating left-right.)

3.1.2 Deployment and Set-up Features

Environment: Suitable for indoor and protected outdoor environments. IP67-rated components (fully sealed against particulates and water resistant).

Operating temperature: −40–158 °F.

Power: Sealed gel-cell internal rechargeable battery with a run time of 24 h and a recharge time of 3 h, external AC power with 10' cord. Not compatible with third party power systems.

Interference mitigation: Includes background noise monitoring mode to find best placement.

Interface: Located on side pole of portal. Once settings are adjusted as desired, the user can lock them with a key to preventing tampering or shutting off the unit.

Self-diagnostics: Built-in automatic calibration and ferromagnetic interference detection.

3.1.3 Other Information

Calibration: Unit self-calibrates but also allows for manual calibration.

Optional accessories: Ferromagnetic weapons training kit available. Can be configured to trigger WallHound-Pro Cell Phone Detector & Deterrent system.

Interoperability: Alerts can be configured to trigger other security equipment such as cameras, digital video recorders, video surveillance and other intrusion detection systems.

Training/Support: Product training available upon request for additional fee (based on number of hours and/or class size).

Standards conformance and other performance testing: None provided.

Price: $15,000, includes two sensor poles for complete portal system and two transport cases. Ferromagnetic weapons training kit available for $799.

Warranty: One-year warranty included with MSRP, $1,620 for 1-year extended warranty.

Product website: www.bvsystems.com/product/safehound-ferrous-detection-security-portal-for-weapons-and-contraband.

3.2 CEIA USA Ltd, OPENGATE

The OPENGATE is a security device designed for the automatic screening of people in transit—including their bags, backpacks, and purses—for the detection of mass casualty shooting weapons and metal threats, such as high caliber assault weapons and IEDs. It is a fully open, active walk-through detection system, composed of two freestanding, self-powered pillars, each equipped with a support base and electronic analysis system. OPENGATE is applicable for long-term and short-term installation, or temporary use in places open to the public and characterized by the need to screen large crowds, such as stadiums, arenas, hospitals, museums, convention centers, transportation hubs, ballparks, theme parks, and theaters.

Figure 3-4 CEIA OPENGATE

Image Credit: CEIA USA Ltd

Figure 3-3 OPENGATE 360° alarm indication

Image Credit: CEIA USA Ltd

OPENGATE does not require any mechanical or electrical connection between the two pillars that define the passageway. Proprietary arch-free structure and embedded electronics eliminate the need for a crossbar. OPENGATE is applicable for long-term and short-term installation, or temporary use in places open to the public characterized by the need to screen large crowds, such as stadiums, arenas, hospitals, museums, convention centers, transportation hubs, ballparks, theme parks, and theaters. The system is activated by a single on/off switch, requires less than 1 minute to be operational and does not require adjustments nor assembly of mechanical and electrical parts. All computational analysis is performed locally in the device. No cloud-based, internet or external connections are required for screening operations. Cloud-based data storage is optional via NetID Anywhere.

Column Dimensions: 72” (H) x 5.5” (diameter); dimensions of column base footprint are 12” x 19.7”

Passage width: 27–39”, bi-directional traffic flow.

Column Weight: Main column weighs 33.5 lb. with batteries, 26.5 lb. without batteries; secondary column weighs 30 lb. with batteries, 23 lb. without batteries.

3.2.1 Screening Capabilities and Features

Detection principle: Active continuous wave metal detection. Algorithmic analysis of electromagnetic signal.

Threat objects detected: Multi-caliber weapons of ferromagnetic and non-ferromagnetic metals, high caliber assault weapons and IEDs.

Innocuous objects discriminated: Metal beverage bottles, cell phones and protective sunglass cases.

Security settings: Seven pre-programmed sensitivity levels designed for different applications. Each setting can be adjusted according to specific needs and/or agency-specific standards.

Maximum throughput: 10,000 people per hour. (Manufacturer noted that detector can reset every 0.3 seconds with ideal maximum throughput over 10,000 people per hour, but actual throughput depends on a variety of factors that are not related to the detector itself.)

Body coverage: Operational height up to 71" (5' 11") for detection at feet, ankles, head; possible to detect above 71", depending on the size of the intended target.

Alerts and indicators: Visible and audible alerts at top of column on portal, also displayed on remote interface. Color-coded indicators: green indicates no detection; red indicates detection or self-diagnosis; blue indicates wireless connection in progress; yellow indicates low battery.

Object localization: None.

3.2.2 Deployment and Set-up Features

Environment: Suitable for indoor and unprotected outdoor environments. Specialty top cap allows for alarm visibility even in direct sunlight. IP 65. Operates in relative humidity from 0–95%, non-condensing and at altitudes up to 9,800 ft (3,000 m).

Operating temperature: 0–122 °F. (40–105 °F for battery charging; −34–122 °F for storage).

Power: Runs on four 18V–12Ah lithium-ion batteries for up to 14 hours. Dual-bay simultaneous battery charger has a charging time for two batteries of 130 minutes. Power supply weight is 3.5 lb. Also compatible with standard wall outlet (110v) via a socket on each column and comes with a 6.8-foot AC power cord. 40 VA typical consumption. Also compatible with Milwaukee M18 battery pack.

Interference mitigation: Proprietary techniques reduce its susceptibility to interference.

Interface: Detection and signaling parameters can be set via the OPENGATE app designed for smartphones or tablets, on both Android and iOS operating systems, and the app connects to portal wirelessly.

Diagnostics: System has internal diagnostics to verify correct operation; includes several self-diagnostic checks. If there is a fault, the detector produces clear alerts.

3.2.3 Other Information

Calibration: Not required. The detector is stable in time and temperature because of its digital technology.

Optional accessories: Hard rubber stabilizing base plates or sandbag option available. External power adapter for dual portable battery power and AC power as well as dual battery charger and 18V battery options. Transport kit for OPENGATE, which includes hard covers for pillars and backpack for batteries. One-year license for NetID Anywhere cloud data storage, a centralized CEIA-provided cloud system. Standard test piece for NILECJ-STD-601.00.

Interoperability: Compatible with third party video management systems (VMSs). Optional remote relay for third party systems is equipped with analog inputs via an accessory. Optional application programming interface (API) (via Bluetooth low energy integration) to download traffic and alarm data via proprietary CEIA cloud NetID Anywhere.

Traffic data collected: Integrated high-precision transit counter for ingress transits. Optional centralized network system to collect and analyze flow data and detection volume.

Training/Support: Customer site and/or factory training available. 24/7 technical support by phone.

Standards conformance and other performance testing:

- NIJ 0601.02 (2003)
- ASTM F3566 (2022)
- IEEE C95.1-2019
- 47 CFR 15 (Restricted Bands)
- Safety Act designated.

Additional safety certifications are available from the manufacturer.

Price: Not provided.

Warranty: Two-year warranty covers depot parts and bench labor.

Product website: www.ceia.net/security/product.aspx?a=OPENGATE.

3.3 CEIA USA Ltd, PMD2 Plus/EZHD

The PMD2 Plus/EZHD is a multizone heavy duty metal detector system that is designed for use in government buildings, public events, amusement parks, courts, cruise ships, data processing centers, hotels, and schools. The PMD2 Plus/EZHD detects firearms and knives and indicates the position of the threat, its intensity, and its prevalent composition. It's discrimination technology allows personal effects to be ignored, allowing people to be screened without divesting. It has a low nuisance alarm rate at sensitive security settings, allowing high transit flow rates and the minimum need for intervention by inspection personnel. (The resulting nuisance alarm rate is tied to the chosen security level of the detector (i.e., what the user wants to detect).)

Figure 3-6 CEIA PMD2 Plus/EZHD

Image Credit: CEIA USA Ltd

Figure 3-5 PMD2 Plus/EZHD assembly features

Image Credit: CEIA USA Ltd

The PMD2 Plus/EZHD has elliptically shaped side panels with a heavy-duty, impact resistant configuration and automatic vibration compensation that is suitable for applications where equipment is subject to frequent relocations. It is assembled without tools and with an installation time of 10 minutes. The system uses a one-touch guided automatic function that assists with step-by-step installation procedures. It performs automatic synchronization between two or more detection systems with a distance down to two inches without the use of external cables. Cloud based or internet connections are not required for screening operations, but cloud data storage with NetID Anywhere™ is recommended.

Column Dimensions: 88.8” (H) x 13.4” (D) x 15.8” (W). An alternate model with reduced height of 81.4” is available for low-celling applications.

Passage width: 28.3–32.3”, bi-directional traffic flow.

Portal Weight: 100 lb.

3.3.1 Screening Capabilities and Features

Detection principle: Active continuous wave metal detection. Algorithmic analysis of electromagnetic signal.

Threat objects detected: Ferromagnetic metals and non-ferromagnetic metals; firearms and knives.

Innocuous objects discriminated: Belts, coins, key, jewelry, watches, and wallets.

Security settings: Up to 50 built-in pre-programmed sensitivity settings, including up to 30 international standards and up to 20 customizable sensitivity levels. Users can choose directly from known international standards or request implementation of a standard personalized to their own requirements. Users can also create their own program and save it in an internal memory for later use. The product is equipped with a randomized alarm capability that allows the user to select a percentage of people who did not have metal over the alarm threshold to be selected for secondary screening.

Body coverage: From shoe level to height of 80” (6’ 8”).

Alerts and indicators: Four display bars are each programable as zone indicators and/or pacing lights. Control unit and zone indication is visible the side columns. Zone indication can be seen on both inbound and outbound sides (360 degrees). Green and red signals are proportional to the mass of the detected object and visible from 19.7 ft under lighting of 4000 lux. Prevalent composition can be displayed on the control unit. If the "metal type indication" setting is enabled, the control unit will indicate if the mass that caused the alarm was mostly ferrous or mostly non-ferrous. Color indication is used for specific shoe alarm.

Acoustic alarm signaling system with 10 selectable alarm volume levels ranging from 0 to 90 dbA at 3.3 ft. with 10 continuous and pulsed tones and 34 special sounds.

Object localization: 60 zones, consisting of 20 vertical and 3 lateral, with left, center, and right indication. (While the sensitivity of the zones can be differentially adjusted, doing so is not recommended by the manufacturer for security reasons.)

3.3.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP66 enclosure. Relative humidity 0 to 95%, non-condensing.

Operating temperature: −4–149 °F with −34–158 °F option available upon request. (−34–158 °F storage temperature.)

Power: AC to DC power with supplied 10 ft power cord, 40 VA typical consumption. Optional separate external compact power supply (IP65) with 14h operation, 7h charging time, weight 30 lb.

Interference mitigation: Automatic environmental noise compensation.

Interface: A chip card system allows for secure parameter changes such as alarm volume and tone, counter reading and setting the security level without having to program the device. An option for programming the control unit uses an alphanumeric display and keyboard. Both chip card and programming access are protected by user and super-user passwords.

