

# DHS Science and Technology Directorate

## Precision Outdoor and Indoor Navigation and Tracking for Emergency Responders (POINTER)

### Keeping tabs on our nation's first responders for a more coordinated response

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.

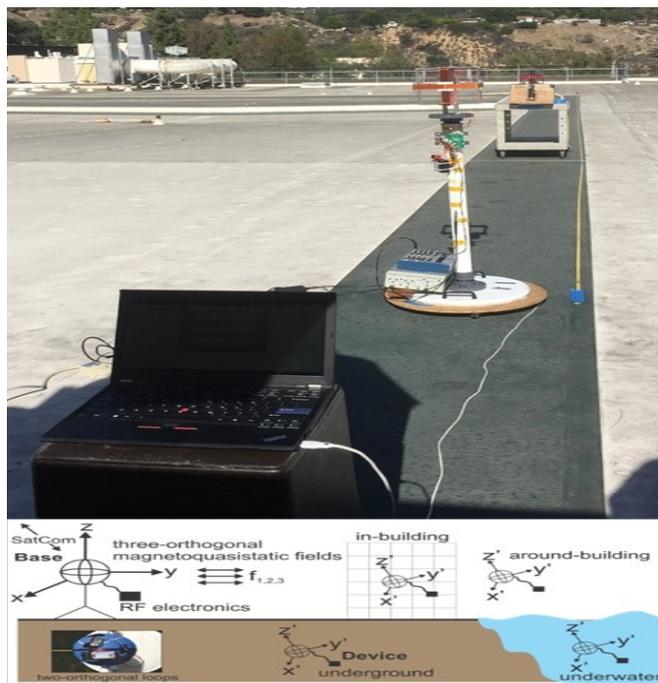
Despite numerous advances in position tracking in recent decades, radio-based systems—such as global positioning systems, ultra-wideband systems, radio-frequency identification systems, and sensor fusion methods—suffer reduced performance in non-line-of-sight environments where obstructions such as walls, trees, hills, or mountains can block signals. These drawbacks severely limit their use by first responders, who need tracking technology that functions in any response scenario.

Enter POINTER: Precision Outdoor and Indoor Navigation and Tracking for Emergency Responders. Currently under development by the U.S. Department of Homeland Security 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.

### Revolutionizing tracking capabilities for a more precise response in any environment

S&T and NASA JPL's goal is a tool first responders can use to accurately track position and orientation in the most diverse and complex environments.

With traditional radio-based systems, performance decreases due to energy loss as radiation passes through matter, causing the signal to be lost. In contrast, POINTER's system of electrically-small magnetic field loops generates a magnetoquasistatic energy field that can penetrate most materials without energy loss, determining a responder's location—to the exact floor in a building. Responders wear a small transmitter which sends the signal to receivers at a base-station or command unit.



Recent POINTER demonstration at NASA JPL in Pasadena, California. When complete, POINTER will operate in and around buildings, underground, and underwater.

Specifically, POINTER:

- Administers 3-D location and motion tracking,
- Works in- and outdoors, above- and below-ground, and underwater, and
- Enables precise positioning for a large number of response applications. This includes long-range in- building positioning, air-to-underground positioning for individuals inside mines or bunkers, and heavily- cluttered electromagnetic environments where line- of-sight to the device may be blocked.

### Preparing POINTER for responder field testing

The project has two phases:

- Build, experiment with, and test functionality of an initial prototype
- Design and construct a system for testing by first responders in real-time and realistic environments

Currently in phase II of development, a prototype capable of providing location and height information will be available in 2016. A commercialized system is expected in 2017.



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