

GEORGIA TECH RESEARCH

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Picture of the tower @ Redstone

News Release

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**U.S. ARMY MICOM GETS HIGH-POWERED
95 GHz RESEARCH RADAR TO STUDY
MILLIMETER WAVE TARGETS & CLUTTER**

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Millimeter wave sensing devices offer substantial advantages over conventional optical and infrared sensors. But many questions remain to be answered about the resolution needed to differentiate targets, the best waveforms to use, and how target and clutter scattering characteristics differ in the millimeter wave spectrum.

To find answers, the U.S. Army Missile Command (MICOM) in Huntsville joined forces with the Georgia Institute of Technology to build a 95 GHz research radar system known as HIPCOR -- a high power, coherent radar for studying targets and clutter.

"HIPCOR is a research tool which will allow the Army to gather data to help understand the basic research problems in millimeter wave radar systems and guidance work," explained Ted Lane, Senior Research Scientist in Tech's Radar and Instrumentation Laboratory (RAIL).

Researchers can vary a number of HIPCOR's system parameters, including polarization, frequency bandwidth, frequency step size and pulses, giving it flexibility unusual for a coherent radar of its power, he said.

Scheduled for installation in February at the Redstone Arsenal in Huntsville, Alabama, HIPCOR will be part of MICOM's new Target and Seeker Measurement Facility (TSMF).

The TSMF provides a superior test facility for millimeter wave, radio frequency, infrared and electro-optical signature measurements, and for the evaluation of seekers using those technologies. It consists of a 329-foot tower, a mobile turntable capable of supporting 70 tons, and approximately 30 acres of test area.

The tower, holding a 32 by 17 foot laboratory, provides sufficient stability to permit high resolution millimeter wave and infrared measurements even under windy conditions. It looks down on a mobile turntable which can rotate a target and move it into different types of background to perform scattering comparisons.

An elevator in the tower permits target scattering measurements from different angles.

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The HIPCOR system is remotely controllable using special hardware and software also developed by Georgia Tech engineers. As configured, a MASSCOMP computer serves as primary radar controller and data acquisition system for the HIPCOR.

Tech is developing additional software that will allow the MASSCOMP to handle the data reduction, data analysis, and system diagnostic work, much of the process in real time.

With the MASSCOMP's off-line processing power and special waveform generation, HIPCOR will offer resolution down to three inches for studying the radar scattering characteristics of targets.

"HIPCOR's step frequency approach will allow the Army to investigate how much resolution it really needs to try to detect different kinds of targets with various background conditions," Lane explained. "Most of the targets that we are talking about are tactical vehicles. In this general scenario, we are looking from an air platform down to the ground, and must be able to discriminate targets from natural and man-made ground clutter."

Fine-grain target signature data produced by the HIPCOR/MASSCOMP system could differentiate a tank from less important targets and background clutter, said Lane. By seeking only certain target signatures, a detection system would be able to pick out high-value targets without having to process vast amounts of data.

"The Army wants to find a signal processing technique that uses only part of the data and gives a good probability of the right answer," he added. "The less data you have to look at, the more robust the system will be."

HIPCOR uses two amplifiers: a 100 watt Traveling Wave Tube (TWT) and a 2 kilowatt Extended Interaction Klystron Amplifier (EIKA). The combination, said Lane, gives the radar much of its versatility.

HIPCOR provides pulse-to-pulse frequency agility in either of two modes: a high-power mode with a peak power of 2,000 watts and bandwidth of 350 MHz, and a medium-power mode at 100 watts with a bandwidth of 2 GHz.