Diagnostics: Continuous self-diagnostics monitor performance reliability with built-in operational functional verification.

3.3.3 Other Information

Calibration: No periodic re-calibration nor preventative maintenance required.

Optional accessories: Ethernet interface; IR remote control; transport case (92"x16.5"x30" and 132 lb.); canvas bag for transport and assembly; stabilizing plates; reference test samples; separate power supply; and ceiling power adapter available.

Traffic data collected: Uses a two-beam transit counter for in-bound and out-bound transits, with alarm rate calculation. Includes automatic compensation for repeated transits of the same person. For example, if a reverse transit is made 30 seconds after a forward transit, the first transit is subtracted from the overall count, so that when a person walks through a second time they are only counted as one person.

Training/Support: Operational and technical training support offered by certified personnel either at a CEIA facility or customer location in addition to 24/7 phone support.

Standards conformance and other performance testing:

- NIJ 0601.02 (2003) (Large object class)
- ASTM F3566 (2022) (Applicable portions)
- IEEE C95.1-2019
- 47 CFR 15 (Restricted Bands)

Additional safety certifications are available from the manufacturer.

Price: Not provided.

Warranty: Two-year parts and labor warranty included with purchase.

Product website: www.ceia.net/security/product.aspx?a=PMD2+Plus%2fEZHD.

3.4 Evolv Technology, Express

Figure 3-8 Evolv Express dual lane indoor configuration

Image Credit: Evolv Technology

Figure 3-7 Evolv Express image-aided alarm

Image Credit: Evolv Technology

Evolv Technology's Express is designed to screen guests while they walk through at a natural pace and without their having to stop and hand over their belongings. It uses artificial intelligence to alert operators to the potential presence of weapons while ignoring most harmless personal items. When a potential threat is detected, real-time image-aided alarms show guards where it is located on a person or in his or her bag. The Express is available in single lane or dual lane configurations.

The Express dual-lane system consists of a center transmitting tower, two outer receiving towers, two pedestal-mounted user interface tablets and two desktop stands for them. Three cables connect each outside tower to the base of central tower while the tablet pedestals connect wirelessly. The cables connecting the towers are enclosed within dual floor mats to enable fixed distance positioning of the side towers for consistent detection performance. Base covers on each tower cover the connection points.

Setup from storage takes about 5 minutes. The center tower has built-in wheels that are retractable via a foot-activated lever once positioned. The side towers have offset side-mounted wheels on the base to allow for rolling in a tipped position but do not touch the ground when the tower is in upright position.

The Express system can operate as a stand-alone device to screen for threats without internet connectivity, however, that is not the manufacturer's recommended mode of operation. When connected to the internet, this system has access to the "Insights" platform, which provides data for users such as number of people screened, alert counts, and type of threat found. Connecting to the internet also enables remote support for system health monitoring and troubleshooting as well as facilitating software updates.

Portal dimensions: 74" (H) x 40" (D) x 17" (W) (central tower); 74" (H) x 23" (D) x 17" (W) (side towers).

Passage width: For indoor system set up, 32" (with standard mat) or 40" (with wide mat); for outdoor use, 29" (with standard mat) or 37" (with wide mat). One-way traffic flow.

Portal Weight: 268 lb. (single lane); 334 lb. (dual lane).

3.4.1 Screening Capabilities and Features

Detection principle: Active continuous wave metal detection, extremely low frequency (ELF) range;[22] magnetic signatures used for alarm differentiation, and AI-powered signal analytics.

Threat objects detected: Ferromagnetic and nonferromagnetic metals.

Innocuous objects discriminated: Cell phones, keys, and coins.

Security settings*:* Six pre-programmed sensitivity level settings for standard width model or seven pre-programmed settings for the wide width model. The user Sensitivity settings are selectable from a pre-defined set and the user can tune differently from the presets.

Maximum throughput: 1,800 people per hour per lane (standard width), 2,000 people per hour per lane (wide width), assuming sufficient security staff to resolve alerts without causing a backup.

Body coverage: Operational height up to 78" (6'6") for detection at feet, ankles, and head.

Other sensors: A video camera integrated into both sides of the transmitting tower captures still and moving images of people who cause alerts. To preserve anonymity of people passing through the portal, the manufacturer does not collect, process, or use any of these images (which are personally identifiable information).

Alerts and indicators: The towers display visible alerts, and the tablets sound audible alerts.

Object localization: Capable of localizing object detections: on tablet computers, red cubes are to indicate locations of potential threats are superimposed on an image of the person causing the alert.

3.4.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP56-rated components. IP67-rated connectors.

Operating temperature: −4–131 °F.

Power: AC power via provided 13-foot power cord with socket on one side. Also compatible with user-provided third-party battery.

[22] The RF band designated by acronym ELF corresponds to 3-30 Hz. https://www.nasa.gov/general/what-are-the-spectrum-band-designators-and-bandwidths/.

Interference mitigation: Manufacturer recommends outdoor systems be anchored to the ground.

Interface: Tablet computer.

Self-Diagnostics: System has internal diagnostics to verify correct operation.

3.4.3 Other Information

Calibration: Not required.

Optional accessories: Available front- and rear-facing situational awareness cameras can be integrated into a third-party VMS and are also compatible with third-party video analytics software. A purpose-built cart to transport the outer towers and tablet pedestals is also available.

Interoperability: Uses an open API for interoperability with third-party VMS and security operations center alert management packages. Out-of-the box integrations with Genetec and Milestone video management and Titan HST mass notification systems. Capable of physical interface with access control systems using a dry relay contact box.

Traffic data collected: Visitor arrival and alarm rates by entrance, time and date can be viewed through Evolv Insights, a web-based and mobile-enabled analytics application. Evolv Insights supports post-event analysis and future operational planning. Visitor arrival curves and alarm rates by entrance, time, and date can be used to understand where and when the flow of people and threat objects peak, enabling staffing accordingly.

Cloud: "MyEvolv" portal is a cloud-based service used to manage Evolv Express systems remotely. It also provides security operation data analytics using anonymized and aggregated data. Integrations between Evolv Express and other technologies are managed by secure connections to the Amazon Web Services cloud. Consent must be given by the customer administrator to accept that images will be sent to and stored on the cloud for a 7-day default time period after which they are automatically deleted. Alert images are only sent to and stored on the cloud if the customer administrator provides affirmative consent.

Training and support: Operator training for security teams is available during initial deployment of the system, along with online training videos. Customer success manager and 24/7 technical support available by telephone.

Standards conformance and other performance testing:

- IEEE C95.1-2019
- ICNIRP Guidelines (1 Hz -100 kHz)
- NRTL-certified (UL 61010-1, CSA, 61010-1, and EN 61010-1)
- CE mark
- FCC 47 CFR Part 15
- RoHS Directive
- ADA-compliant for all configurations except outdoor model with standard width mat

Price: Varies depending on model. Available on General Services Administration (GSA) schedule number 47QSWA18D003K.

Subscription: Price varies depending on model. Provides software updates, concept of operations (CONOPS) support, support services and periodic security training. Standard subscription is 4 years and includes hardware, software, and 24/7 service and support by phone, emails, and Zoom video conferencing platform. Also offers a purchase-subscription mode.

Rental options: Partners with several companies to offer rental for annual or infrequent events.

Warranty: Same term as subscription.

Product website: www.evolvtechnology.com/products/evolv-express.

3.5 Garrett Metal Detectors, Paragon

Figure 3-10 Garret Metal Detectors Paragon

Image Credit: Garrett Metal Detectors

Figure 3-9 Paragon portal, side view

Image Credit: Garett Metal Detectors

The Garrett Paragon is a WTMD, constructed of aluminum with scratch resistant laminate, intended for venues such as stadiums, courthouses, theme parks, and schools, as well as airports and prisons. The Paragon uses broadband detection technology with 66 detection zones and "Quick-Q" software for innocuous object discrimination including cell phones. It does not require the divestment of cell phones or other small metallic items and allows for people to be screened together with their bags. Designed for both security screening and theft prevention, Paragon has a capability known as Ambiscan that enables the system to have different security settings for each traffic flow direction, for example to catch weapons coming in and company property going out. Ambiscan can also reduce operator fatigue alerting in only one direction but turned off in the reverse direction, to minimize redundant alarms during the screening process. No internet connection is required for operation.

Paragon's Quick-Q discrimination technology is designed to provide quicker venue access into stadiums, arenas, outdoor events, convention centers and concert halls by allowing movement of high volumes of patrons. Settings can be configured to not alarm for innocuous items and smaller threats by several application-specific programs for the user's needs and applications. Paragon's settings can also be configured to detect threats as small as a razor blade for increased security posture if needed. Settings can be changed by swiping a wireless near-field communication (NFC) card or using a wireless Module.

Another model, the Garrett PD6500i, with 33 detection zones, can also be used with Quick-Q software for high-throughput and event type security or adjusted to offer low throughput with high security detection.

Portal Dimensions: 87" (H) x 23" (D) x 35" (W)

Passage Width: 30” or 32.5” models are available. Bi-directional. Intended for security but also offers theft prevention capability when different security settings used for each direction.

Portal Weight: 152 lb.

3.5.1 Screening Capabilities and Features

Detection principle: Active metal detection, with transmitting and receiving in both panels; 3–30 kHz pulse induction. Magnetic signatures are used for alarm differentiation with algorithmic analysis of electromagnetic signal.

Threat objects detected: Ferromagnetic and nonferromagnetic metals.

Innocuous objects discriminated: Cell phones, keys, belt buckles, glasses, umbrellas (depending on the size).

Security settings*:* Has 23 programmable settings with 200 sensitivity levels. Settings can be adjusted according to intended use, from high-throughput event type protection to high security metal detection (with lower throughput). This allows users to change their security posture as needed, for example if an immediate threat is detected, or to operate at varied detections levels (depending on their event).

Additionally, the Ambiscan feature allows supervisors to set two programs with distinct sensitivities based on the direction of traffic flow.

Maximum throughput: 1,800 persons per hour.

Body coverage: Operational height up to 87” (7’ 3”) including detection at feet and ankles, with detection probability evenly distributed across walk-through portal.

Other sensors: Time-of-flight sensors using LiDAR on side panel detect both the presence of people and the direction of their movement through the walk-through portal.

Alerts and indicators: Visible and audible alerts on portal and on remote interface. Covert alerts are available, with differential alarms for threat object size or severity.

Object localization: Capable of localizing object detections. The system has 66 independent detection zones (22 left, 22 center, 22 right), with capability to emphasize high risk zones. All 22 of Paragon’s vertical zones are independently adjustable.

3.5.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP65 rating.

Operating temperature: −4–131 °F.

