

POINTER

*Precision Outdoor and Indoor Navigation
and Tracking for Emergency Responders*

Problem

Need for centimeter to meter accuracy (“xyz” axis), real-time geolocation technology in GPS-denied environments where GPS and all other geolocation technologies fail to perform, resulting in unmitigated risk to human lives and high value assets.

Solution

POINTER is a precision positioning sensor that locates first responders via low frequency magnetic fields that can transmit signals through materials including wood, concrete, brick, earth and metals for indoor, underground, underwater, and metallic environments.

End Users

- First Responders
- Military
- Commercial

Technology Sponsors

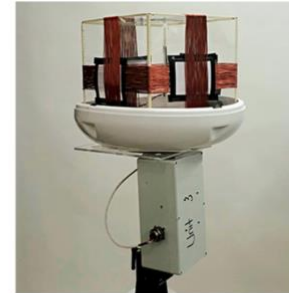
- DHS
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- CDC
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Current prototype of the POINTER receiver, which is worn by responders entering a structure. What is now the size of a cell phone will ultimately be reduced in scale and potentially integrated into existing firefighting equipment.



Current prototype of a POINTER transmitter. The transmitters use magnetoquasistatic (MQS) fields to communicate with the receivers worn by responders. POINTER transmitters deployed.

About POINTER

Developed by the Department of Homeland Security Science and Technology Directorate (S&T) and the [NASA Jet Propulsion Laboratory \(NASA JPL\)](#), POINTER is groundbreaking new first responder tracking and location technology that allows first responders to pinpoint their colleagues more precisely in emergencies. Using the POINTER system, first responders can not only track team members to the exact floor in a building, but also determine whether they are still or in motion, standing upright or lying down.

Unlike existing GPS-based tracking technologies, POINTER uses magnetoquasistatic (M/EQS) fields to geolocate individuals and high-value assets in environments where line of sight is severely compromised. POINTER can penetrate natural materials like dirt, earth, water and metals from a standoff distance of 75 meters and may be extended to kilometers based upon system configuration and environment, determining an individual’s exact position within one centimeter of accuracy.

POINTER does not require a network of built-in infrastructure; the system consists of receivers worn by first responders that are smaller than a cell phone, transmitters positioned outside the scene, and a base station laptop that runs algorithms to track and display individuals in real-time.

This location and tracking technology was the number one priority identified by members of S&T’s [First Responder Resource Group](#), and the responders’ input has been incorporated throughout the research and development process. Additional operational field testing will continue throughout 2021 (TRL 7/8). POINTER is scheduled to be commercially available for agencies to purchase in 2022.

How does POINTER work?

What are Magnetoquasistatic (M/EQS) fields?

M/EQS fields are magnetic fields with very slow temporal variations that appear static and can penetrate through natural materials just like the Earth’s magnetic field. As a result, they can be used in a broad array of sensor applications.

How does POINTER's M/EQS positioning differ from other responder tracking technologies?

Several tracking technologies currently exist that use GPS, acoustic sensors, radar ranging, ultra-wideband ranging, inertial sensing or vision techniques. However, there are drawbacks, including: high error rates due to multi-path or signal bouncing in LoS-denied environments; inability to penetrate into buildings, underground, and underwater; a drift in position results that increases quickly over time or distance traveled; or requirements for a large network of built-in infrastructure in order to operate.

These drawbacks severely limit their use in life-or-death first responder applications. By using M/EQS fields, POINTER can be quickly deployed and can track and locate first responders in multiple environments within centimeters of accuracy.

How does POINTER Work?

M/EQS fields can be used for short or long-range position sensing in Non-LoS environments. The POINTER system consists of three parts that each play a unique role in pinpointing responders' exact location within centimeters:

- **Transmitters** based at the incident scene generate M/EQS fields and use complex sensors and algorithms to solve for position and orientation in 3D space (**x, y, z axis**). This allows command to pinpoint responders' location precisely, including which floor a team member is located on and whether they are in motion, standing or lying down.
- **Receivers** (cell phone size) worn on PPE by first responder and detected in unique M/EQS fields.
- **Base Station** allows an incident commander to view responders' locations in real-time as they make their way through an incident scene.

FAQs

Who is leading POINTER's research and development?

DHS S&T is funding NASA Jet Propulsion Laboratory, based at the California Institute of Technology in Pasadena, California, to develop the POINTER system. S&T is also working with industry partner Balboa Geolocation, Inc. to prepare the technology for the commercial marketplace in 2022. Robust patent estate, including 13 issued and pending patents.

How accurate is POINTER's tracking capability?

POINTER can accurately track a responder's location to within centimeters to a meter from a standoff distance to 75 meters and may be extended to kilometers based upon system configuration and environment.

How many Receivers can be tracked and visualized by a single Transmitter and Base Station?

>100 Receivers (individuals)

Can POINTER be integrated with other technologies?

Yes. POINTER can be integrated with communication systems, visualization software, GPS, imaging (e.g., acoustic, thermal, radar), and other geolocation technologies. POINTER may also improve functionality of autonomous and robotic tactical solutions.

When will POINTER be commercially available?

A soft commercial launch is targeted for early 2022, with a full commercial rollout of first-generation POINTER expected in second half 2022. Updates will be posted on the DHS S&T website, as well as via industry partner [Balboa Geolocation, Inc.](#)