

# Zap!

A detailed critique delving into the gameplay and hardware behind Laser Tag

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## Abstract:

Laser Tag refers to the competitive gameplay that uses a transmitted message, often in infrared, to simulate a shooting game. It is often implemented in such a way that there is a gun to fire the “laser” and a chest plate to tell the player they are hit. This is an in-depth critique of this wide spread competitive game: Laser Tag; it will explore the history of infrared being used as gun simulations and will explain about the restrictions/ innovations that have occurred in the various hardware used by different companies and implementations.

## Contents:

<b>Introduction</b>	<b>2</b>
A Brief History	2
<b>Gameplay</b>	<b>3</b>
<b>Hardware Benefits and Restrictions</b>	<b>4</b>
MILES	4
The Laser Pro 9000	5
The Star Trek Electronic Phaser Guns set	5
Concept of other transmitted beams	6
<b>Conclusion</b>	<b>6</b>
<b>References</b>	<b>6</b>

## Introduction:

The name Laser Tag, is an umbrella term for many different systems across the world that use large arenas (often indoors) to create an immersive shooting game where one player “tags” another. The players are generally split into two teams and can be given a large variety of different game styles to play, usually based around “killing” the other team members or “destroying” their base - I use quotation marks here because the whole concept of laser tag is based around representing killing or destroying through the use of flashing lights or loud sound from the chest-piece or gun.

### A Brief History:

The use of infrared beams as a shooting simulation has been used since the early 1980’s. It was implemented by the U.S Army for training purposes and since then has been used in many of the armed forces across the world.

According to Wikipedia the first ever infrared shooting toy was the “Star Trek Electronic Phaser Guns set” created in 1979<sup>1</sup>. According to a paper titled Laser Tag History<sup>2</sup>, there was then a surge in interest with regards to Sci Fi themed laser tag games that began when a company called Photon opened an arena type game based in Dallas, Texas in 1984 and then swept the US. The paper even says that there may still be a few of these arenas still in use.

Laser Tag History <sup>2</sup> then goes on to say that other companies started to appear with varying hardware and game styles including a company called Worlds Of Wonder that then went on to create the “Lazer Tag” brand that is now known throughout the world.

These arena style laser tag games are still very popular all around the world and they have always been based around a competitive yet enjoyable atmosphere that a person of any age could play.



Figure 1: Star Trek Electronic Phaser Guns set

## Gameplay:

The vast majority of laser tag companies are based around the concept of an indoor arena to run around in. This allows for obvious benefits such as localised equipment e.g. the company knows where all the guns are and can store hit data from all the targets, but also allows for many different organised game types such as destroying the enemies’ base or setting a specific number of lives for each person. These create a structured gameplay that allows (if needed) reasonably enforced rule following; if the teams had free reign over the hardware and software there may be major problems that could cause the company very large sums of money. In some of the earlier hardware, where it was not necessarily an encoded message being transmitted, it was sometimes possible to sneak a TV remote into the arena and provide yourself with a secondary weapon.

Our team project may come across the same kinds of problems with people modifying circuitry or hardware. As a mainly open sourced idea we actually encourage people to create their own weapons using our circuitry but nonetheless, the fact that most companies decided to keep all the hardware in one defined area and obviously don’t allow modification, serves as a warning that there is always that one person that tries to cheat.

Another benefit for arena based gameplay is the ability to host a variety of party events. A person that may never be interested in buying a gun for themselves can still compete with everyone else for what may work out to be cheaper than buying a set product. Many arena based companies charge the player per round which could theoretically generate more money for the company compared to the player making a one off purchase for the gun. An owner of the gun would never have to pay to use it but a user of an arena would have to pay every single time.

Although many of the companies do specialise in indoor, arena based games, there are many products that have been released specifically for home use (such as the previously stated Star Trek Phaser Guns set). This allowed the buyer to play the game pretty much anywhere, which a far more applicable idea for our project.