Power: Proprietary integrated uninterruptible lithium-ion battery power supply with standard 1 hour backup. Larger lithium-ion battery and external battery charger are also available with battery run time of 10–12 h, charge time 6–8 h. Also compatible with external AC power-connector socket on both sides, 10-ft long AC power cord—and internally mounted emergency power for continuous operation in the event of accidental AC disconnect or power outage.

Interference mitigation: Auto-frequency scan selects an operating frequency with the least amount of external interference. Designed to account for transmitter and receiver in each panel to eliminate interferences caused by other units in close proximity.

Interface: Settings can be adjusted from a tablet or laptop connected wirelessly or by cable, or on the system when accessed using an NFC card. The NFC card reader allows quick settings adjustment without mechanically inserting the card by bringing to NFC in close proximity to the reader inside the Paragon. The NFC feature can be used to clone settings on detectors, modify security posture, or set the unit back to factory default. Additionally, the detection head and crosspiece are key, locked to prevent tampering.

Self-Diagnostics: System has internal diagnostics to verify correct operation.

3.5.3 Other Information

Calibration: Not required. Users are encouraged, however, to conduct a test validation process each time the detector is used to ensure settings have not been changed or tampered with since its last use.

Optional accessories: Casters for transport (model number 1169101) $499.95; casters $549.95. “iC Module” for networking and product integration, relay, module system integration, and IR remote control. The SmartScan accessory is a thermal imager for health screening that can be used to alerting for high temperatures above a customizable threshold.

Interoperability: Compatible with third party VMSs and security operations center alert management packages. Socket-based data can be streamed with the iC Module accessory using an ethernet 10/100 base network or wirelessly using Wi-Fi. Dry contact relays can be provided for communicating to other devices. Options for manufacturer to provide system integration with access control devices such as turnstiles, cameras, door locks, X-ray machines, proxy card readers and building management systems.

Traffic data collected: Transit count and alarms by date and time. The system can store up to a year’s worth of data. A specific date range can be selected for any specific detector or for groups of detectors using the iC Module and client interface.

Training and support: In-person and online training can be customized to user needs. The online Garrett Academy also provides certifications for completing courses.

Standards conformance and other performance testing:

- ICNIRP/ISO 14117
- IEEE C95.1-2019

- EN 61326-1-2013
- NIJ 0601.02 (2003)
- ASTM F3566 (2022)
- 47 CFR Part 15 (Restricted Bands)
- System uses IEC AC cables for service which meet all CSA and UL safety requirements.

Additional conformance test information may be available from manufacturer.

Price: $8,995 MSRP for the Paragon with 1.8Ahr backup battery unit. GSA schedule number: GS-07F-025DA; 14Ahr Battery (model number 2238000).

Warranty: Standard 3-year warranty, batteries excluded, limited parts and labor. Extended warranties available.

Product website: garrett.com/security/walk-through/paragon-walk-through-metal-detector

3.6 Metrasens, Ultra

Figure 3-12 Metrasens Ultra

Image Credit: Metrasens

Figure 3-11 Ultra in a freestanding base

Image Credit: Metrasens

The Ultra is designed to detect weapons, recording devices, and other contraband for use in healthcare facilities, corrections facilities, and corporate, hospitality/entertainment venues, as well as government and education domains. In addition to security applications, Metrasens' Ultra also offers patient safety applications such as ensuring an MRI patient does not have any metal objects on them. Portable and set up either on its freestanding base or wall-mounted, it can be deployed as a single unit or a pair of two units that can be moved around facility as needed. (Two units are not needed for screening.) It can be set up and ready for operation in minutes. Internet connection is not required for operation.

Secure Ethernet offers remote management and integration with third-party security management systems.

Column Dimensions: 72" (H) x 4.7" (D) x 3.7" (W).

Passage width: Up to 30" if two pillars used, bi-directional.

Column Weight: Sensor unit weighs 22 lb. and the base, 24 lb. for a combined weight of 46 lb.

3.6.1 Screening Capabilities and Features

Detection principle: Passive metal detection. Software-based technology platform uses proprietary algorithms.

Threat objects detected: Ferromagnetic threats such as, guns, knives, vape pens, razors, recording devices, weapons and high-risk items.

Innocuous objects discriminated: Non-ferromagnetic metals including coins, aluminum cans and bottles, and jewelry (silver, gold).

Security settings*:* Adjustable sensitivity—ten sensitivity levels that can be set up to detect different ranges of items—with three different screening modes.

Maximum throughput: 3,600 people per hour (assuming uninterrupted flow).

Body coverage: Head-to-toe coverage.

Alerts and indicators: Appear on a 4.3-inch touch screen in the column with backlight technology. Columns provide 360-degree green and red LEDs for detection with five LED levels at the top (front facing) for indicating signal strength on detections and five LED zone location identification signals (front facing). Ultra also provides audible alerts with adjustable tone and volume. The system can be used in "covert mode," with no visual or audible alerts, when managed remotely.

Object localization: Five vertical detection zones.

3.6.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP65 rating, relative humidity 95% non-condensing.

Operating temperature: 5–120 °F.

Power: Li-Ion battery with runtime of 16+ hours, charge time 3 hours; 24V DC charger; charging temperature 32–104 °F. Li-ion battery includes automatic power-save feature. System also compatible with power over ethernet (PoE).

Interference mitigation: Environmental noise filtering feature to reduce false alarms.

Interface: In-column 4.3-inch color touch screen with backlight for controlling settings. PIN authorization required to adjust system settings.

Self-Diagnostics: None required.

3.6.3 Other Information

Calibration: None required.

Optional accessories: Customers choose their desired deployment option (included in purchase price) from free-standing base, and three wall-mounting options (the standard wall-mount, a ligature-safe design, and a cage mount for use in data room environments).

Interoperability: Published API for integration with third party security management systems. Available by secure ethernet connection: VMSs, physical security information management, access control. Capability to query and control various aspects of Ultra's operation and tailor functionality to suit specific needs.

Traffic data collected: Logs detections and offers centralized data analysis and event reporting for operational compliance and to provide actionable insights.

Training and support: Customers are trained on-site by a certified Metrasens trainer: sessions include 2-hour classroom instruction and 2-hour hands-on, on-the-job training. Additional on-demand, online training courses are offered.

Standards conformance and other performance testing: Compliant with and certified to applicable standards for electrical safety. Compliant with and exceeds standards on electromagnetic exposure and pacemaker safety as it is a passive technology with no emittance or exposure. Additional conformance test information may be available from manufacturer.

Price: $18,995 includes one sensor unit, a base or wall mounting option, charging cord, transportation case, and a 1-year warranty. Two units are not needed for screening.

Warranty: One-year factory warranty. Extended service plan available for purchase.

Product website: www.metrasens.com/solution/metrasens-ultra.

3.7 Passive Security Scan, Inc., The Passive Portal

The Passive Portal is a reactive artificial intelligence weapons detection system that uses passive sensing technology and is deployable for long- or short-term use. It self-calibrates after every scan. People being screened may keep purses and bags on their person. The location of a detected item is shown on the provided tablet computer user interface. The Passive Portal can also operate in stand-alone mode with no tablet connected or by a Windows computer. An internet connection is not required for screening operations.

Figure 3-13 The Passive Portal

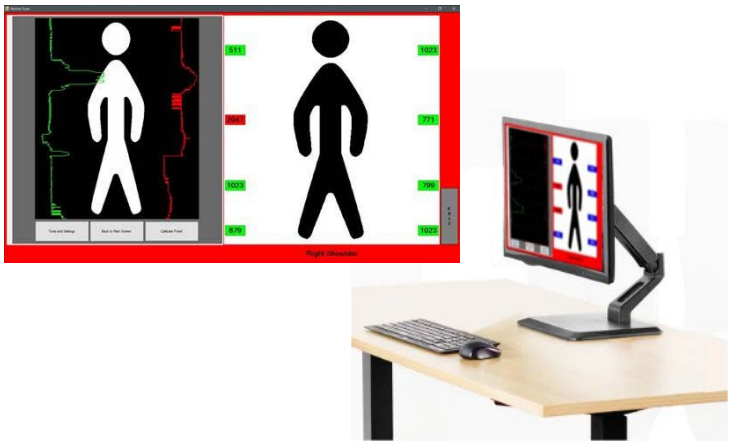

Figure 3-14 Passive Portal adjustable table stand and display

Portal Dimensions: Outer frame measures 84" (H) x 1.5" (D) x 38" (W) while inner frame, 80" (H) x 30" (W). Feet at the base are 30"in length.

Passage width: 30" bi-directional.

Portal weight: 28.5 lb.

3.7.1 Screening Capabilities and Features

Detection principle: Passive "field deflection" metal detection.

Threat objects detected: Ferromagnetic metals in knives, firearms, and other weapons.

Innocuous objects discriminated: Non-ferromagnetic metal items such as aluminum water bottles, belt buckles, and jewelry.

Security settings*:* Single sensitivity setting is set by the manufacturer according to intended use.

Maximum throughput: Approximately 1,200 people per hour.

Body coverage: Head to foot.

Other sensors: Passive break-beam IR sensor triggers scanning of a person walking through the portal. Optional USB connected video camera for image capture. Image capture is only saved if the person scanned has triggered an alarm. All screening metadata is saved into the image file for future retrieval by law enforcement.

Alerts and indicators: Audible alerts and visible alerts via LED lights on device or via remote screen interface upon detection. LEDs are located on both sides of portal: red LED indicates detection; green LED indicates no detection; blue LED indicates portal is occupied (passively scanning). Location information provided on remote interface.

Object localization: Capable of localizing object detections. The maximum readings per sensor for four zones on each left-right side are displayed in the tablet-based software application. Additionally, a display of the waveform data of the scan can be used for front-rear localization on body.

3.7.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments**.** Described as "weather resistant," but no IP rating provided.

Operating temperature: 32–158 °F.

Power: Runs on external power,120/220 V-AC 50/60 Hz, with included 6-ft long power cord. Also compatible with supplied 12-volt DC rechargeable lithium-ion battery with 12-hour run time. Battery recharges when portal is plugged in at wall-outlet and has approximately 5-hour charge time.

Interference mitigation: Portal must be installed on a solid, stable surface to eliminate swaying while subjects pass through the portal. It is not compatible with running electrical equipment in vicinity of security zone.

Interface: Tablet or laptop application paired with portal via wired (12-foot USB cable) or Bluetooth wireless connection. Passive Security Scan software installed on included tablet. Software interface provides detection alerts and object localization information. Windows-compatible software is also available for download. Software also provides speech synthesis capability to communicate to portal operator.

Self-Diagnostics: System has internal diagnostics to verify correct operation.

3.7.3 Other Information

Calibration: Self-calibrates after every scan.

Optional Accessories: Custom colors and logo. Soft transport bag. Elevated body temperature sensor available.

Traffic data collected: Log file of scan results is saved on secure digital card internal to portal.

Training and support: Operations manual provided with purchase.

Standards conformance and other performance testing: None listed.

