# Imaging experiment of point light source under total reflection and its result analysis

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**Abstr: Yesterday, I did an experiment of three-color plastic film under three-color light source and wrote an article named "a simple experimental device to verify the nature of light and analysis of experimental results". Today, I will do another simple optical experiment, using the imaging of red point light source under the total reflection of the reflector. The nature of light and what the human eye sees are discussed in more depth. It is hoped that teachers and friends with better experimental conditions will join in and further expand the breadth and depth of this experiment. Work together to recognize the nature of light as soon as possible.**

## I. Brief Introduction to Experimental Equipment and Steps

**1. Experimental equipment**

Photo 1: Experimental equipment

1.1.An ordinary rectangular mirror;
1.2.A red laser pointer;
1.3.A carton with side holes.

**2. Design of experimental device**

Photo 2: Experimental setup

As shown in photo 2 above: place the mirror in the middle of the carton, and the laser pointer enters the carton from the small hole on the right side, and the laser pointer is as close as possible to the mirror.

**3. Experimental steps**

3.1. Place the experimental device in a darkroom;

3.2. Turn on the laser pointer and make the point light source illuminate on the mirror surface near the middle position;

3.3. Take photos from multiple angles with your phone.

## II. Experimental results

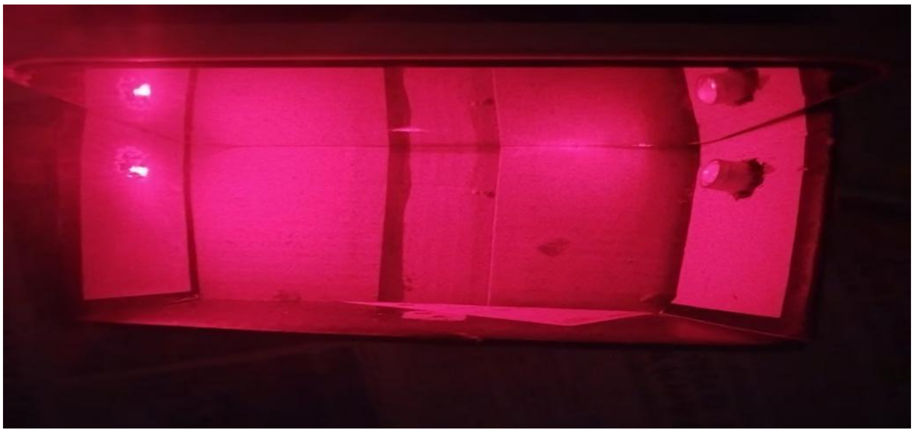

**Photo 3: Near Vertical Photo**

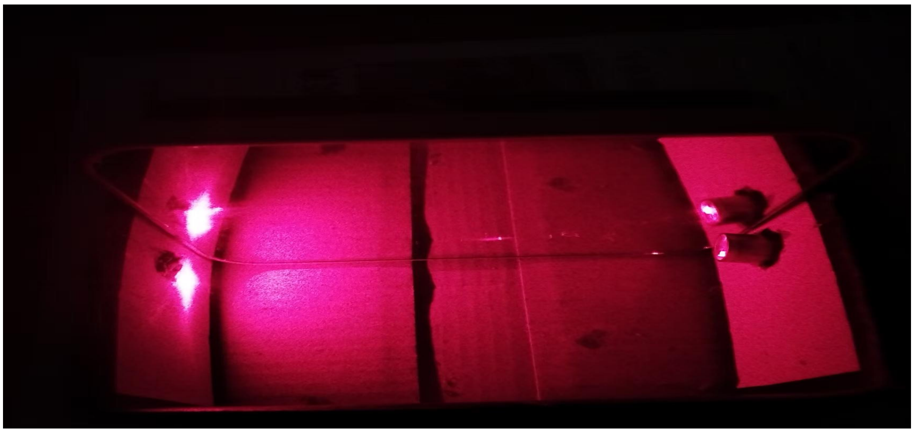

