

# Directed Energy Devices



Crowd-Control Weapons Series

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## Overview

Directed energy weapons, also known by the brand name Active Denial System, are a new technology developed by the U.S. military. This technology delivers very high-frequency millimeter-wavelength electromagnetic rays that heat skin on contact, causing a painful burning sensation. These weapons have not been used on protesters to date but are actively in development for military as well as crowd-control purposes, and they are being marketed to law enforcement as well as military agencies.

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## History

The U.S. Air Force Research Laboratory and the U.S. Department of Defense's Joint Non-Lethal Weapons Directorate initially funded the development of an electromagnetic heating weapon in 2002. By 2004, private manufacturers such as Raytheon were funded to continue research. The first prototype, Active Denial System I, underwent some testing and was deployed in Afghanistan in 2010, but was recalled a few months later and has never been used since then against enemy combatants in military settings. Since 2011, the updated ADS II and the Silent Guardian, a smaller mobile device, have been demonstrated on military personnel and volunteers. The Silent Guardian is marketed directly to civilian law enforcement agencies and other security providers.

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## How They Work

Directed energy weapons project a focused beam of electromagnetic waves at a high frequency and short wavelength, making them capable of penetrating superficial skin layers to cause pain and burning without causing ionizing radiation that can alter cellular structure. The electromagnetic beam is invisible and can travel distances of up to one kilometer.

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## Device Types

There are truck-mounted versions and a newer more transportable version currently being considered by the military and, potentially in the future, by law enforcement.

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## Health Effects

There is little medical research about the health effects of directed energy weapons because of limited publicly available data about their military testing. However the little data that is available points to some serious concerns. Testing on military volunteers identified several cases of skin burns, blisters, or prolonged pain. Capable of penetrating about 0.5 mm into the body, the electromagnetic waves could potentially access skin past the dermal layer, which contains blood vessels, nerves, and glands. The skin on eyelids, for instance, is 0.2 mm deep. Increased exposure times can produce skin burns and dermal damage. Areas of thin and delicate skin, such as on the face and eyes, could be more at risk for injury. Although the electromagnetic waves produced by studies of cellular directed energy weapons are touted as a non-ionizing type of radiation, long-term -level impacts have not yet been conducted and there may be a risk of this kind of damage.

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## Legality of Use

International human rights law protects the right to freedom of assembly, including the right to hold public or private meetings, marches, processions, demonstrations, and sit-ins.

The state has a duty to protect those exercising their right to peaceful assembly from any type of violence, including violence from law enforcement agents and counter-protesters. As long as the purpose of the assembly is peaceful, incidental violence does not discharge the state from this obligation to protect.

International legal principles require law enforcement agencies to adopt rules and regulations for the use of force within the following parameters:

- The use of force must be minimized, targeted, proportional, and directed at de-escalating violence.
- The use of non-lethal incapacitating weapons must be carefully controlled.
- The deployment of non-lethal incapacitating weapons must occur in a manner that minimizes the risk of endangering uninvolved persons.
- Restraint must be shown in all use of force by law enforcement agents, with a view to minimizing injury and loss of life.

In addition, the state has an obligation to ensure that assistance and medical aid are rendered to any injured or affected persons at the earliest possible moment. International human rights principles have been violated if the use of non-lethal incapacitating weapons is not adequately regulated, or if the weapons are used in an indiscriminate manner.

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## Considerations and Policy Recommendations

Directed energy weapons have not yet been transparently and appropriately tested, and PHR has serious concerns about their short- and long-term medical impacts. It is hard to conceptualize a test that would fulfill federal ethics guidelines for research on human subjects.

The weapon's long-range capabilities limit opportunities for the user to assess on-the-ground conditions, potentiating the risk for its inappropriate or disproportionate use.

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