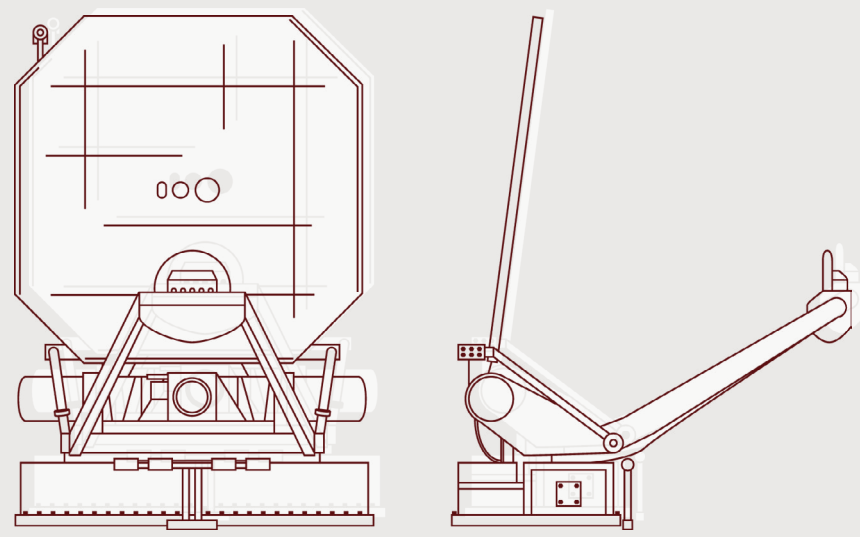
DIRECTED ENERGY DEVICES

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 protests to date but are actively in development for crowd-control purposes, and they are being marketed to law enforcement as well as military agencies.

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.



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**. There are truck-mounted versions and a newer, more transportable version being considered.

POTENTIAL FOR INJURY

Little is known about the health effects of directed energy weapons because of limited publicly available data about their **military testing**. However, based on the little data that is available, there are 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 directed energy weapons are touted as a **non-ionizing** type of **radiation**, long-term studies of cellular-level impacts have not yet been conducted and there may be a risk of this kind of damage.

CONSIDERATIONS & POLICY RECOMMENDATIONS

DIRECTED ENERGY WEAPONS HAVE NOT YET BEEN TRANSPARENTLY AND APPROPRIATELY TESTED, AND THERE ARE SERIOUS CONCERNS ABOUT THEIR SHORT- AND LONG-TERM MEDICAL IMPACTS.

- ✔ **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.

For more information, see Physicians for Human Rights and INCLO, "*Lethal in Disguise: The Health Consequences of Crowd-Control Weapons.*" (March, 2016).

PHR Physicians for Human Rights

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