LASER LIGHT BENDING VIA LENSES

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Abstract

This study is about a single component cylindrical structured lens with gradient curve which we used for bending laser beams. It operates under atmospheric conditions and bends the laser beam independent of temperature, pressure, polarity, polarization, magnetic field, electric field, radioactivity, and gravity. A single piece cylindrical lens that can bend laser beams is invented. Lenses are made of transparent, tinted or colored glasses and used for undermining or absorbing the energy of the laser beams.

Keywords: Laser, Bending, Lens, Light, Nonlinear optics

1. Introduction

There are various different studies conducted on the bending of light. Some of these studies have been discussed in the experimental study in which the light was bended while it was passing through high gravitation field [1] and magnetic field [2]. Moreover, various different studies and theorems that focus on the bending of light are provided in the references [3].

Disregarding the effect of light diffraction, light tends to spread along a straight path. All the winding paths are used to gain plenty of light through mirrors, lenses and wave guides of light. Therefore, many researchers conducted their studies in various environments in which light is bent, even in vacuum [4].

Kaminer and his colleagues revealed that through the full solution of Maxwell's wave equations, light could have turns to the right or left without diffraction and by itself in circular orbits [5-8]. It is possible to identify in detail the behavior in sound and water waves, similar to the equations that account for these light waves. That light waves in the form of a special shape without accelerating has been proposed in the reference [9].

The studies conducted during the last decade have shown experimentally that Airy wave packets could bend themselves without accelerating [10-14]. These are defined as self-accelerating Airy wave beams. These studies have also proposed that these waves could be used in different ways in optical micromanipulation [15], plasma guidance [16-17], and in the position of routing surface plasmon [18-20]. It is also provided in the sources that apart from airy beams, Bessel waves have the same feature [18-21]. Due to the force of gravity, Airy beams move in their path as parabolic trajectories. In wide angels, without keeping their features and shapes, they spread in the form of paraxial approximation [21-22].

In the studies conducted on accelerating beams and paraximal regimes, the real solutions of nonparaximal Airy beams are Maxwell's wave equation solutions [22-23]. In another study, "caustic-design" accelerating beams cannot keep their shapes like nonparaxial regime nondiffacting paraxial Airy beams, and these are defined as caustic method [24-26].

Several studies found out that through the filemantation of ultra-intense Airy beam waves in air, Airy wave packets could lead to the generation of curved plasma channels [27]. The use of ultra-intense Airy beams curved plasma channels and self-bending, filemantation, and femtosecond laser pulses, and their features have been provided in the sources [27-33].

The current study, unlike the studies aforementioned, was conducted simply using a lens under the atmospheric conditions. The scale of laser beam bending can be adjusted as desired. It is not self-bending that occur due to the conditions. The radius of the bending light can be meters. The details of this experiment have been provided below.

2. Laser Bending Experiment

In the experiment, the CW laser was used as a source optical and with output power 1... 5mW, "CLASS-III" semiconductor laser diode operating with two pieces of standard AAA 1.5V. This laser source is an electronic component manufactured commercially without a special purpose. A 16 Mpiksel resolution camera was used to take the photos of the shapes. The distance between the laser source and the optical lens ranges from 60 mm and the distance between the optical lens and the plane is 1300 mm. The captured images are the final images spreading in the atmosphere after passing through the lens and are emitted in the atmosphere.

The images in the figures from 1 to 5 have been gained through the aforementioned lens. Green laser has been used as a resource.

