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NATIONAL URBAN SECURITY TECHNOLOGY LABORATORY

SAVER TechNote

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RFID EVIDENCE MANAGEMENT

Law enforcement agencies maintain extensive inventories of crime scene evidence, such as blood stains, hair, fibers, firearms, fingerprints, documents and specimens from sexual assault kits. The proper collection, labeling and tracking of evidence gives credence that the evidence presented in court is the same evidence that was collected at the crime scene. Radio frequency identification (RFID) technology can help facilitate, standardize and automate inventory and asset tracking tasks for law enforcement's management of evidence.

This equipment falls under the Authorized Equipment List (AEL) reference number 04HW-02-RFID titled "Devices, Radio Frequency Identification."

RFID Evidence Management System Overview

RFID evidence management systems have four basic components: tags, readers, middleware and an evidence management database to store and manage information obtained from the tags and readers. RFID tags contain a microchip encoded with unique identifiers, which can be associated with individual evidence items. An antenna on the tag is scanned by a radio frequency transmitter/receiver that forwards the embedded data to the system's middleware software.

The middleware translates and formats the raw tag data into logical database fields that it exports to an evidence management software application. This software allows property managers to check in evidence, conduct inventories, document evidence transfers, generate evidentiary chain-of-custody records and manage the disposition of evidence.

One advantage of an RFID evidence management system is the ability to scan multiple tags simultaneously, without physically locating and handling each piece of evidence. Inventories can be completed within minutes, instead of days or weeks. In addition, individual items stored in evidence rooms containing thousands of objects can be located quickly. Users should be aware that scans only reflect the presence of the RFID tag, not the actual evidence item should the tag become detached. Metal containers and overcrowded evidence bins may also interfere with RFID detection by blocking radio signals or limiting the tag's range.

RFID System Components

RFID Tags

Tags are classified as *passive*, *active*, or *semi-active*. *Passive tags* are the most commonly used due to their long life and low cost. A passive tag, as shown in Figure 1, consists of a printed antenna and an integrated circuit, or chip, which has a unique digital ID. Some tags also have the capability to store user-defined data directly on the tag. Powered wirelessly by signals from an RFID reader, passive tags have no battery, allowing them a long lifespan and enabling them to be as small as envelope address labels. A passive RFID tag transmits information only if queried by a reader and has a limited read range of 1–50 feet, depending on tag technology, placement and the RFID reader's power.

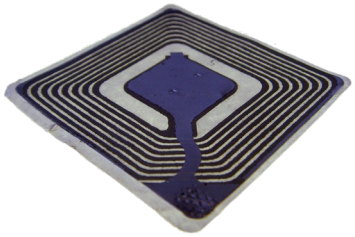

Figure 1. Passive RFID Tag
Image Credit: Maschinenjunge/ CC-BY-SA-3.0 Wikimedia Commons

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) program to inform emergency responder equipment selection and procurement decisions.

Located within the Science and Technology Directorate, the National Urban Security Technology Laboratory (NUSTL) manages the SAVER program and works with emergency responders to conduct objective operational assessments of commercially available equipment.

SAVER knowledge products 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?"

To explore the full library, visit SAVER online at www.dhs.gov/science-and-technology/saver-documents-library.

For additional information on the SAVER program, email NUSTL at NUSTL@hq.dhs.gov.

Science and Technology

Active tags have onboard batteries that increase their read range and power any embedded sensors. Some active tags have adjustable read ranges from one foot to 1.9 miles. Active tags can transmit data at predefined intervals without waiting for a reader's signal, providing near-continuous presence tracking for valuable or sensitive evidence. They are, however, more expensive than passive tags. *Semi-active tags* have batteries to increase range or power sensors, but like passive tags, only transmit when queried by a reader. Some active and semi-active tags have security measures to detect attempts to remove or tamper with them. One example is a security strap, an RFID tag similar to a zip-tie, that, once tightened, will emit a signal if cut or stretched. Active or semi-active tags may be used to supplement a system that primarily uses passive tags.

RFID tags are available in a multitude of sizes, materials and forms that can be fitted to most types of evidence packaging. Tags can typically incorporate printed information on their label, including case ID numbers and barcodes. Sensor-based features, such as temperature and humidity monitoring, are available on active and semi-active tags; however, battery life and cost must be considered if these tag types are incorporated into an RFID system.

RFID Readers

Handheld readers (see Figure 2) are the most commonly used readers. Facility-based systems may also incorporate doorway-mounted portal readers like those seen at department store exits. These readers emit radio waves to power passive tags, trigger a response from all tag types and capture the RFID tags' response data. Portal readers can allow for automated evidence logging or trigger alarms if evidence is removed from a room without being properly checked out. A facility may use additional, specialized, fixed readers to assist in the precise tracking of evidence through signal triangulation.

Figure 2. RFID Handheld Reader
Image Credit: Sraleppal/CC-BY-SA-3.0 Wikimedia Commons

Software: Middleware and Database

Two types of software are required for an RFID evidence management system. *Middleware* collects data from RFID readers, appends it with information (e.g., date, time, and reader location), and formats that data for export into an evidence management database. An *evidence management database* is typically a separate application and can be configured to collect information from multiple sources, such as manual entry, barcodes and RFID. This software is used to associate evidence with specific cases, record evidence transfers, generate chain-of-custody records, and document evidence disposition.

Application of RFID Evidence Management

RFID systems can read multiple tags simultaneously, allowing near-instant inventory of relatively large areas. Missing evidence can be quickly located by sweeping rooms with readers as opposed to manipulating individual items. RFID evidence management systems can be as minimal as passive tags with handheld readers, or can be expanded to include features like portal readers and active tags for the continuous tracking of sensitive or high-value items of evidence.

Relevant Standards and Regulations

Evidence management software that is networked to departmental systems may need to comply with standards established by the Federal Bureau of Investigation, Criminal Justice Information Services (CJIS) division. CJIS compliance ensures information storage and transmission methods meet federal security standards for sensitive data. [1] Also, RFID readers are subject to regulation under Federal Communications Commission rules in the Code of Federal Regulations, Title 47, Part 15. [2]

References

[1] Federal Bureau of Investigation, "Criminal Justice Information Services (CJIS) Security Policy," 16 8 2018. [Online]. Available: https://www.fbi.gov/file-repository/cjis-security-policy_v5-7_20180816.pdf/view. [Accessed 15 1 2022].

[2] Federal Communications Commission, "Equipment Authorization - RF Device," 2022. [Online]. Available: https://www.fcc.gov/oet/ea/rfdevice. [Accessed 15 3 2022].