Benefits of this concept are mainly based around the free roam associated with it. A company that chooses to direct its product mainly towards this premise would save great deal of money due to not leasing buildings or paying staff to run them.

## Hardware benefits and restrictions:

This section will talk not about the specific internal circuitry of the hundreds of toys on the market, but about specific positioning of receivers and transmitters, their ranges and efficiency. Our group's project is based purely around use outside of an arena, in the real world, so I will only talk about products that are available outside of an arena company like "Lazer Tag".

### MILES (Multiple Integrated Laser Engagement System):

Many armed forces across the world use the MILES as their battle simulation. According to Wikipedia<sup>3</sup>, the soldiers carry infrared emitters attached directly to the barrel of their gun and an array of small receivers scattered over their bodies. The military uses many different MILES but each laser generally carries information, such as the shooter, weapon and ammunition, encoded into the beam.

Depending on the information received by the target, a random number is generated and read off a table to determine the probability of a casualty. This allows a large variety of guns to be used with each one carrying a coded signal specific to the look up table; this also makes it a much more realistic simulation as the receivers can also be placed directly onto vehicles.

The concept of a coded message per gun creates a massive development idea for our project. It would allow a much more in depth experience and with the use of a mobile app would give the game a real-life Call of Duty feel; being able to see who killed you and vice versa.

The infrared receivers of the MILES are generally spread all over the body and allow the soldier to shoot a person in a specific body part to govern different responses. Figure 2 shows a Polish soldier equipped with MILES: it can be seen in the image that the sensors surround the head and can vaguely be seen on his shoulders, unfortunately the sensors on his chest cannot be seen but the point remains that all angles are covered. This coupled with the look up table and encoded message sent by the gun allows for very specific information to be sent back to the shooter/database although this information was never stored so there was no way of actually knowing who shot whom.



Figure 2: a Polish soldier with MILES gear

The problem with a helmet and chest plate is that it is not completely socially acceptable attire. In a game, like our project's, where the players can be walking around in an urban environment, the receiver must be an inconspicuous piece of wearable tech. It was also reported that the head gear was very heavy and the soldiers experienced neck pain.

Another hardware restriction of the MILES is the capability of cheating. On most references to the MILES, including the two previously stated, it states that it was very easy to turn off the receivers after being shot and turn them on again, thereby resurrecting themselves and carrying on. This

cheating was also completely possible due to the fact that the gun remained active after being hit.

After 1986, the previously stated hardware floors were solved by the use of a loud tone that signalled when the soldier had been hit. To turn this off, the soldier had to remove a yellow key from

his gun and use it to turn off the tone, this key removal also prevented the infrared beam from being transmitted. This concept cannot be used in our project but it was a novel solution to the problem of cheating. The MILES are still used around the world.

### The Laser Pro 9000:

This home use laser tag toy was developed in 1997 by Lewis Galoob Toys and featured an all in one package. The gun itself contained both the transmitter and receiver allowing for freedom of movement and the ability to store it in a bag for use anywhere.

Various flashing lights on the gun determined whether a hit had occurred or whether the gun was firing. A visual effect has always been applied to pretty much every laser tag game made for home use as it allows the player to be aware of what's going on in a very sci-fi-esque fashion.

The Laser pro 9000 was innovative because it was capable of telling the difference between whether the gun had received a hit or whether the gun was receiving its own reflected beam. The gun was also cheaper than most of the other brands because a lot of money was saved by not using a separate receiver circuit and not having to manufacture a vest of some sort.

The concept of a receiver in the gun would cause a lot of problems in our project because of the range that we are trying to achieve. We wish to be able to shoot the target player at any angle or time, even if the player has their gun stored away. As a sniper game, the receiver will most likely have to be somewhere visible at all 360 degrees and also unobtrusive / generally wearable.

An advert for the Laser Pro 9000 can be found at: <http://www.youtube.com/watch?v=nmsjaLORj-c> It shows that the gun can be drawn quickly and no other equipment is needed. It forms a very strong argument for putting the infrared receiver in the gun itself.