**Photo 4: Near 70 degree orientation photo**

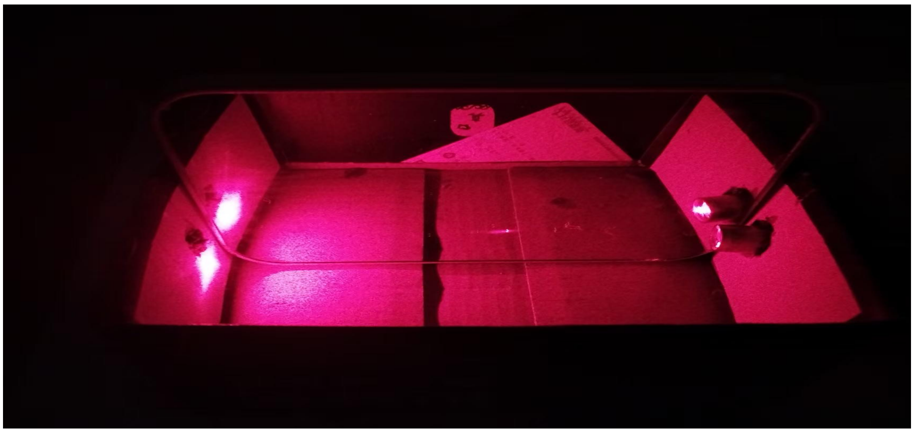

**Photo 5: Near 45 degree orientation photo**

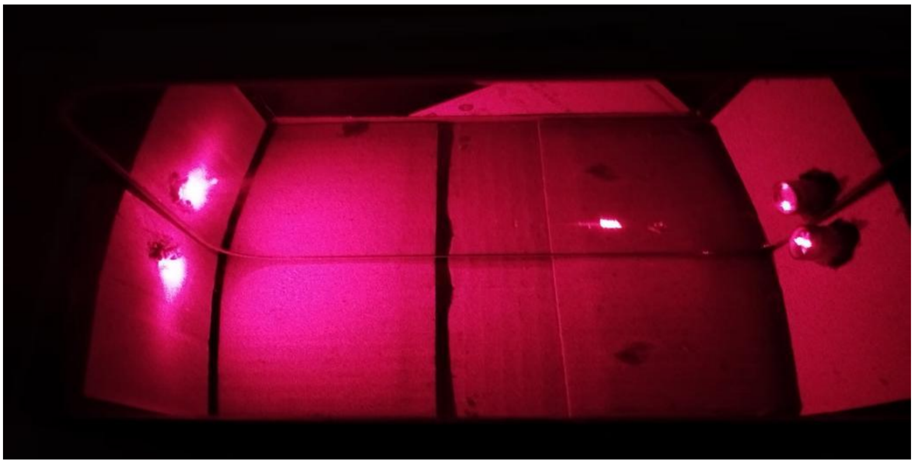

**Photo 6: Photo of the direction near 65 degrees after the light source has been rotated.**

**Photo 6: Photo of the direction near 40 degrees after the light source has been rotated.**

## III. Simple analysis of experimental results

**1. Brief description of the photo**

1.1 Photo 3: The luminous point of the laser pointer and the mirror image in the mirror surface are not bright, while the reflective point on the left wall of the carton and the mirror image in the mirror surface are bright;

1.2 Photo 4: The brightness of the luminous point of the laser pointer and the reflection point on the mirror surface is not high, but the brightness of the mirror image of the laser pointer in the mirror surface is higher. While the reflective spot on the left side wall of the paper box and the mirror image in the mirror surface have high brightness;

1.3 Photo 5: little difference from Photo 4;

1.4 Photo 6: The luminous point of the laser pen and the mirror image in the mirror surface, the reflection point in the middle of the mirror surface, the reflection point on the left side of the carton and the mirror image in the mirror surface are all bright;

1.5 Photo 7: little difference from Photo 6.

In addition, the white label paper on the lower side wall of the paper box is white in the mirror image of the mirror surface in both Photo 3 and Photos 5, 6, and 7. Except for the area with high intensity of reflected light on the left side, the color of the bottom of the carton is dark yellow. The right side wall of the carton is also approximately white.

