



***Light Saber – A discharge lamp that looks like the light saber from Star Wars that can be used to remotely control a touch lamp using the electrical noise it generates***

Target Audience: Parents of elementary school students (grades 3-6) and Middle and High School Students

Objectives:

1. Introduce the idea of the electric circuit using humans as conductors
2. Introduce discharge light sources (e.g. neon signs)
3. Introduce the touch lamp
4. Demonstrate that discharge lamps produce significant electrical noise of sufficient intensity to activate a touch lamp
5. Provide interaction with engineering students.



BOM: Plasma Fire Saber, touch lamp (Target has an inexpensive floor lamp) or touch flashlight (Eddie Bauer sold one a few years ago). (Optional) A hand held spectroscope.

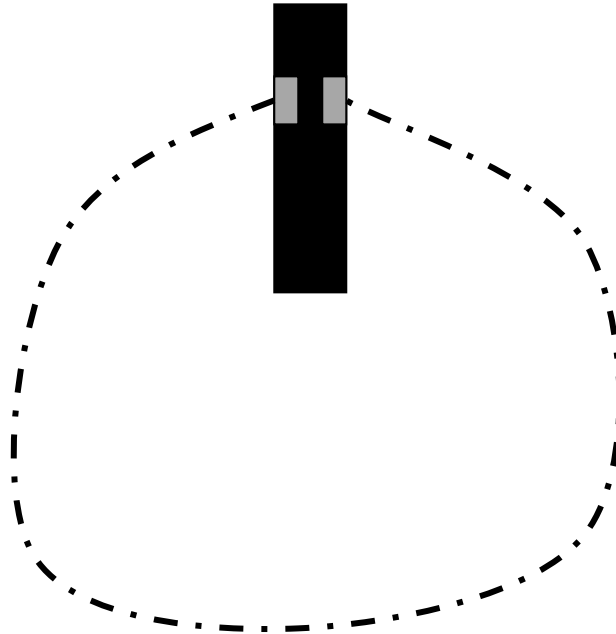
Item	Source / Website	Price
Plasma Fire Saber	<a href="http://www.amazing1.com/plasma_fire_saber.htm">http://www.amazing1.com/plasma_fire_saber.htm</a>	\$40 - \$80 range
Touch Lamp	Walmarts, Target, etc (see text for additional information)	\$15 - \$100.00 range
Spectrometers	www.scientificsonline.com	Selection available w/ varied pricing

Set Up: Since this is for one or two person demos, there is no need for a large table. The light saber and the lamp need to be located near one another and the handle of the saber should be screwed onto the discharge tube.

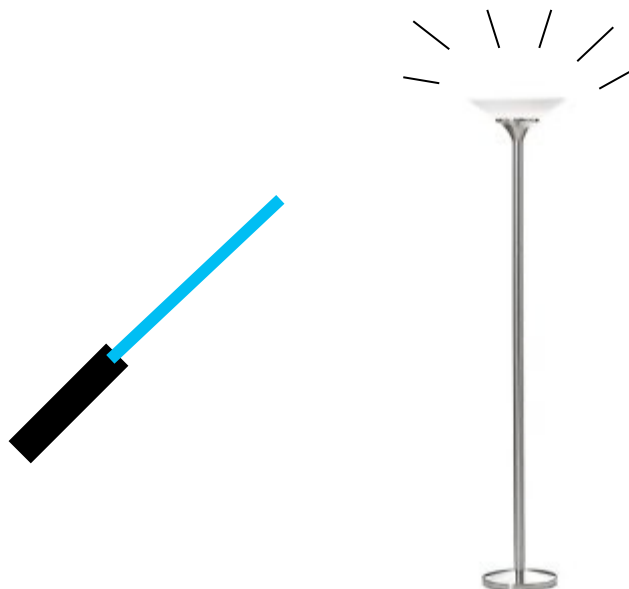
Activities:

1. Introduce mentor(s) and general purpose of activities
2. Being a resistor in an electrical circuit: In this device, a light beam is caused to move up a glass tube when the person holding the handle connects the two metal contacts with their thumb or finger. To make this more interesting, and to show that we are all good electrical conductors, up to 5 people will hold hands and

form a circle with the people at the end each making contact with one of the metal contacts. The length of the light beam is determined by how good the contact is, so having many people in the loop will probably make the beam rather short. Each observer should, thus, try to turn the beam on by themselves and then see if it is longer or shorter. The red beam is neon and the blue beam is argon. Once the beam is as bright as possible, it can be observed through a spectroscope, if one is handy.



3. Turning on a touch lamp with the light saber: Bring the light saber close to the floor lamp without touching it. About one meter of separation is good. Turn on the light saber and you should also see the floor lamp turn on. This happens because the lamp is electrically very noisy and the floor lamp is a touch lamp. Touch lamps turn on when you touch them because you are acting like an antenna and you pick up electrical noise from the air. To act like an antenna, you must be a conductor, but we have already shown that we are conductors by holding hands and turning the light saber on.
4. Discuss what has been learned about discharge bulbs and electrical noise.
5. Take general questions on the experience of being an engineering student



Outcomes:

1. Audience will be better informed about electrical noise issues associated with discharge lamps
2. Audience will appreciate that they are indeed conductors and can be part of an electrical circuit
3. Audience will have an increased understanding and enthusiasm for what engineers do and for an engineering career.
4. Audience will visit the website of the Smart Lighting ERC.

Resources:

Background information on gas discharge tubes and the operation of touch lamps.

Touch Lamps: The best way to find up-to-date info on touch lamps is to search online for ‘touch lamp 555 timer,’ which will generally give the clearest descriptions. An example is found at [http://www.seekic.com/forum/22\\_circuit\\_diagram/18728\\_THREE\\_WAY\\_TOUCH\\_LAMP.html](http://www.seekic.com/forum/22_circuit_diagram/18728_THREE_WAY_TOUCH_LAMP.html) Touch switches are made many different ways, but the easiest to understand is based on the ever popular 555 timer chip.

Gas Discharge Tubes: This is a huge topic involving plasma physics, high voltage and many other issues. Wikipedia has a decent article. [http://en.wikipedia.org/wiki/Gas-filled\\_tube](http://en.wikipedia.org/wiki/Gas-filled_tube) Other general information on plasmas and their applications can be found at the Coalition for Plasma Science <http://www.plasmacoalition.org/>, Perspectives on Plasmas <http://www.plasmas.org/>, on Wikipedia [http://en.wikipedia.org/wiki/Plasma\\_\(physics\)](http://en.wikipedia.org/wiki/Plasma_(physics)), Plasma Science and Technology <http://pst.pppl.gov/>, and many others.

Takeaways:

A handout with an online link to all information. The link information is a mechanism for encouraging the interested public to visit the website of the Smart Lighting ERC and should also help connect the audience to information on engineering, engineering careers, and K-12 STEM education.