### The Star Trek Electronic Phaser Guns:

These guns were similar to the Laser Pro 9000 (although created just over a decade earlier) in that it featured a gun with a built in receiver. The gun itself was very small but still had a range of up to 40ft allowing a reasonably large field of play.

The gun is considered one of the earliest examples of infrared battle simulation and even outdates the MILES system by a few years. Regardless of its age, the gun still had many of the key features that we need to consider in our project including a reaction to being hit and an action to symbolise firing. The Phaser had a lot of different sound effects to symbolise near misses and direct hits and the whole system was contained within one machine.

If this gun was still around, there would be major problems with other infrared devices, such as TV remotes, because of the simplicity of the contained circuitry.



Figure 3: The Phaser Guns

## The concept of other transmitted beams:

Many laser tag games before the company “Lazer Tag” formed the surge in laser tag products used a variety of different visible light based beams to try and carry a beam; generally based around the idea of strobe lights. These mechanisms did not have the required marketing or efficiency to remain a part of the developing laser tag industry of the late 1980’s. Our project will definitely use the tried and tested infrared transmitter and receiver.

## Conclusion:

Laser tag based battle simulations have been in circulation for nearly three decades now and have varied between: simplistic two person indoor games; arena based battles and even military training. There are still many laser tag centres around the world and they are still very popular but there are seemingly fewer general use laser tag guns that can be used anywhere anytime. The MILES is probably the closest thing to our concept, that I have found, but there are still fundamental problems with using that system for entertainment reasons.

In terms of real world battle simulations, the world is now tending towards other games such as paintball, airsoft and Nerf products. But with a whole new gameplay idea and a new long range infrared system, I believe that infrared battle simulation can make a comeback with our project.

The placement of sensors and the obtrusiveness of equipment has always been a problem associated with laser tag games so a great deal of thought must go into the best location for the receiver. What the receiver looks like is also a major consideration when used in an urban environment so research should be done into the wearable tech as well.

## References:

1 – Wikipedia titled “Laser Tag” found on 18/10/2014 at:

[http://en.wikipedia.org/wiki/Laser\\_tag](http://en.wikipedia.org/wiki/Laser_tag)

2 – “Laser Tag History” written by TagFerret found on 18/10/2014 at:

[http://home.comcast.net/~ferret1963/All\\_Systems.HTML](http://home.comcast.net/~ferret1963/All_Systems.HTML)

3 – Wikipedia titled “Multiple Integrated Laser Engagement System” found on 18/10/2014 at:

[http://en.wikipedia.org/wiki/Multiple\\_Integrated\\_Laser\\_Engagement\\_System](http://en.wikipedia.org/wiki/Multiple_Integrated_Laser_Engagement_System)

Figure 1: image of Star Trek Electronic Phaser Guns set found on 18/10/2014 at:

[http://www.ebay.com/itm/VINTAGE-STAR-TREK-TWO-ELECTRONIC-PHASER-GUNS-1979-SOUTH-BEND-TOYS-/231287898814?pt=Vintage\\_Antique\\_Toys\\_US&hash=item35d9d542be](http://www.ebay.com/itm/VINTAGE-STAR-TREK-TWO-ELECTRONIC-PHASER-GUNS-1979-SOUTH-BEND-TOYS-/231287898814?pt=Vintage_Antique_Toys_US&hash=item35d9d542be)

Figure 2: Polish soldier wearing MILES found on 18/10/2014 at

[http://en.wikipedia.org/wiki/Multiple\\_Integrated\\_Laser\\_Engagement\\_System](http://en.wikipedia.org/wiki/Multiple_Integrated_Laser_Engagement_System)

Figure 3: image of image of Star Trek Electronic Phaser Guns set found on 18/10/2014 at:

[http://home.comcast.net/~ferret1963/All\\_Systems.HTML](http://home.comcast.net/~ferret1963/All_Systems.HTML)