**2. Simple analysis of experimental results**

2.1 The law of interaction between light and medium does not follow the law of geometrical optics.

The condition of this experiment is close to the condition of total reflection. Therefore, after the point light source irradiates the mirror surface, it should be almost completely reflected to the other side, and the reflection bright spot on the mirror surface should not be seen in different directions. In addition, the light in other places should come from the reflection point on the left side wall of the carton. But this is not the case. This proves that the law of geometrical optics recognized by most experts and scholars at present does not conform to the objective reality.

2.2. Prove that what the human eye sees is not the so-called light, but the substance that is emitting light and is composed of atoms as the basic unit.

In all the photos of the experimental results, only the laser pointer and its mirror image, the mirror reflection point, the reflection point on the left wall of the carton and its mirror image, and the bottom and side walls of the carton and their mirror images were seen. The red light lines from the laser pointer to the specular reflection point and from this point to the reflection point on the left side wall of the carton are not seen, even though they are in the atmosphere. This is because the intensity of the laser produced by the laser pen is not enough to make the atoms and molecules in the air produce visual effects, so the so-called light on the optical path can not be seen. It has been amply demonstrated that the human eye sees the glowing matter, not the light itself.

2.3. Prove that the essence of light is the Coulomb force between charged particles.

In the experimental environment, the laser pen is the only light source. When the red light produced by the laser pen meets the substances composed of different atoms and molecules, the color of the substances will change obviously in the natural light state, but it is definitely not only red, but also has a variety of colors, and its color changes with the change of the incident light intensity. This is because the red laser only generates a time-varying Coulomb force with a main frequency in the red light band, just like a phased array radar: when the atoms in the laser pen head vibrate at similar frequencies and phases, the Coulomb force generated by the atoms has directivity, and changing the phase difference between adjacent atoms can change the directivity of the Coulomb force generated by the atoms. When the Coulomb force generated by the laser pen acts on different atoms and molecules, the superposition results of the forced vibration frequency and the original vibration frequency of the atoms and molecules will be different due to the different frequency and intensity of the Coulomb force. This is the reason why red light will have different colors on the surface of objects of different colors.

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Due to my lack of English ability, the Chinese to English translation was achieved through common software. Therefore, the English version is likely to have more inaccurate and not easily understood parts. In order to facilitate the review of the manuscript by experts, the original Chinese version is attached. Please accept my apologies for any inconvenience.

# 全反射条件下的点光源成像实验及其结果分析

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**[文章摘要]：昨天本人做了一个三色塑料薄膜在三色光源下的实验并写了一篇名为《一个简单验证光的本质的实验装置及实验结果分析》的文章，今天再进行一项简单的光学实验，利用红色点光源在反射镜的全反射条件下的成像情况，对光的本质及人眼看到的到底是什么等问题进行更深入的探讨。希望有更好实验条件的老师和朋友们加入进来，进一步拓展本实验的广度和深度。为早日认清光的本质而共同努力。**

