

High Definition-Advanced Imaging Technology Shoe Scanner



Science and
Technology

ADDRESSING THE NEEDS OF THE FUTURE

The Department of Homeland Security (DHS) understands the importance of updating airport passenger screening systems to stay ahead of security risks, but also to accommodate the growing number of passengers that are traveling each year.

The DHS Science and Technology Directorate (S&T) is developing systems for the Transportation Security Administration (TSA) to increase efficiency and effectiveness, while improving the passenger experience. One of those systems is a shoe scanner that can detect prohibited items without passengers having to remove shoes at the checkpoint.



High Definition-Advanced Imaging Technology Shoe Scanner.
Photo Credit: Pacific Northwest National Laboratory.

SHOES STAY ON AT THE CHECKPOINT

The S&T Screening at Speed Program develops next generation screening for TSA and has partnered with the Department of Energy's Pacific Northwest National Laboratory (PNNL) to develop a shoe scanner that could provide a fast and efficient alternative to current security practices at airports.

When a passenger steps onto the shoe scanner, harmless millimeter-waves pass through the sole of the shoe and the data is sent to a detection algorithm for review. For the prototype, the footwear scan takes about two seconds and image processing about five seconds. In the future, the shoe scanner could be incorporated into the floor of passenger screening systems so that passengers and their shoes can be screened simultaneously, reducing the inconvenience of passengers having to remove their footwear.

HIGH-DEFINITION IMAGING

The backbone of the shoe scanner is built on millimeter wave High Definition-Advanced Imaging Technology (HD-AIT),

which provides better quality images than current screening systems, reduces false alarms that lead to secondary screening, and is built on an open architecture that allows rapid software updates and the use of third-party detection algorithms to identify prohibited items.

Utilizing third-party algorithms enables TSA to leverage the most cutting-edge detection algorithms available regardless of if the company developing the algorithm currently provides screening hardware to TSA.

WHERE IS DEVELOPMENT NOW?

The S&T Transportation Security Laboratory (TSL) has performed technical evaluations of the system and of a prototype detection algorithm for the shoe scanner. The shoe scanner was licensed to Liberty Defense Holdings, Ltd., for commercialization and won the Research and Development World 100 award as well.

RECENT ACCOMPLISHMENTS

- Demonstrated and conducted early-stage testing of the rotational HD-AIT shoe scanner at TSL (FY23 Q3)
- Completed detection evaluation of shoe scanner with an automatic threat recognition algorithm without requiring passengers to remove their shoes (FY24 Q3)

UPCOMING MILESTONES

- Kickoff planning with TSA for a shoe scanner airport demonstration (FY26 Q3)
- Conduct a shoe scanner airport demonstration to detect threats in footwear without having to remove shoes to gather feedback from passengers and TSA Transportation Security Officers (FY27 Q4)

SHOE SCANNER SCREENING PARTNERS

- PNNL, Richland WA
- Liberty Defense Holdings, Ltd., Wilmington, MA
- TSL, Egg Harbor, NJ
- TSA Requirements and Capabilities Analysis, Springfield, VA

