



MEDIA RELEASE

Joint Non-Lethal Weapons Program



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Researchers Demonstrate Improved ADS Beam Characterization Tool

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The W-Band Beam Diagnostic Array, the improved tool to characterize the ADS beam.

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The Active Denial System (ADS), a developmental directed-energy, counter-personnel weapon, has the potential to provide an important new escalation-of-force capability to U.S. operating forces. The ADS projects a focused beam of 95GHz millimeter waves to induce an intolerable heating sensation on an adversary's skin, repelling the individual with minimal risk of injury. More than a decade of research has established the biological and behavioral effects of Active Denial Technology (ADT).

The ADS, like other non-lethal weapons, can provide warfighters with escalation-of-force options when lethal force is not the best first response. The Department of Defense defines non-lethal weapons as "weapons, devices and munitions that are explicitly designed and primarily employed to incapacitate targeted personnel or materiel immediately, while minimizing fatalities, permanent injury to personnel and undesired damage to property in the target area or environment. Non-lethal weapons are intended to have reversible effects on personnel and materiel."

While the effects of ADT systems have been successfully established, the technology that produces those effects has the potential to progress in a number of ways. Several research efforts are focusing on reducing the weight, size and cost of system components. Current Active Denial Systems project a radio-frequency beam with a large spot size. One research effort involves developing lower-power radio-frequency sources that operate with much smaller beam sizes and have the ability to project multiple beams. This will allow for reduced power output, which will in turn enable lighter, smaller, lower-cost systems.



The Active Denial System uses radio-frequency directed energy to induce an intolerable heating sensation on a target's skin, repelling the individual with minimal risk of injury.

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To this end, the Joint Non-Lethal Weapons Program (JNLWP) has sponsored the Directed Energy Warfare Office (DEWO) at the Naval Surface Warfare Center Dahlgren Division, Va., to

develop a new ADS beam characterization tool that measures the beam in much greater spatial and temporal detail. DEWO completed the development of this new ADS beam characterization tool, which measures the beam at every square inch and quarter of a second. Researchers successfully demonstrated the W-Band Beam Diagnostic Array at Kirtland Air Force Base, N.M., in September with measurement on ADS System 0, the first system developed.

Millimeter-wave beams will always have slight variances in the amount of energy they deposit throughout different parts of the beam, according to Rick Scott, project engineer at the Joint Non-Lethal Weapons Directorate. By measuring the beam's varying densities, the diagnostic array will enable researchers to combine information on beam employment and the target's immediate environment (such as within a car, building, etc.). Developers can then modify ADS antenna designs to optimize the beam so that it provides extended range with reduced energy output. As a result, the new diagnostic array will enable developers to design and build more compact (smaller beam) ADS sources that are lighter and lower cost.

The new ADS beam diagnostic tool will enable researchers to maximize the performance of these new lower power ADS sources, according to Randy Woods, lead engineer at DEWO. "This will allow for smaller systems to be developed in the future," said Woods.

The successful development of the ADS diagnostic array marks an important milestone for the development of lower cost, more compact ADT systems. The JNLWP plans to fund additional experiments that will help optimize the design of next-generation ADT systems that require reduced power output and utilize smaller effective beam sizes. As Active Denial Technology matures, the JNLWP will continue to work to provide this important escalation-of-force capability to warfighters.

For more information on non-lethal weapons, visit the JNLWP website at <https://www.jnlwp.com>.