Price: $5,000 plus shipping and handling.

Warranty: Two-year warranty against defective material workmanship starts from date of shipment. Products determined by manufacturer to be defective will be replaced in whole or in part. Warranty does not include labor costs or other claims for damages.

Product website: www.passiveportal.com/pdf/PassivePortal1TechSpec_Web.pdf.

3.8 Rapiscan Systems, Orion Metor 900M

The Orion Metor 900M WTMD is intended for visitor screening in private and public buildings; stadiums and other event spaces; and airports or other mass transit terminals. The system uses electromagnetic characteristics of the material and shape of the item to distinguish between threats and innocuous objects. Its object classification technology has the capability to identify items in addition to ferromagnetic and non-ferromagnetic information. Security settings for Metor 900M can be adjusted with 200 pre-programmed setting to choose from. The system is capable of localizing object detections. The system also offers a "tailgate alert" that alarms when two people pass through the metal detector too close to each other.

Figure 3-15 Rapiscan Systems Orion Metor 900M

Image Credit: Rapiscan Systems website

Portal Dimensions: 88" (H) x 26" (D) x 34" (W).

Passage width: 30" bi-directional.

Portal Weight: 131 lb.

3.8.1 Screening Capabilities and Features

Detection principle: Active metal detection, transmitter and receiver in separate panels.

Threat objects detected: Ferromagnetic and non-ferromagnetic metals such as handguns, knives and other security threats.

Innocuous objects discriminated: Not specified.

Security settings*:* Has 200 pre-programmed settings intended for different applications. An automatic interactive sensitivity calibration function enables the detector's sensitivity to be automatically selected for a specific test object.

Maximum throughput: 3,000 people per hour.

Body coverage: Operational height up to 81" (6' 9").

Alerts and indicators: Audible and visible alerts; two-dimensional multicolor display of detected object location; tailgating alert.

Object localization: With 60 localization segments the system can indicate items located left, center and right. Multi-colored LED's and 4 multi-zone display bars are programmable as location indication or pacing lights.

3.8.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. "Weatherproof," IP65 rating, 0-100% relative humidity.

Operating temperature: −4–140 °F (5–113 °F when backup battery is in use).

Power: 100–240 VAC. Power consumption 30 W. Also compatible with 12 VDC optional backup battery with 10 hr. run time. Automatically adjusts to changes in power supply without operator intervention.

Interference mitigation: Digital filtering by signal processor. Several operating frequencies suppress local electrical noise. Can operate in close proximity to static metal, with recommended distance of at least 8". Detection coil is designed to maximize ratio between moving metal inside and moving metal outside the detector. Mechanical construction enables immunity against mechanical vibration. Allows operation of multiple metal detectors in close proximity.

Interface: Keypad and graphical display are located on the cross piece. Parameters can be adjusted using NFC smart card with a PIN number for secure access. Parameter memory retains last settings in case of power loss (backup battery not required for this feature). Compatible with Rapiscan Systems "MetorNet 10" monitoring software, and ethernet-based security management system to allow remote monitoring of multiple systems from a single location or an internet-enabled device. Software communicates with hardware via Ethernet, USB, Bluetooth or Wi-Fi.

3.8.3 Other Information

Calibration: Automatic or manual calibration. An automatic interactive sensitivity calibration function enables the detector's sensitivity to be automatically selected for a specific test object.

Optional accessories: Wheel kit for moving short distances, dolly kit for long distances. Splitter power cord for multiple systems. Test pieces for calibration.

Interoperability: Relay contact for remote alarms. Supports communication with various interfacing protocols including Fast Ethernet, USB, Bluetooth, Wi-Fi, IR, RS 232, digital I/O.

Traffic data collected: Bi-directional traffic counter also counts number of alarms and alarm rate. Counter can be set to increase in one direction and decrease in the reverse (for use if someone needs to divest a metallic item and be re-screened).

Training and support: One-day in-person operator training can be delivered at a vendor training center or the user's location for up to 10 students. Students have access to a personalized learning hub for 12 months; annual refresher training is offered. A 2-hour e-learning course is also available. Rapiscan Systems has a help desk and technical support that is available 7 days a week, 365 days a year to support technical inquiries.

Standards conformance and other performance testing: Conformance test information may be available from manufacturer.

Price and Warranty: Not provided.

Product website: www.rapiscansystems.com/en/products/orion-metor-900m.

3.9 SoundThinking Inc., SafePointe

Figure 3-16 SoundThinking SafePointe

Image Credit: SoundThinking, Inc

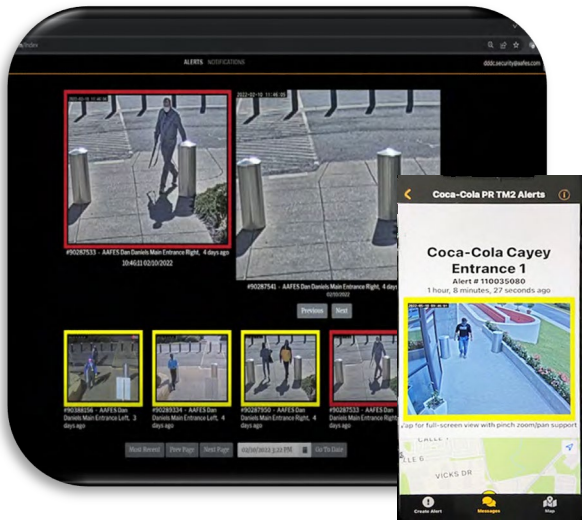

Figure 3-17 SafePointe user interface

Image Credit: SoundThinking, Inc.

SafePointe is a fixed-installation artificial intelligence-based weapons detection system designed for interior or exterior use at high throughput facilities in a low-profile form factor. This system can be used at workplaces, museums, schools, casinos, financial institutions, and hospitals. SafePointe leverages artificial intelligence (AI) to not alarm on innocuous objects by filtering their magnetic signatures. It uses discreet sensors that require no action, disruption, or security personnel at ingress points to screen individuals and their belongings as they pass through the sensors.

The detection hardware is packaged in discreet bollards that create screening lanes. These are paired with cameras and communication connections to a remote incident review center. Detections are sent to SoundThinking's Incident Review Center for review by a trained analyst who will review and prioritize threats. After review by SoundThinking, alerts are categorized and sent to the on-site security team with the related video within seconds via application or multimedia messaging service (MMS).

An on-site internet connection is required for screening operations (but not for each sensor).

Column Dimensions: 38" (H) x 16" (diameter). Embedded sensors are 16" diameter.

Passage width: 7 feet to 12 feet; 10 feet is recommended.

Column weight: Not provided.

3.9.1 Screening Capabilities and Features

Detection principle: Passive metal detection.

Threat objects detected: Ferromagnetic and nonferromagnetic conductive material including firearms, tactical knives, and explosive device components using magnetic signatures. Includes over 14 million weapon signatures using continuous learning.

Innocuous objects discriminated: Not specified.

Security settings*:* Different security settings are available and are configured by SafePointe based on customer requirements at installation.

Maximum throughput: 7,200 people per hour per lane.

Body coverage: Entire body; can detect up to 15' around sensor.

Other sensors: One camera.

Alerts and indicators: Detections are flagged for SoundThinking analysts to review and prioritize, then categorized alerts, along with suspect video are sent to the on-site security team via application or MMS.

Object localization: Capability is under development (its rollout is planned for 2024), but not currently available at the time of this market survey report.

3.9.2 Deployment and Set-up Features

Environment: IP67.

Operating temperature: −40–122 °F.

Power: PoE.

Interference mitigation: SoundThinking recommends placing sensors at least 1 ft away from revolving objects and machinery.

Interface: Alerts are sent via provided application or MMS to configured contacts.

Self-Diagnostics: System health monitoring is automated via the server connection. Diagnostics and troubleshooting completed remotely by SoundThinking.

3.9.3 Other Information

Calibration: Self-calibrated system.

Optional accessories: Not applicable.

Interoperability: Direct integrations to VMS system by installed relay switch available through web-enabled user interface into VMS.

Traffic data collected: Traffic estimates available. Analytics capability including detailed person counting is under development as of the time of this market survey report (capability rollout is planned for 2024).

Training and support: On-site and remote training available. Support is handled via email and phone.

Standards conformance and other performance testing: Contact manufacturer for information about independent customer performance tests and internal performance tests.

Price: Not provided; contact vendor for information.

Warranty: Term of software as a service offering with repair/replacement.

Product website: www.soundthinking.com/security/weapons-detection.

3.10 Xtract One, SmartGateway

Figure 3-19 Xtract One SmartGateway

Image Credit: Xtract One

Figure 3-18 Xtract One SmartGateway

Image Credit: Xtract One

The SmartGateway is an unobtrusive system to scan entrants for concealed weapons in order to secure patrons and venues from weapons threats. It replaces traditional screening methods such as walk-through-metal-detectors, hand wands, or pat downs, providing a method for patrons to enter a venue without having to stop or to divest of personal items. Guests can walk through the system with purses, bags, backpacks, and other items. The SmartGateway is designed to alert on weapons (e.g., firearms, knives, bomb-making components) and not alert on benign items such as cellphones, keys, and wallets. It is designed to be used at stadiums, arenas, live entertainment venues, theaters, casinos, nightclubs, art galleries, schools, hospitals, manufacturing and distribution buildings, and other venues that require security screening without detracting from the guest experience.

The SmartGateway consists of two towers that are connected to each other through a thin ribbon power cable that is 1/16th of an inch wide and covered with a carpet to remove trip hazard. Pillars are typically deployed at 36” apart for ADA compliance for wheelchairs while also facilitating a “one person at a time” walking speed for optimal detection of weapons. This maintains a fast ingress and minimal false alerts.

An internet connection is not required for the SmartGateway to operate. The system has its own built-in Wi-Fi access point, accessible to any Wi-Fi equipped device (e.g., smartphone, tablet, laptop) that has the correct access credentials. Alerts can then be sent to any of these connected devices, which provides flexibility in design of the security operations for the entrance or venue.

Column dimensions: 54” (H) x 10” (D) x 10” (W)

Passage width: 36–48,” typically deployed at a 36” for optimal operation. Bi-directional.

Column weight: Approximately 40 lb.

3.10.1 Screening Capabilities and Features

Detection principle: Passive metal detection.

Threat objects detected: Ferromagnetic metals; firearms, knives (down to 1” folding pocketknives) and bomb-making parts.

Innocuous objects discriminated: Smartphones, keys, watches, wallets, belts, zippers, buckles, and small electronics such as earbuds, tablets and walkie talkies.

Security settings*:* Ten pre-programmed sensitivity level settings. Level 1 is the least sensitive (designed to alert only on large firearms); Level 10 is the most sensitive (designed to alert on very small items such as a 1” pocketknife). As the setting level is increased, the user should also expect an increase in false alerts.

