

DHS Science and Technology Directorate Precision Outdoor and Indoor Navigation and Tracking for Emergency Responders (POINTER)

Keeping track of our nation's first responders in dangerous situations

When responders arrive at the scene of an emergency and rush into a building, it is critical their team knows their exact location at all times. In situations with heavy smoke, debris, or line-of-sight obstructions, maintaining awareness of responder locations not only enhances real-time response efforts but also saves precious seconds when a responder is injured or lost.

Despite recent advances in position tracking, radio-based systems—such as global positioning systems (GPS), ultra-wideband systems, radio-frequency identification systems, and sensor fusion methods—do not perform well in non-line-of-sight environments where obstructions such as walls, heavy foliage, hills, or mountains can block signals. In addition, with traditional radio-based systems, performance decreases due to energy loss as radiation passes through matter, causing the signal to be lost. These drawbacks severely limit their use by first responders, who need tracking technology that functions in any response scenario.

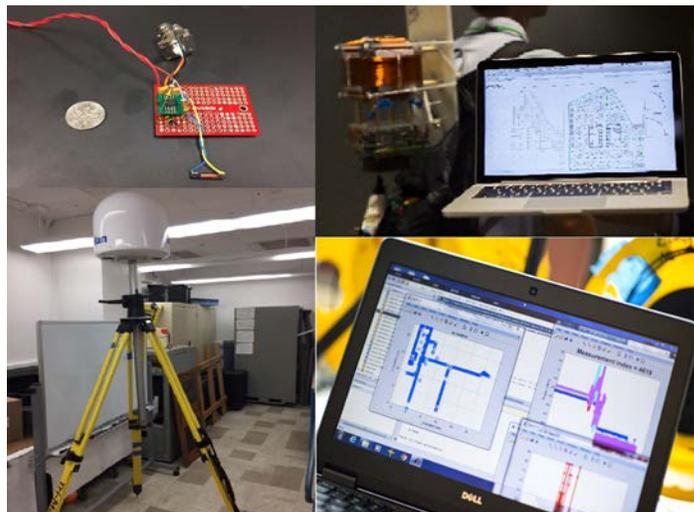
Revolutionizing tracking capabilities for a more precise response in any environment

Enter POINTER: Precision Outdoor and Indoor Navigation and Tracking for Emergency Responders. Currently under development by the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) and the National Aeronautics and Space Administration Jet Propulsion Laboratory (NASA JPL), POINTER is a precision positioning sensor system that locates first responders via low-frequency magnetic fields that can transmit signals through materials including wood, concrete, brick, and rebar.

POINTER's low-frequency magnetoquasistatic energy field can also penetrate most materials without energy loss, determining a responder's location—to the exact floor in a building and the responder's orientation. This information can be directly relayed to the incident command post or dispatch.

Specifically, POINTER:

- Monitors 3-D location and motion tracking;
- Works in- and outdoors, above- and below- ground, and underwater; and



Prototype components of the POINTER system are tested. The receiver worn by first responders will be approximately the size of a cell phone.

- Enables precise positioning for several response applications. The first version of POINTER includes long-range in-building positioning and use in heavily-cluttered electromagnetic environments where line-of-sight to the device may be blocked. Future versions will include ground-to-underground positioning for individuals inside tunnels, mines, or bunkers.

The POINTER system is unobtrusive to the first responder. Responders wear a small receiver which obtains the signal from transmitters at a base-station or command post. These receivers have low energy needs and batteries will last through multiple responses.

Preparing POINTER activities and milestones

POINTER is currently able to track first responders at a distance of 70 meters (m) with an error rate of less than 2 m. The project team is working on increasing this distance while maintaining or improving the error rate and miniaturizing the device.

POINTER should be available to first responders in 2019. This version will be designed for use in single family homes, warehouses, and buildings that are 12 stories or less. Future versions of POINTER will accurately track first responders in high-rise buildings, outdoors, and underground.



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To learn more about POINTER, contact first.responder@hq.dhs.gov.