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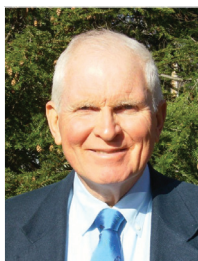


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Homeland Security: Old Concept, New Technologies



Thomas O. Perkins
Senior Technical Editor

“Homeland Security” has been a priority in this country at least since the Minutemen of Middlesex County, Massachusetts were organized by colonists in the 17th century. These were not the only Minutemen; for example, there were also the Culpeper Minutemen in Virginia, so named as they trained to respond “at a minute’s notice.” Over the years, various terminologies have been employed to describe this important function including Civil Defense, used for many decades during the Cold War. In those days of the 1950s and 60s, electronics’ role was typically in emergency radio communications, CONELRAD (CONtrol of ELectromagnetic RADiation), and Geiger counters. In the wake of 9/11/01 the definition has expanded to include emphasis on making transportation safe from potential terrorist attacks, particularly air travel.

As is typically the case in our world of rapidly developing technology, many innovative techniques have coalesced to detect threats and disruptive behavior. Sensor technology has grown significantly and real-time tracking via satellite GPS and smartphones is commonplace. Active and passive tags such as RFID devices have also become commonplace in recent years which also enhances detection of threatening contraband. Even the use of unmanned aerial vehicles for surveillance, albeit expensive, has matured significantly.

Terahertz Holds Promise

In our February issue Publisher Scott Spencer made reference to T-rays. New breakthroughs enabled by Terahertz technology—radiation at frequencies above millimeter-wave but below visible light—offer a partial solution to providing higher levels of security screening.

Terahertz energy can penetrate fabrics and plastics, and therefore it has strong potential for remote detection of concealed weapons or smuggled goods. Some materials of interest have unique spectral “fingerprints” in the terahertz range. This offers the possibility to combine spectral identification with imaging. The passive detection of terahertz signatures may avert the privacy concerns that arise with other detection techniques because it targets a very specific range of materials and objects.

NASA’s Jet Propulsion Laboratories (JPL) recently reported a 675 GHz imaging radar using a FMCW radar technique with approximately 30 GHz bandwidth. Range resolution of less than 1 centimeter with 3-D spatial attributes can be obtained with complementary digital signal processing and other emerging support technology. This equipment has the potential

to detect concealed weapons from a long standoff range.

In recent years successful companies have emerged that focus on imaging. One example is Millivision Technologies of South Deerfield, Mass. In addition to detecting concealed threats, they also seek to prevent the loss of physical and intellectual property. As metal detectors are no longer adequate in the face of composite guns, ceramic knives and plastic explosives, Millivision employs passive millimeter-wave imaging coupled with an Automatic Threat Detection Tool capable of scanning up to 900 people per hour.

Researchers at MIT Lincoln Laboratories have developed a new radar that can provide real-time video of activity behind solid walls. An antenna array of 8 receiving elements and 13 transmitting elements, coupled with the use of crystal filters and operating at S-Band (2 - 4 GHz) permits detection of activity behind heretofore impenetrable objects. A key component of this system is the signal processing, which allows the observer to see small changes in the target image while ignoring large radar returns from obstructing objects such as cinder-block walls.

In This Issue

Dr. Tom Williams, CTO at Millivision Technologies, addresses "Passive Millimeter-Wave Imaging for Security."

Ray Swanson of X-COM Systems explains how to uncover and identify RF interference in long-term spectrum capture files and how to solve this challenge.

Upcoming Events

A special note regarding the Microwave & RF Exhibition, set for April 3 - 5 in Paris. Readers who may have attended Hyper & RF in the past will likely remember show manager Sylvie Cohen. She is now

the driving force behind Microwave & RF, so it's a safe bet that a visit to this event will represent time well invested. For more info please visit <http://www.microwave-rf.com/?lang=EN>.

It's not too early to register for the IEEE MTT-S International Microwave Symposium 2012, scheduled for June 17 - 22 in Montreal.

This is only the second time in the 60-year history of the Microwave Theory and Techniques Society that the event will be held in Canada. The previous occurrence was in Ottawa in June 1978. See <http://www.ims2012.org/>.

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