Maximum throughput: 2,400 people per hour. (In a lab environment the system can screen over 3,000 patrons per hour, but in real-world applications the manufacturer recommends planning for 2,400 patrons per hour to account for the ability to manage alerts).

Body coverage: Operational height up to 78” depending on the setting.

Other sensors: Includes a camera to take images of the individuals who cause an alert. A “pacing tablet” is integrated into the front of the tower; this tablet has options to inform patrons and pace them at different throughput speeds as desired by the venue.

Alerts and indicators: When a patron passes through a SmartGateway and causes an alert, the alert information can be provided to the operator in a number of ways:

- audible alert indicating “pass” or “fail”
- simple alert on an integrated tablet on the towers that shows “pass” or “alert”
- detailed alert displaying a silhouette of a person that shows green (“pass”) or red (“alert”), and if “alert,” also shows the location of the weapon on the person
- photo image of the alerting individual.

The above alerts can be presented on the tablet integrated into the SmartGateway towers, on any Wi-Fi connected device (e.g., smartphone, tablet, laptop) and/or on any device or security operations center connected via the venue’s network.

Object localization: Capable of localizing object detections in approximately 58 localization areas. Location of the weapon on the body is shown on a silhouette display.

3.10.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP65 rating.

Operating temperature: 14–122 °F.

Power: 110/120V.

Interference mitigation: Artificial intelligence engines designed to eliminate interference due to vibration, noise or electromagnetic interference.

Interface: Integrated display on towers as well as options for Wi-Fi connected tablet, laptop, or smartphone.

Self-Diagnostics: System can detect issues such as misaligned pillars or incorrectly plugged in cables and displays guidance on the tablets integrated in the towers. System will also self-diagnose and provide an alert if it detects a system failure.

3.10.3 Other Information

Calibration: Unit self-calibrates when initially deployed and does not require ongoing calibration.

Optional accessories: Additional tablet computers to receive alerts.

Interoperability: Can be integrated with video management and alerting systems such as Genentech, Milestone, and others.

Traffic data collected: By-the-minute count of individuals passing through the system and number of alerts. Additional alert information also can be collected, such as images of individuals causing an alert, location of the weapon on the body, and alert characteristics.

Training and support: Xtract One conducts a comprehensive initial site assessments of the venue and personnel requirements to offer a customized solution. In-depth product training available as well as ongoing support to adapt to evolving needs. Training is provided in classroom or remotely, repeated on-site with a system, and then during a series of ingresses to re-enforce best practices. Training is augmented with videos on system operation, maintenance, setup, and the roles of security staff.

Standards conformance and other performance testing:

- U.S. Department of Justice standards NIJ and NILECJ
- ASTM standards for weapons screening solutions

Additional conformance test information may be available from the manufacturer.

Price: Venue- and application-dependent.

Warranty: One year; additional years can be purchased as part of an annual maintenance program.

Product website: xtractone.com/products/smartgateway.

4.0 PRODUCT INFORMATION: WALK-THROUGH IMAGING SYSTEMS

This section provides information on five walk-through weapons screening systems that are based on imaging. Products are listed alphabetically by manufacturer. The information is from manufacturer descriptions of their products in response to a SAVER RFI or information available at their websites and has not been independently verified by the SAVER program. Below are definitions of the product information in Table 4-1 listed in column order.

MSRP indicates the manufacturer's suggested retail price in U.S. dollars with all necessary components. "NP" means that the price was not provided by the vendor.

Detection Principle: Indicates the basis of the detection technology and will be noted as "Active MMW," "Active Radar" (which is non-imaging), or "Passive MMW." For active systems, the frequency of the electromagnetic field used for illumination is given in parenthesis.

Standoff Distance Range: Refers to the minimum and maximum distance at which screening can be performed (rounded to the nearest foot) for systems that operate as standoff devices. "NA" means not applicable because the system is configured as a walk-through portal rather than a standoff device.

Automated Threat Indication: Refers to how detected threats are signaled. "Y" means that the system uses an algorithm to detect anomalies that could be weapons and displays either a go/no-go indication to the operator or a probability of the presence of a threat object. "O" means that the system provides a contrast image for the operator to interpret, with an option for automatic indications of potential concealments.

Throughput rate: Indicates the expected maximum number of people that can be screened per hour.

Passage width: Notes the distance (rounded to nearest inch) between the portal side panels for systems configured as walk-through portals. "NA" indicates not applicable, for standoff systems.

Dimensions: Refers to the side panel height, depth, and width (rounded to nearest inch) for active imaging portals, except for one product (indicated by asterisk) for which dimensions of the entire system are provided. Footprint of panel base is also listed as applicable. For stand-off systems, the height, depth, and width of the sensor device (rounded to nearest inch) is indicated.

Weight: Refers to the weight (rounded to the nearest pound) of the complete unit given as one value. Where two values are listed, the numbers indicate each side of a two-sided system.

Optical Camera: Indicates whether the system has the capability to provide an image of the person being screened when there is a detection alert: "Y" means that it does, while "N" means the system does not use optical imaging.

Internet Required: Indicates whether the system must be connected to the internet during screening operations: "Y" means the internet is required, while "N" means it is not required for operation.

AC Power: Indicates whether the device can be powered by a wall outlet: "Y" means that it can. Where one is provided, the number refers to the length of the power cord in feet.

Battery Type: Refers to the kind of rechargeable battery used. "None" means the system does not use batteries. "NP" means the battery type was not provided.

Battery Run and Charge Times: Times are given in hours; "NP" means not provided.

IP and Operating Temperature: Refers to the IP rating, a measure of the system's imperviousness to dust and to water. A rating of IP20 means the enclosure prevents entry of fingers and similarly sized objects with no protection from water exposure. IP56 means protected from dust and low-pressure water jets. IP65 means the system is dustproof and protected from high-pressure water jets. The IP value is followed by the system's operating temperature range in degrees Fahrenheit. "NP" means this information was not provided by manufacturer.

Table 4-1 Walk-Through Imaging/Radar Product Comparison Matrix

Manufacturer and Product	MSRP	Detection Principle (frequency)	Standoff Distance Range (feet)	Automated Threat Indication	Throughput (people/h)	Passage Width (inches)	Dimensions (inches)	Weight (lb)	Optical Camera	Internet Required	AC Power	Battery Type	Battery Run Time Charge Time (h)	IP Operating Temperature
Elva-1, WAX-radar	$80,000	Active radar (76 GHz)	16–66	Y	720	NA	8 x 5 x 12	45	N	N	Y	none	NA	IP56 −49 to 131°F
Liberty Defense Technology, Inc., HEXWAVE HW2000	NP	Active MMW (6 - 10.6 GHz)	NA	Y	700	69	73 x 36 x 8 44 x 26 base	140 140	Y	N	Y 12’	NP	NP	NP 42 to 95°F
QinetiQ, SPO-NX	$200,000	Passive MMW	16–66	Y	360	NA	13 x 21 x 10	22	Y	N	Y	NP	6-12 NP	IP65 14 to 95°F
Rohde & Schwarz, QPS Walk2000	$199,000	Active MMW (3 - 10.6 GHz)	NA	Y	750	32	98 x 108 x 72*	950	N	N	Y 20’	none	NA	IP20 41 to 104°F
Thruvision, HTC16	$150,000 to $300,000	Passive MMW	13–20	0	1,000	NA	10 x 24 x 24	57	Y	N	Y 6’	12V Lead-acid†	8 6-8	NP 64 to 72°F

Notes:
“NA” means the specification is not applicable to the product.
“NP” means information on this feature was not provided by manufacturer.
* Dimensions are for entire QPS Walk2000 system.
† Battery is used with alternate portable model TAC16 Tactical Deployment System.

4.1 Elva-1, WAX-radar

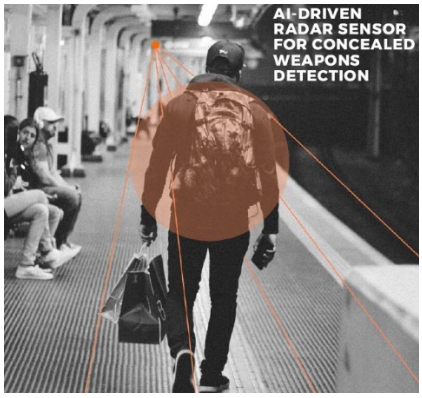

Figure 4-1 Elva-1 WAX-radar

Image Credit: Elva-1

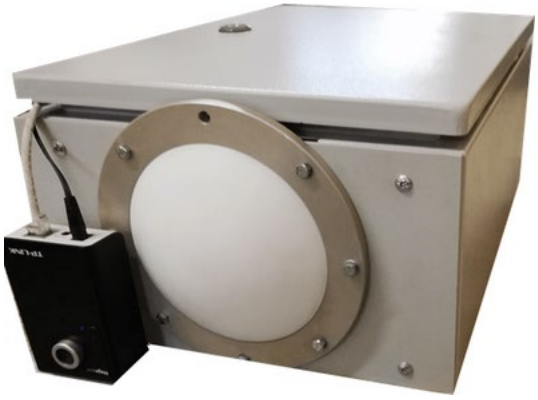

Figure 4-2 Elva-1 WAX-radar

Image Credit: Elva-1

The Elva-1 WAX-radar system is designed to scan moving people to search for packs of small metal particles typical for explosive belts and IEDs. It uses low-power polarimetric radar for standoff detection of on-body concealed weapons at a maximum distance of 65.6 feet. It is compact and portable but intended for long-term, covert installation. Various mounting options are possible, including mounting on a pipe standard, wall framework, ceiling beam, or in a hidden location such as built into an advertising display.

The ELVA-1 system works by using non-imaging millimeter wave radar to scan individuals as they walk within the spot of radar beam. It can detect threat objects concealed on-body or in a bag, regardless of whether the bag is in contact with the person or carried by hand, as long as the bag is within the field of view of the radar sensor (i.e., not hidden behind the person's body). The results of the scans are analyzed in real time by an AI engine and compared to a database of known patterns. Alerts are indicated remotely on a connected tablet or laptop computer. The system constantly learns and adapts to new patterns at its place of deployment. Internet access is not required for standalone operation but is required to upgrade the system database.

Sensor dimension: 8.4" (H) x 4.8" (D) x 12" (W).

Stand-off distance range: Up to 65.6 feet with a 1.6-foot resolution. The typical area being screened is 1-foot diameter. At a standoff distance of 16 ft the beamwidth corresponds to a diameter of about 14". Uses a small, replaceable antennae with 1.4° to 3° beamwidth to cover various distances.

Sensor Weight: 45 lb.

4.1.1 Screening Capabilities and Features

Detection principle: Non-imaging, low power MMW polarimetric method operating at 4 mm wavelength (76 GHz, E-Band).

Software image analysis: Uses data with test target (human with shrapnel) and human without shrapnel to train AI on site. The AI engine is fabric-trained to recognize IED bombs with metal particles.

