

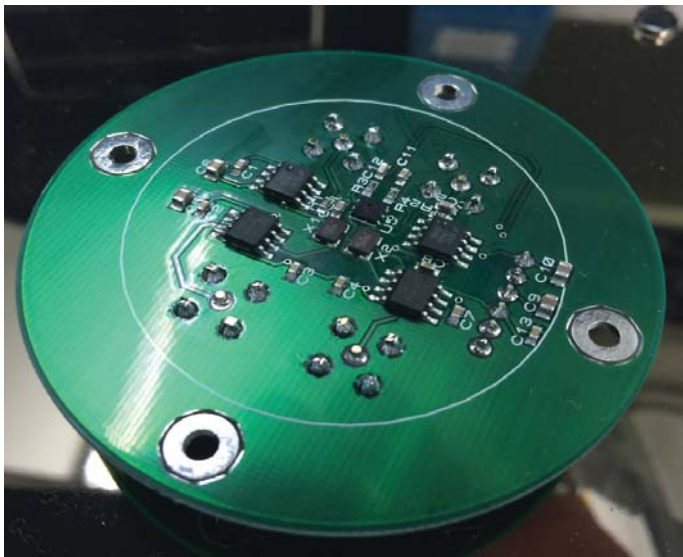


Explosives Detection: Portable, Integrated Microscale Sensors (PIMS)

A DHS Science and Technology Center of Excellence Solution

Making a Smaller, Faster, More Reliable Sensor

Each day, millions of people board airplanes in the United States and tens of millions of pieces of cargo are screened and loaded onto aircraft and ships and transported across the globe. To stay one step ahead of security threats involving explosives, researchers in the School of Mechanical Engineering at Purdue University, in association with the Department of Homeland Security (DHS), Science and Technology Directorate (S&T) Center for Awareness and Localization of Explosives-Related Threats (ALERT), are developing a new explosives detection technology: Portable, Integrated, Microscale Systems (PIMS), to increase screening reliability and accuracy without impacting the screening process for passengers and cargo.



A representative PIMS sensor. Future generations of the device would be even smaller than that depicted here, which is approximately the size of a dollar coin.

These small-scale, cost-effective, sensing systems would be ideally suited for integration into new or existing baggage, cargo, and passenger screening portals. In addition, they could be integrated into building ventilation systems or placed within handheld portable devices, enabling enhanced building and infrastructure security.

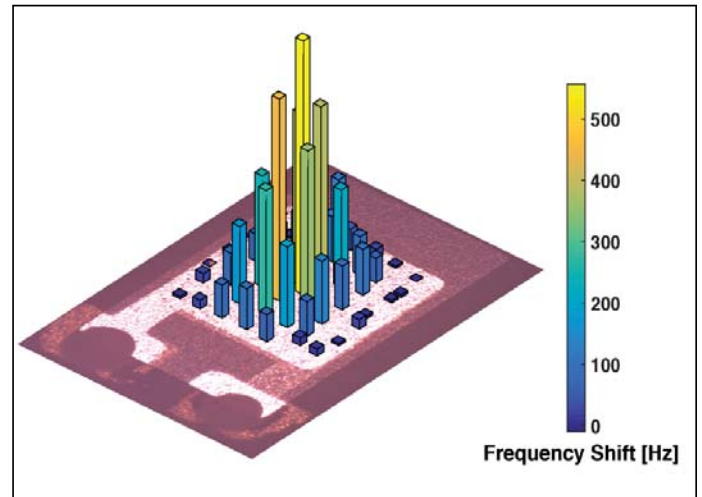
How It Works

The PIMS devices in development use a novel mechanism for sensing explosives. Explosives vapors interact with a functional polymer layer deposited upon the oscillating surface of a microscale cantilever beam. When these explosives vapors interact with this

part of the sensor, its oscillating frequency and amplitude change, signaling a positive detection. Because of this novel approach, the team is able to greatly simplify the associated control electronics, which makes them cost-effective and more portable.

Key PIMS features:

- Provides a simple go/no-go indicator for screeners
- System sensitivity can be widely tuned to control false detection rate
- Able to be integrated into existing screening portals or ventilation monitoring systems



Experimental sensitivity map.

Partnering for Success

To facilitate rapid and seamless technology transition, researchers at both Purdue University and ALERT partner with key DHS entities, including:

- Transportation Security Administration,
- U.S. Customs and Border Protection,
- U.S. Coast Guard,
- U.S. Secret Service, and
- Federal Protective Services