GEORGIA TECH RESEARCH

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U. S. ARMY GETS NEW MILLIMETER WAVE DIRECTION FINDER; EQUIPMENT FOR ASSESSING RADAR VULNERABILITY

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moss - 8244
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The growing use of millimeter wave radar devices has created a demand for equipment to detect and track hostile radar signals -- and to assess the vulnerability of U.S. radars to interception by hostile forces.

To help meet those needs, U.S. Army Communication-Electronics Command (CECOM) and the Georgia Institute of Technology have worked together to develop direction finding systems that can pinpoint the location of millimeter wave radars and collect data about the signals. The equipment has also been modified to help Army researchers study means of protecting U.S. radars from interception.

"We're collecting and analyzing data about signals in the millimeter wave environment," explained Richard Moss of Georgia Tech's Electronics and Computer Systems Laboratory. "Many of these are hostile signals, and the objectives are to receive those signals, measure parameters such as pulse rate and frequency, and to measure the angle of arrival."

Three different millimeter wave direction finding systems have been built for the Army, and the most recent was delivered to the Army's Vulnerability Assessment Laboratory at White Sands. That system provided improved performance, and will be used to help determine the vulnerability of U.S. systems to interception.

Georgia Tech researchers are now miniaturizing the direction finding equipment for possible use in an unmanned aerial vehicle (UAV), and a ground-based vehicle. The equipment grew out of MEDFLI, a military signal collection system for which Georgia Tech developed millimeter wave tracking systems.

The equipment monitors military millimeter wave frequency bands, and can detect exotic signals, reported Research Engineer William Butler.

The direction finding system can track several signals at once, using special software to display the data in real time, store it for later analysis or produce a graphics-based histogram of the information. Among the pulse parameters collected are the repetition rate, angle of arrival, width, frequency and amplitude.

Butler - 3541
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The system can scan through the millimeter wave frequencies, and includes provisions for reducing unwanted interference from multipath.

The Army has recognized the growing importance of the millimeter wave band for a number of years, Moss said, and took steps in 1981 to ensure the availability of the direction finding equipment.

"More and more potentially hostile threat emitters are moving up into the higher frequency regions for a variety of reasons," he explained. "They are trying to escape detection, and they can get much higher resolution and enhanced technical capabilities by moving up to the millimeter wave frequency region."

In developing the system, researchers had to solve several tough technical problems, Moss noted.

"One of the fundamental problems of any signal collection system is the probability of intercept: what is the probability that a signal collection system can be at the right place physically and electronically," he said.

That issue affects the rotation speed chosen for the parabolic reflector which collects signals. A fast-scanning antenna may sweep right past a slow pulse-rate signal without picking it up. On the other hand, a slow scanning rate might cause the radar to miss a signal that is emitted for just a brief time.

For these reasons, multiple rotation speeds are featured in the system, and specially designed software algorithms are used to deliver a "line-of-bearing" on the target.