## 一、实验器材和实验步骤简介

### 1、实验器材


照片 1：实验器材

1.1、普通长方形镜子一个；

1.2、红色激光笔一只；

1.3、开有侧孔的纸盒一个。

### 2、实验装置设计

照片 2：实验装置设置

如以上照片 2 所示：将镜子置于纸盒内近正中位置上，激光笔从右侧小孔进入纸盒内，激

光笔尽量靠近镜面。

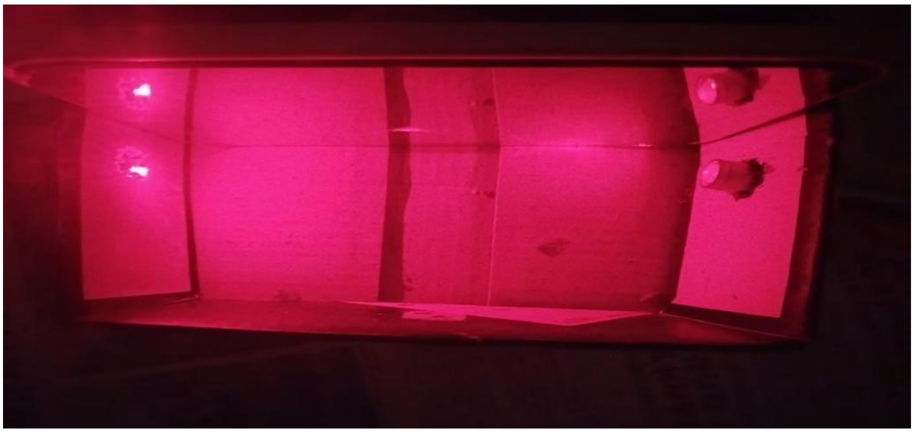
**3、实验步骤**

3.1、将实验装置置于暗室内；

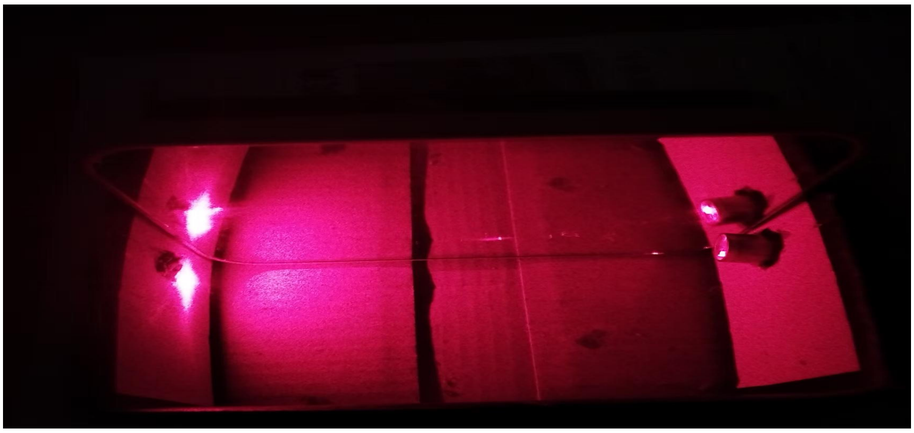
3.2、打开激光笔并使点光源照射在镜面靠近中间位置上；

3.3、用手机多个角度拍照。

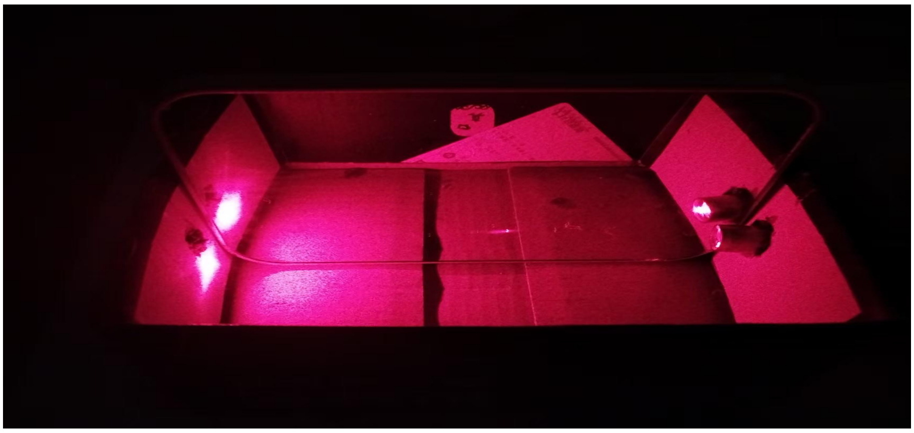
## 二、实验结果



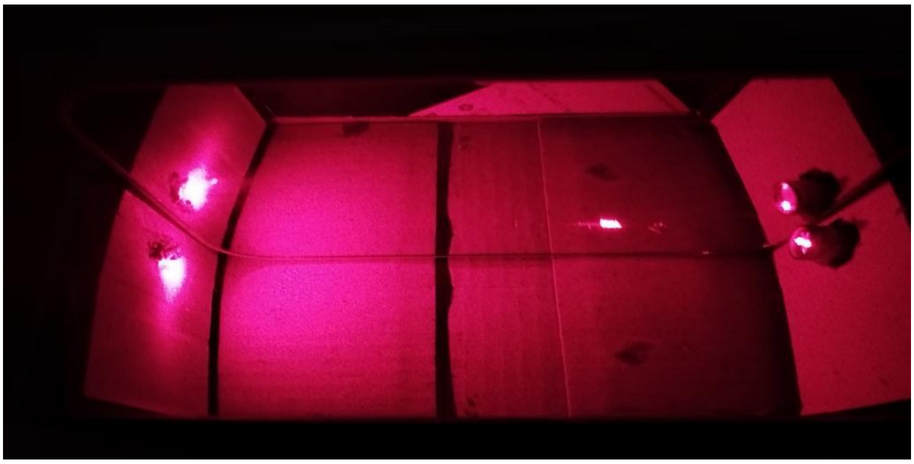
**照片 3：近垂直方向照片**



**照片 4：近 70 度方向照片**



**照片 5：近 45 度方向照片**



**照片 6：光源有所转动后近 65 度方向照片**

**照片 6：光源有所转动后近 40 度方向照片**

## 三、实验结果简单分析

**1、照片简要描述**

1.1、照片 3：激光笔发光点和镜面中的镜像亮度不高，而纸盒左侧壁上的反光点和镜面中的镜像亮度较高；

1.2、照片 4：激光笔发光点和镜面上的反射点的亮度不高，但激光笔在镜面中镜像亮度较高。而纸盒左侧壁上的反光点和镜面中镜像亮度很高；

1.3、照片 5：与照片 4 差异不大；

1.4、照片 6：激光笔发光点及其镜面中的镜像、镜面中部的反射点、纸盒左侧的反光点及其镜面中的镜像的亮度均较强；

1.5、照片 7：与照片 6 差异不大。