Threat objects detected: IEDs, packs or belts of small metal pieces.

Body Coverage: Operational detection zone up to 38”; cannot detect near feet or ankles.

Maximum throughput: 720 people per hour.

Alerts, indicators, and localization: Alert is signaled on remote interface. The interface provides a numerical probability of the presence of a suspicious object, where a value of less than 0.5 indicates no threat, and a value > 0.5 indicates a suspicion of threat.

4.1.2 Deployment and Set-up Features

Environment: IP56. Enclosure design can be changed upon request.

Operating temperature: −49–131 °F.

Power: External 220VAC 50Hz.

Interference mitigation: MMW radar does not interfere with Wi-Fi communications equipment, surveillance cameras and other home appliances. One radar can be operated with one sensor in direct line of sight with target, or multiple sensors can be installed at different angles. Inputs from multiple sensors do not interfere with each other.

Interface: Alerts visible on tablet or laptop, connected by cable.

Self-Diagnostics: Self-diagnosis of serviceability of the internal electronic subsystems.

4.1.3 Other Information

Calibration: During the initial installation the AI must be trained. Retraining is also required after a change in the environment, such as a change in the position of surrounding reflective objects (for example poles, racks, etc.).

Traffic data collected: On customer’s request.

Training and support: Remote training and support for first installation is included in the price and includes installation recommendations, testing with a simulator, calibration, and threshold setting. Additional 24/7/365 support cost per year is 16% of the equipment cost.

Standards conformance and other performance testing: The equipment is supplied with a manufacturer’s certificate of conformity and a factory testing report. Additional conformance test information may be available from manufacturer upon request.

Price: $80,000 USD with one antenna. Optional software upgrades are available for 10% of the equipment price (includes new features but is not needed to maintain operations). No annual license is required.

Warranty: One year from the date of arrival of goods to distributor office or customer’s office in case of direct shipment as per the date on airway bill/bill of lading unless another period is specified in the order.

Product website: elva-1.com/products/a40166.

4.2 Liberty Defense Technology, Inc., HEXWAVE HW2000

Figure 4-3 Liberty Defense Technology HEXWAVE HW2000

Image Credit: Liberty Defense Technology, Inc

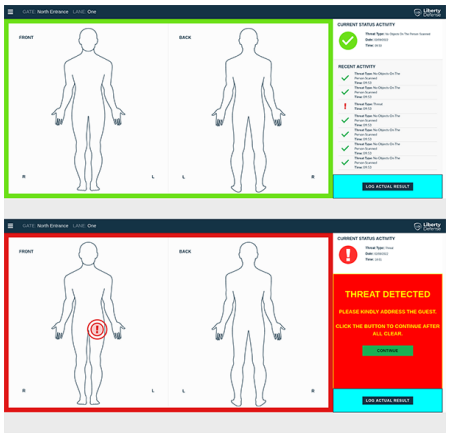

Figure 4-4 HEXWAVE HW2000 interface

Image Credit: Liberty Defense Technology, Inc

Liberty Defense's HEXWAVE™ HW2000 product combines millimeter wave sensors, video-rate three-dimensional imaging, and machine learning technology to detect concealed non-metallic and metallic threats such as weapons, explosives, and drugs. This product is designed for use at sports and entertainment venues, casinos, hotels, tourist attractions, shopping malls, office buildings, school campuses, places of worship, distribution centers and other public spaces. Its video-rate speed allows HEXWAVE to process crowds in real-time through multiple entry points without entrants need to divest clothing or personal items. The system has been designed to detect large anomalies as potential threats and to disregard smaller benign objects such as keys, wallets, and cell phones. While millimeter waves can penetrate bags and backpacks, the manufacturer does not recommend using it for screening off-body, carried personal property, since restricted items and threats can be shielded. (Liberty Defense Technology recommends visual inspections of bags or scanning them separately with an additional X-ray technology.) It provides gender-agnostic, on-body detection for walk-though security. The detection software runs on the internal computer in each HEXWAVE panel. Images are not displayed to the operator, and they are not stored.

With handle holds and lockable wheels, this product offers flexibility to be moved and installed indoors and at protected outdoor access points in less than 30 minutes. It can operate in two configurations. The S-Configuration is a continuous walk-through flow of people through the system (shown in Figure 4-3). The panels are offset and allow for screening of the front, sides and back of a person without stopping. In the Walk-Turn-Go configuration, the panels are parallel, a person walks into the system, turns and faces either panel with a 2 second pause, then walks out.

An Internet connection is not required for use. Sensor panels do not need to be attached to a network and can operate in standalone mode. The detection software runs on the internal computer in each HEXWAVE panel. A secure login is used for each screener, supervisor, manager, and service technician. The system can operate via Wi-Fi or hardwired via ethernet cable.

Portal dimensions: 73.3" (H) x 36" (D) x 8.2" (W). The footprint of the base of each panel has dimensions of 43.8" x 26.1."

Passage width: 69" in an "S" configuration.

Portal weight: 140 lb. per panel (wheeled).

4.2.1 Screening Capabilities and Features

Detection principle: Active MMW, frequency range 6–10.6 GHz. Active 3D imaging technology captures over 400,000 Voxels (3D volume pixels).

Software image analysis: Performs automatic threat detection for go/no-go decisions using AI and deep learning algorithms. The algorithms are developed using models walking through the system with and without various threats. Algorithms were developed and trained on the software. Algorithm optimization is ongoing with different algorithms planned for different customers as some prefer to have people fully divest, while others would prefer people be able to keep their keys, wallets, and cell phones on their person as they go through.

Threat objects detected: Plastic, liquid, and powder explosives; rifles, shotguns, handguns including full-size, compact, subcompact, and 3D printed ghost guns; knives including metal, ceramics and plastic.

Innocuous objects discriminated: Keys, wallets and cellphones.

Maximum throughput: 700 people per hour.

Body coverage: Operational height up to 75" (6' 3"); detection zone includes the subject's feet.

Other sensors: Optical camera near top of each panel triggers start and stop of scans.

Alerts, indicators, and localization: Visible alerts are indicated on the portal; display on the tablet shows an avatar with the location of threat detected. Optional audible alerts from panels.

4.2.2 Deployment and Set-up Features

Environment: The HEXWAVE can operate indoors and outdoors for short periods of time under cover, with relative humidity 20–80% (without condensation). Not IP rated.

Operating temperature: 42–95 °F. (Storage temperature 32–113 °F.)

Power: External AC via included 12-ft power cord to each panel.

Interference mitigation: Unaffected by proximity to electromagnetic interference or metal.

Interface: Standard tablet with a stand is offered or user-provided laptop or tablet if preferred; option for cable or wireless connections.

Self-Diagnostics: System has internal diagnostics to verify correct operation.

4.2.3 Other Information

Calibration: Calibration is recommended once a day, usually at start-up, and is a 5-minute process. No additional equipment is required for the calibration.

Optional accessories: Laptop (for administrator use), APC UPS 1500VA UPS battery backup and surge protector, threat kit, custom panel graphic, table for divestiture, stanchion set.

Interoperability: Smart Internet of Things functionality for connectivity to existing security systems (VMS, access control). Platform has an open back-end that can be integrated into various systems such as video management, security operations center and alert management packages. (Integrations are custom work.)

Traffic data collected: Dashboard supports data analytics and reporting.

Training and support: Training is available on site or at Liberty Defense's facility, including for operator and manager levels.

Standards conformance and other performance testing:

- 47 CFR Part 15 (Restricted Bands)
- Compliant with safety standard UL 62368-1:2019 Ed. 3

Additional conformance test information in progress may be available from the manufacturer.

Price: Not provided. Cost includes a 5% yearly subscription fee that includes system algorithm updates and improvements.

Warranty: Twelve months standard parts and labor warranty included with the system. Extended warranty options are available.

Product website: libertydefense.com/product/hexwave.

4.3 Qinetiq, SPO-NX

Figure 4-6 Qinetiq SPO-NX system components

Image Credit: Qinetiq

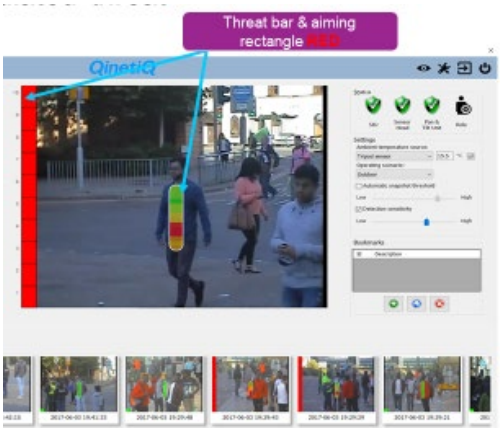

Figure 4-5 Qinetiq SPO-NX user interface

Image Credit: Qinetiq

The SPO-NX is a passive stand-off system capable of screening large groups of people to detect potential concealed threats. It is designed to be used as a counterterrorism tool to detect person-borne IEDs. Because there is no requirement for individuals to interact with the system when being scanned, SPO-NX can scan a crowd of people without disrupting pedestrian movements. It is based on technology that has no RF emission and is therefore harmless to individuals being scanned. It does not generate an image of individuals' bodies but will display a potential threat level on detection of an object concealed under clothing, such as large weapons, IEDs, and contraband. The SPO-NX does not detect small threat items such as knives or small handguns. When it detects a potential threat, an alarm is activated at the operator's workstation, as well as a visual depiction of the potential threat. Aiming the SPO-NX system is achieved through either a joystick, mouse, touchpad, or touch screen control. The system does not screen bags.

The SPO-NX is designed to be transportable using three two-wheeled Pelican cases. A wheeled tripod mount provides a portable and mobile option. The system can be rapidly assembled by one person without tools in less than 5 minutes. Warm-up time is 3 minutes. Alternatively, it can be wall or ceiling mounted for permanent or semi-permanent operation either overtly or covertly behind opaque screens. Internet connection is not required for operation.

System dimensions: Sensor head is 12.5" (H) x 20.8" (L) x 9.5" (W); tripod height is adjustable from 46.8" to 90" (3' 11" to 7' 6"); two of the transport cases measure 3.6" x 28.8" x 18" and the third case has dimensions 37.2" x 27.6" x 14.4".

Standoff distance range: The SPO-NX operates at distances of 16.4 to 65.6 feet and is designed to screen for objects the size of a paperback novel at those distances. The actual detection range depends on threat object type and environmental conditions.

Weight: Sensor is 22 lb.; the three transport cases weigh 68 lb., 106 lb., and 75 lb.

4.3.1 Screening Capabilities and Features

Detection principle: Passive MMW.

Threat objects detected: Person-borne IEDs, assault rifles.

Innocuous items ignored: Keys and mobile phones.

Security settings*:* Sensitivity adjusted on a sliding scale.

