

Laser tight rays of
photons that have
been



**ASSIGN
BUSTER**

Laser guns are a staple in many science fiction stories and films. The bright and colourful blasts of energy are very pleasing to the eye and are much more exciting than any other ordinary weapon. Lasers are very common in technology nowadays, found in barcode scanners, laser printers, CD and DVD players, X-rays, and a handful of other things.

Each of these everyday uses of lasers are very easy to build and acquire because they are not meant to cause harm to anything. Having lasers in weapons is an entirely different approach for a use of lasers because they are meant to cause damage, meaning the level of energy must be more intense. “ Weapons inflict damage to a target by two different ways. One is the transfer of momentum, picture the force of a swinging blade or a zipping bullet, and the other is the transfer of kinetic energy. Projectiles are very efficient because they have a lot of mass. Yet photons, the constituents of lasers, have no mass. In order to achieve kinetic energy-type damage with lasers, you need to have the energy sky-high, and you need to store a lot of it” (Hadhazy).

Since photons have no mass, it makes lasers a difficult material for a weapon because, in order for it to be powerful enough to cause some significant damage, it takes a lot of energy and storage. It can be done but it is not as easy as creating a typical gun that shoots bullets. Lasers are devices that emit electromagnetic radiation. They emit tight rays of photons that have been generated by the excitation of atoms in a certain material, or electrons in a beam. If the atoms in a material are stimulated with enough energy, it results in them emitting light waves.

These light waves can be amplified and made to travel in a tight narrow beam. Laser beams have a special property that the light waves travel coherently, meaning they are all in step with one another, and they are usually one wavelength or colour. In 1917, Albert Einstein proposed a theory of stimulated light emission (Physics, I. O.).

He had proved before that light was composed of tiny packets of wave-like energy, which he called photons. He theorized that if the atoms in a material were provided with excess energy, they would emit photons. Those photons created would stimulate the nearby atoms which would result in more photons being created. This would create a cascade effect that would continue on and on and potentially could never stop. The principle behind Einstein's theory was that the material would have to be pumped with energy from a different light source or electrical current. The stimulated light emission that comes from that is then amplified by bouncing back and forth through the material in a mirrored cavity, stimulating more emission before it escapes through a transparent mirror section as a laser beam.

The term "laser" originally was created as an acronym for "light amplification by stimulated emission of radiation" (Physics, I. O.). Laser light is immensely different from regular light, for a couple of reasons.

First, laser light only contains one wavelength or colour which is determined by the amount of energy that is released when the excited electron drops to a lower orbit. Second, laser light is totally directional. A laser creates a long narrow beam that is very tight, and because the beam is so small it makes it a lot easier to hit a specific target.

Lastly, laser light can travel extremely long distances. Unlike light that is generated by a flashlight, lasers can travel far because of how narrow and tight the beams are. The light coming from a flashlight is spread out more and can cover a large area depending on how big the flashlight is. Lasers cover such a small area, and as long as the atoms are continuously being stimulated, the beam can go as far as the moon and back. Although lasers aren't widely used as weapons yet, there have been some uses. Lasers have lots of advantages over typical weapons, which makes them very efficient for guns and other machinery.

The first advantage of lasers is that the energy travels at the speed of light. Bullets can travel with a very large velocity, but nothing compared to the speed of light. The second advantage of lasers is the precision. Because lasers have the tight narrow beam, they are extremely precise, especially if the laser light is visible. Regular guns are pretty precise but most of the time it is entirely up to the shooter to judge whether or not they are going to hit the target. The third and final advantage to lasers is that the energy output can be controlled.

With any other gun, chances are if the target is hit in the right spot they won't make it, but lasers can be controlled. Lasers generate heat, which is what can cause damage. If the amount of energy and heat that is produced can be managed, there can be both lethal outcomes as well as nonlethal outcomes (Freudenrich).

Although there are many benefits to laser light, there is a few disadvantage as well. As said before, lasers do their damage by heating things up. Even

though laser light travels at the speed of light, once it hits the target it does take a few seconds to heat it up enough to cause enough damage. Bullets will cause damage as soon as they hit the target, which is definitely a key factor in a good weapon.

Also, laser weapons are not inexpensive to produce. They require a lot of energy and technology, but once they have been created, they are not expensive to maintain. The advantages of laser light do outweigh the disadvantages, but they certainly would not make the perfect weapon.

Laser guns are not being used quite yet, but there have been a few prototype weapons on a much larger scale. The first example is the Active Denial System (ADS).

This is a weapon that is used for human flesh. What this weapon does is it fires an infrared light beam towards a number of targets, since it is a large beam it can hit a lot at a time, and once it hits the skin it causes a painful burning sensation (Hadhazy). It is not meant to be lethal, but if it needed to be it definitely could be. The second example is the High Energy Laser Mobile Demonstrator (HEL MD). This is another prototype laser weapon that was developed for the US army, but unlike the ADS, it was created for the destruction of metal objects, not for flesh. It works the same way as the ADS, by shooting a laser at the target and heating it up enough that it will explode (Military Technology). In conclusion, laser light is a very efficient use of weapons for many different reasons, but of course, with the pros come the cons.

The technology needed to develop these weapons is accessible but building them all will cost a sizeable amount of money. Once a large number of the actual weapons are built, it will be inexpensive to maintain them, so that point just needs to be reached. Lasers will have a large influence on weaponry in the military in the years to come because they are already highly in demand.