此外，纸盒下侧壁上的白色标签纸无论在照片 3 中，还照片 5、6、7 中的镜面中的镜像均呈现白色。而除左侧反射光强度大的区域外，纸盒底面的颜色均呈现暗黄色。纸盒右侧壁也近似白色。

**2、实验结果简单分析**

2.1、光与介质相互作用规律并不遵循几何光学规律

本实验条件接近全反射条件，因此，点光源照射到镜面上后应该几乎全部反射到另一侧去的，不应该会出现在不同方向上仍能看到镜面上的反射亮点。此外，其它地方的光应该都来自纸盒左侧壁上的反射点才对。但实际情况并非如此。这就证明目前绝大部分专家学者认可的几何光学规律是不符合客观实际的。

2.2、证明人眼看到的并非所谓的光，而是正在发光的、以原子为基本单位组成的物质

所有实验结果的照片中，只看到了激光笔及其镜像、镜面反射点、纸盒左侧壁上的反射点及其镜像，以及纸盒底和侧壁及其镜像。并没有看到从激光笔到镜面反射点间和此点到纸盒左侧壁上的反射点的红色光线条，即使其位于大气层内。这是因为激光笔产生的激光强度不足以使空气中的原子和分子产生可视的效应，所以不能看见所谓光路上的光线。这已充分证明：人眼看到的是在发光的物质，而非光本身。

2.3、证明光的本质是带电粒子之间才存在的库仑力

在实验环境中，激光笔是唯一光源，其产生的红光遇到不同的原子和分子组成的物质后，物质的颜色与自然光状态下虽然会有较明显的变化，但绝对不是只呈现红色，而仍然有各种各样的颜色，且其颜色随入射光强度的变化而变化。这是因为红色激光产生的只是主频位于红色光波段的时变库仑力，就像相控阵雷达一样：激光笔发光头中的原子以相近的频率和相位振动时，其产生的库仑力就具有了方向性，改变相邻原子间的相位差就能改变其产生的库仑力的方向性。当激光笔产生的库仑力作用在不同的原子和分子上时，会因库仑力的频率和强度的不同，原子和分子的被迫振动的频率和本有振动频率的叠加结果也会不同。这就是红光照射在不同颜色的物体表面上会有不同的颜色的原因所在。

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