Software image analysis: The SPO-NX is a detection system, it does not recognize or identify the object detected. No system learning or threat library required.

Maximum throughput: 360 people per hour can be scanned by an experienced operator.

Body coverage: Torso or back.

Other sensors: Wide and narrow field of view video cameras are integrated in the system for targeting and situational awareness. An aiming rectangle is shown in the narrow field of view image indicating the area over which the system is sensitive. The operator can take snapshots of suspect scans, which are stored in a database.

Alerts, indicators, and localization: A display unit on a laptop screen provides a visual representation of the position of a potential threat overlaid on a photo image of the person screened. It uses a color-coded (red/green) threat bar indicator displaying a 0 to 10 level threat alarm. Also provides an audible alert to the operator.

4.3.2 Deployment and Set-up Features

Environment: Suitable for indoor and outdoor environments. IP65 rating (excluding notebook computer and joystick).

Operating temperature: 14–95 °F. (Storage temperature –4–122 °F.)

Power: 90-264 VAC, 50 to 60 Hz; optional battery available with run time of 6–12 hours.

Interference mitigation: None.

Interface: Pan and tilt controlled via laptop; connection between sensor head and laptop uses cable or wireless Ethernet (a 15 ft Ethernet cable is supplied).

Self-Diagnostics: Self-diagnostics and simple user-initiated recalibration available.

4.3.3 Other Information

Calibration: User-initiated recalibration.

Optional accessories: Wall and ceiling mounting brackets are available with a variety of cable options. Battery pack.

Interoperability: None.

Traffic data collected: Logs of traffic are created as screenshots.

Training and support: One-day operator training course delivered by manufacturer.

Standards conformance and other performance testing:

- FCC 47 CFR Part 15b Class A

Additional conformance test information may be available from manufacturer.

Price: $200,000.

Warranty: Twelve months, return to manufacturer.

Product website: www.qinetiq.com/en/what-we-do/services-and-products/stand-off-threat-detection.

4.4 Rohde & Schwarz (R&S) QPS Walk2000 Security Scanner

Figure 4-8 QPS Walk2000 Security Scanner

Figure 4-7 QPS Walk2000 Security Scanner

The R&S QPS Walk2000 (QPW) security scanner uses a multiple array of micropower ultrawideband radio sensors to provide high-resolution, three-dimensional images coupled with software to automatically detect threats concealed on the body in real time. Persons being scanned walk through the gate at a normal pace. The QPW provides full 360° body coverage and penetrates clothing without removal of outerwear such as coats, jackets, or leather clothing. Items and objects typically carried in pockets or on person should be removed/divested prior to screening. Optionally, small items such as keys, wallets, and cell phones can be held in the hands while walking through and the system can be set to ignore (i.e., not alarm on) the hands. Applications include critical infrastructure, government facilities, VIP protection, military compounds, public landmark buildings, such as museums and places of worship, large scale events, such as music festivals, sporting events, exhibitions and conferences, customs checkpoints, and cruise ship terminals.

The QPW automatic threat detection software leverages AI anomaly location, using machine-trained algorithms to locate suspicious items of all material types. It searches for anomalies and indicates unusual objects rather than particular items, enabling it to discover new and unknown threats. Data acquisition and image reconstruction begin as soon as a person steps onto the entrance ramp and continues until the person steps off the exit ramp. Analysis occurs in real time such that by the time the person steps off the exit ramp, the decision result (pass, alarm, etc.) is displayed simultaneously on the gate indicating strip lights and user interface screen. The QPW displays detected anomalies on a human representative figure (avatar).

The QPW's transmitted power is well below safety limits and several orders of magnitude lower than mobile phone emissions. The system is intended for long-term installation. Internet connection is not required for operation.

Portal dimension: 98" (H) x 108" (D) x 72" (W).

Passage width: 32"; wheelchair accessible, one-way operation.

Portal weight: 950 lb.

4.4.1 Screening Capabilities and Features

Detection principle: Active MMW image, non-ionizing 3–10.6 GHz ultrawide-band frequency range.

Software image analysis: The detection software responsible for image reconstruction and automatic detection constructs images at a rate of approximately 8 frames per second. Raw image data is neither stored nor displayed to the operator and is deleted as soon as the detection result is displayed. Systems retains a record of the scan as well as the result (pass/alarm) and the location of any alarms detected, otherwise no personally identifying information about the person scanned is retained by the system to preserve individual privacy.

Threat objects detected: Metallic, ceramic, plastic, liquids, powders, explosives, drugs (powders and granulate), handguns, components of IEDs, knives.

Innocuous Objects Discriminated: Does not have an active discrimination technology but can be set to mask visible areas to prevent hand-carried items from triggering alarms. Items typically carried in pockets or on person should be divested prior to screening, or small items such as keys/wallets/cell phones can be held in the hands while walking through and the system will ignore (i.e., not alarm) on the hands.

Security settings*:* Three settings: A (low sensitivity), B (medium sensitivity) and C (high sensitivity).

Maximum throughput: 750 people per hour, no clothing removal necessary.

Body coverage: Operational height is 1" above unit floor to 79" above unit floor; can scan persons between minimum 3'3" and maximum 6'7" in height.

4.4.2 Deployment and Set-up Features

Alerts, indicators, and localization: A visible alert is provided on portal and on a remote interface. Green and the word "Pass" indicates no detections. Red illumination of portion(s) of the gate indication strip correspond to the general location of detected alarm, while the user interface displays the alert on a gender-neutral body illustration (avatar). (Other messages are used to indicate inadequate scans such as "Walk too fast," or "Walk too slow.")

4.4.3 Deployment and Set-up Features

Environment: Suitable for indoor and protected outdoor environments. IP20 rating.

Operating temperature: Gate and touchscreen from 41–104 °F; server,50–95 °F.

Power: 110 to 240 V AC; 20-foot- long power cord—longer if needed—can be routed to either side.

Interference mitigation: Recommended placement is 25 feet from 5.0 GHz Wi-Fi router.

Interface: On tablet or laptop connected by cable; fixed stand or other VESA mount.[23]

Self-Diagnostics: Internal diagnostics to verify correct operation.

4.4.4 Other Information

Calibration: The system self-calibrates every time the unit boots up. Additionally, a recurring calibration occurs in the background using blank scans when scanner is not scanning personnel. Although typically not required, a manual calibration can be initiated by the operator by pressing the signal bar icon on the user interface.

Optional accessories: Additional resolution monitors can be added.

Interoperability: Security operations center alert management packages; optional QPS Server (separate from QPS Walk2000 server) that can be used to network one or multiple QPS Walk2000 systems, a windows server-based product that uses standard formats to permit interfacing with third party applications (REST API data sharing and non-proprietary, open format JSON data files).

Traffic data collected: Traffic data can be collected.

Training and support: Training programs delivered by R&S product experts ranging from basic operator training (2 hours) to instructor training (train-the-trainer), to advanced user training (administrative & technical; 6 hours) . Training courses, which can be offered locally at a customer location or at one R&S's facilities, are capped at 8 students per class to ensure adequate focus on the hands-on portion of training. Customizable training options can be designed and offered to meet a particular need if required. Access to 24/7 technical support (phone and web-based support) is included with service level agreements.

Standards conformance and other performance testing:

- EU Radio Equipment Directive 2014/53/EU
- European Telecommunications Standards Institute (ETSI) European Standards (EN) 301489-1 & ETSI EN 301489-33
- IEC 61010-1:2010 (3rd. Ed.) & EN 61010-1:2010 (3rd Ed.) Hazardous Substances

Additional conformance test information is available from manufacturer.

Price: $199,000 (subject to change at any time), includes the panels/floorplates, monitor with stand, detection software and gate detection indication lights. Service level agreement, shipping, installation and training priced separately.

- Service Level Agreement: $15,000 per year
- Shipping: Typical $1,200 to $2,400 depending on geographic location
- Installation: $6,500

[23] "VESA mount" refers to standard attachments used to mount flat panel display screens to walls or stands, where VESA is an acronym for Video Electronics Standards Association.

Warranty: Twelve-month parts-only warranty included.

Product website: www.rohde-schwarz.com/us/products/aerospace-defense-security/security-scanner/rs-qps-walk2000_63493-978496.html.

4.5 Thruvision HTC16 High Throughput Camera

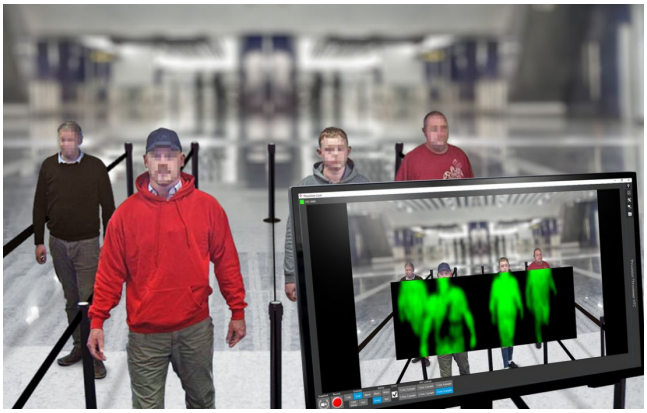

Figure 4-10 Thruvision HTC16 High Throughput Camera interface

Image Credit: Thruvision Ltd.

Figure 4-9 HTC16 High Throughput Camera

Image Credit: Thruvision Ltd.

The Thruvision HTC16 is a stand-off system designed to detect 8" or larger concealed objects at distances of up to 20 feet. It is a people-screening camera with a multi-lane field-of-view for screening multiple lanes of walking people entering conferences, exhibitions, and corporate premises. Subjects pass through the lane one by one, at walking pace without stopping. Outerwear, such as coats and hats, do not need to be removed, but bags must be held out to the side so that the system has a clear view of the subject's body. One lane requires operation by two guards. The first guard is located at the entrance of the lane to ensure that the flow of subjects into the lane is controlled. (An optional large, customized mat with arrow markings can be used to guide subjects through the screening lane.) The second guard is located at the exit of the lane and monitors the system output on the touchscreen display, looking for indications of concealed threats. The camera used by the HTC16 works at a different frequency than typical IR cameras allowing a person's body heat to be visible through clothing. Items concealed under clothing block the heat from reaching the camera, enabling the system to detect the size, shape, and location of a concealed item against the warmth of the person's body. The HTC16 is not capable of showing anatomical details.

The HTC16 system is designed for long-term installation as a 30'x10' walk-through screening area. The system uses two cameras—one mounted at each end of the lane to support simultaneous front and back screening. Cameras are mounted from the ceiling or lightweight overhead gantry; floor mounting using a tripod is also possible. For a more flexible deployment, self-contained mobile camera mountings fitted with wheels can optionally be used instead of the overhead gantry to create a temporary solution that can be removed or relocated within minutes.[24] The user interface is comprised of a high-performance PC, a touchscreen monitor and associated networking components.

