



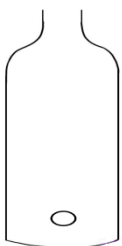
Demonstrating Total Internal Reflection

This demonstration is a fun and effective way to show the principals of total internal reflection (TIR).

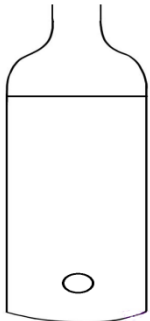
It requires a large plastic bottle with a hole near the bottom, a laser, some water and a receptacle to catch the flowing water in.

SAFETY NOTE – never aim the waterfall towards the public as the laser could shine in their eyes.

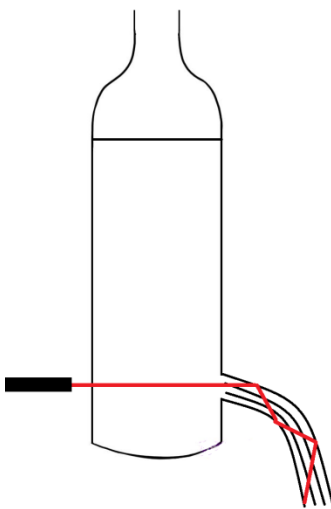
Setting Up The Demo



- 1) Use a hot pin (heated up over a gas flame/lighter/candle) to carefully burn a circular hole about 10cm up from the bottom of your plastic bottle. The hole should be around 5-8mm in diameter.



2) Place your finger over the hole (or block with tape) and fill the bottle almost to the top with water.



3) Turn the bottle sideways on and carefully shine the laser toward the hole from the back of the bottle. Remove your finger/tape and again make sure that the laser is being aimed squarely at the hole in the plastic bottle.

Watch as the laser light transmits down the waterfall. Make sure you have a suitable receptacle to catch the falling water!

What is happening?

The curved stream of water is in many ways acting like a fibre optic cable. As the laser light hits the edge of the water, it does so at an angle greater than the critical angle for water. This means that the laser light is completely reflected inwards (we call this total internal reflection). As it hits the next edge of the water stream it is once again totally internally reflected and this process continues down through the entire length of the water stream.

Loss of laser strength?

You may notice that the strength and intensity of the laser light reduces as it makes its way down the water stream. This is a result of dispersion of the beam of light and also interference effects within the stream. This is actually a problem that we encounter with real life fibre optic cables and can lead to problems such as signal degradation.

For a video of this demonstration in progress please click here:

<https://www.youtube.com/watch?v=Z9O5xY3Z1WE>