Internet connection is not required for operation but can be used to provide network storage of screening video and data.

Sensor dimensions: 9.9" (H) x 24.4" (D) x 24.4" (W).

Stand-off distance range: 13.1 to 19.7 feet. The area screened ranges from 35" x 106" at a standoff distance of 13feet, to 55" x 157" at distance of 20 feet.

Passage width: Adjustable from 3–12 feet, with bi-directional operation.

Sensor weight: 57 lb.

4.5.1 Screening Capabilities and Features

Detection principle: Passive MMW system, frequency range of 100 to 300 GHz (1.2 mm wavelength).

Software image analysis: Conventional image processing chain designed to optimize contrast of concealed items in imagery for human interpretation. Optional deep-learning model can provide automatic indications of possible concealments to assist the operator. Thruvision does not need to record and process personal data for operation. Users may choose to record Terahertz and video imagery in compliance with specific data protection regulations, if required.

Threat Objects detected: All types of large metallic and non-metallic threat items.

Security settings*:* Settings for engineering, administrator, and user accounts, each with their own access credentials and respective system privileges.

Maximum throughput: 1,000 people per hour.

Body coverage: Operational height of up to 95" (7' 11"); whole body detection.

Other sensors: Closed-circuit television video camera lens is positioned on top front of camera, for visual reference and recordings and can capture still images.

Alerts, indicators, and localization: Size, shape, and location of potential concealment indicated to the operator in real-time video images in which potential concealment appears as distinguishable region in the image at the appropriate location.

[24] Another model, the Thruvision TAC16 TDS (Tactical Deployment System) allows the system to be mobile and relocate to different locations. The TAC16 can be mounted on a fixed stand, a Mobile Operator Station (MOS) platform with caster wheels or the TDS, powered by two 110Ah 12V lead-acid batteries with run time of approximately 8 h.

4.5.2 Deployment and Set-up Features

Environment: Indoor use only.

Operating temperature: 41–82 °F though optimal ambient air temperature is 64–72 °F.

Power: AC external power connector socket provided on back side of system with 6' power cord. AC rated range is 100 to 240 V, 50 to 60 Hz; 140 W power consumption. The battery charge time is approximately 6 to 8 hours.

Interference mitigation: A temporary gantry structure, with lightweight ceiling panels, is used to prevent interference from background Terahertz energy in the sky. The ceiling panels need not be used if the system is deployed indoors under a permanent, insulated ceiling.

Interface: Mounting option for operator viewing can be a touchscreen monitor mounted on a fixed stand or a mobile operator station (MOS) swing arm.

4.5.3 Other Information

Calibration: Automatic calibration on initial startup takes approximately 5–10 mins, and no tools are needed.

Optional accessories: Walk-through mat, gantry brackets, fixed stand, MOS, platform with caster wheels, tactical deployment system.

Interoperability: VMSs.

Traffic data collected: Traffic data can be collected if recording features are enabled and the date/time stamp information along with alarms are recorded.

Training and support: Thruvision provides complete system delivery, installation, and training with manuals and documentation upon deployment of system at a location. Thruvision offers standard customer service and support by phone, email, and website with remote diagnostics, service maintenance and repairs throughout the specified warranty/service period.

Standards conformance and other performance testing:

- CE, UKCA, 47 CFR Part 15B (FCC)
- EN 55035:2017 + A11:2020 (EMC immunity)
- EN IEC 62368-1:2020 + A11:2020 (Safety):
- IEC 62368-1:2018, UL/CSA 62368-1:2019
- ETSI EN 300-019-2-2 (T2.2 vibration) when transported in original Thruvision packaging
- 47 CFR Part 15 for an Incidental Radiator (15.3n) as a Class A digital device (15.3h)
- IEC61326-1 Electrical Equipment for Measurement, Control and Laboratory Use- EMC Requirements – Part 1: General Requirements

Additional conformance test information may be available from manufacturer.

Price: Dependent on deployment configurations: approximately $150,000 for a single camera and approximately $300,000 for a fully loaded dual camera walk-through system. GSA pricing schedule GS-07F-9287S.

Warranty: One year factory warranty, with additional years available and a variety of support options.

Product website: thruvision.com/evs-htc16 for entrance and venue security.

thruvision.com/markets-surface-transportation portable model for transportation venues.

5.0 MANUFACTURER CONTACT INFORMATION

Additional information on the systems included in this market survey report can be obtained from the manufacturers, listed in table 5-1.

Table 5-1 Manufacturer Contact Information

Manufacturer	Company Website	Address	Phone Number	Email Address or Web Form
Berkeley Varitronics Systems	www.bvsystems.com	255 Liberty Street Metuchen, NJ 08840	(732) 548-3737	info@bvsystems.com
CEIA USA Ltd	www.ceia-usa.com	6336 Hudson Crossing Parkway, Hudson OH 44236	(833) 224-2342	sales@ceia-usa.com
Elva-1	elva-1.com elva-1.com/products/a40166	Gilland Electronics P.O. Box 1090 Morgan Hill, CA 95038	(408) 778-9049	elva@gilland.com sales@elva-1.com
Evolv Technology	evolvtechnology.com/	500 Totten Pond Road Waltham, MA 02451	(718) 374-8100	evolvtechnology.com/contact
Garrett	garrett.com/security	Security Division 1881 West State Street Garland, Texas 75042	(800) 234-6151	security@garrett.com
Liberty Defense Technology, Inc.	libertydefense.com	187 Ballardvalle Street Wilmington, MA 01887	(613) 292-3669	imcnaughton@libertydefense.com
Metrasens	www.metrasens.com	1842 Centre Point Circle Suite 110 Naperville, IL 60563 USA	(630) 541-6509	info@metrasens.com
Passive Security Scan, Inc.	www.passivesecurityscan.com	6475 East Johns Crossing Johns Creek, GA 30097	(800) 520-9485	pssi@passivesecurityscan.com
Qinetiq	www.qinetiq.com/en	1800 Tysons Boulevard Suite 750 McLean, VA 22102	(540) 658-2720	www.qinetiq.com/en/contact-us

Manufacturer	Company Website	Address	Phone Number	Email Address or Web Form
Rapiscan	www.rapiscansystems.com/en/technologies/metal-detection	2805 Columbia Street Torrance CA 90503	(310) 978-1457	www.rapiscansystems.com/en/contact support@rapiscansystems.com
Rohde & Schwarz USA, Inc.	www.rohde-schwarz.com/securityscanner	6821 Benjamin Franklin Drive Columbia, MD 21046	(888) 837-8772	securityscanner@rohde-schwarz.com
SoundThinking, Inc.	safepointe.com/	39300 Civic Center Drive #300 Fremont, CA 94538	(510) 794-3135	www.soundthinking.com/contact/general
Thruvision	thruvision.com	21140 Ashburn Crossing Drive Suite 140 Ashburn, VA 20147	(540) 878-4844	thruvision.com/contact
Xtract One	www.xtractone.com	Suite 400, 257 Adelaide Street West, Toronto, ON M5H 1X9 Canada	1-888-680-7110	sales@xtractone.com

6.0 CONCLUSIONS

This market survey identified a total of 15 walk-through weapons detection systems. Ten screening systems detect metallic threats based on their electrical conductivity and magnetic permeability. Five of the ten products are active WTMD systems that use circuitry to generate a magnetic field between side panels or columns that define a portal; these systems are capable of detecting both ferromagnetic and non-ferromagnetic metal objects. Five products are passive systems that use the earth's magnetic field and are primarily expected to be capable of detecting ferromagnetic objects. Seven of the ten WTMDs provide the operator with an indication of the location of the threat object. Some products have additional capabilities, such as providing the operator with an optical image of the person being screened. Product weights range from 17 lb. to 334 lb. A few may be portable for short term operations; most are transportable and suitable for longer-term applications, while one is designed to be integrated with building structure for semi-permanent installation. Approximate manufacturer's suggested retail prices were provided for four of the systems, ranging from $5,000 to $19,000.

This market survey also identified five walk-through systems that use imaging principles to detect concealed metallic or non-metallic threat objects based on their reflective properties, rather than their conductivity. The two active systems generate MMW to illuminate the person being screened as they walk through a portal. The other three systems operate in a stand-off configuration. Two are based on passive MMW detection that senses a part of the spectrum of thermal radiation naturally given off by the human body in order to detect objects concealed under clothing. The other stand-off system uses active "non-imaging radar" MMW to illuminate the person being screened. Prices provided for four of these systems range from $80,000 to $300,000.

The purpose of this market survey is to provide public safety and emergency response agencies with information to guide them in making operational and procurement decisions. Performance of these products and information included in this report has not been independently verified by the SAVER program. Agencies should consider overall capabilities, technical specifications, and limitations in relation to their mission and operational needs, as well as potential impacts associated with integration with IT infrastructure, data management, CONOPS, and required maintenance when making equipment selections.

7.0 ACKNOWLEDGEMENTS

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8.0 REFERENCES

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Appendix A. INGRESS PROTECTION LEVELS (IP CODE)

This section provides information on the levels of IP as specified by the 2-digit designations in the IEC 60529 standard [15]. Table A-1 provides levels of solid IP (first digit). Table A-2 provides levels of liquid IP (second digit).

Appendix Table A-1 Levels of Solid IP per First Digit of IP Code

Digit	Object Size Effective Against	General Description
0	No Protection	No protection against contact and ingress of solids
1	> 50 mm	Large surfaces, e.g., back of hand, but no protection against deliberate contact with body part
2	> 12.5 mm	Prevents entry of fingers and similarly sized objects
3	> 2.5 mm	Prevents entry of tools, thick wires, etc.
4	> 1 mm	Prevents entry of most wires, screws, large ants, etc.
5	Dust Protected	Dust ingress not entirely prevented but does not enter in sufficient quantity to interfere with satisfactory operation of equipment
6	Dust Tight	No ingress of dust

Appendix Table A-2 Levels of Liquid IP per Second Digit of IP Code

Digit	Water Exposure Protection	General Description
0	No Protection	No protection
1	Vertically dripping water	Vertically dripping water has no harmful effects
2	Dripping water, enclosure tilted up to 15 degrees	Vertically dripping water has no harmful effects when enclosure is tilted at an angle up to 15 degrees of normal vertical position
3	Spraying water	Water sprayed at angles up to sixty degrees from the vertical position has no harmful effects
4	Splashing water	Water splashed against the enclosure from any direction has no harmful effect
5	Water jets	Water projected by a nozzle (6.3 mm) against enclosure from any direction has no harmful effects
6	Powerful water jets	Water projected in powerful jets against the enclosure from any direction has no harmful effects
7	Temporary immersion in water	Ingress of water in harmful quantity is not possible when the enclosure is temporarily immersed in water under standard conditions or pressure and time
8	Continuous immersion in water	The equipment is suitable for continuous immersion in water under conditions more severe than for numeral 7