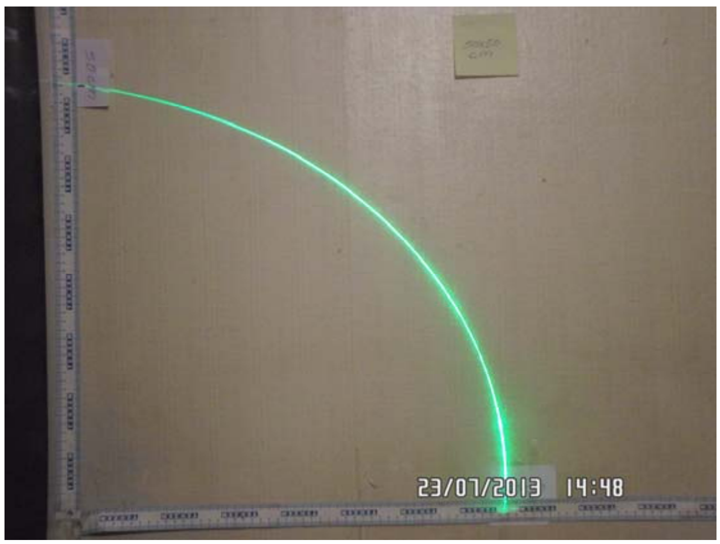

Figure 1. Laser is bent towards the left as a quarter circle.

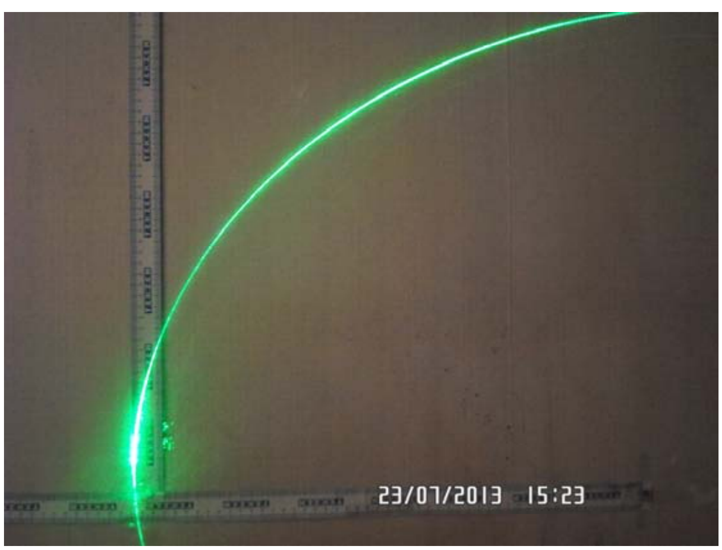

Figure 2. Laser is bent towards the right as parabolic.

Figure 3. Laser light at an angle limit. In this case, the spread of laser light is limited. It is possible to set the limits as desired.

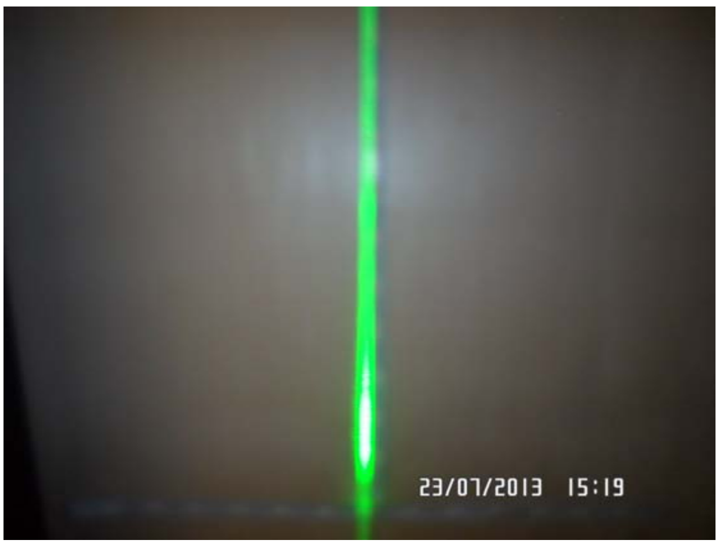

Figure 4. Laser light obtained through bending. In this case, the laser light is perpendicular to the lens. The laser beam moving as points are converted linear through bending and continues on its path as a vector. In our experimental studies, the laser beam was exposed to splitting and bending process at the same time [34]. It is an interesting finding in our experimental study that although the bending laser beam is expected to spread while moving away from the source, it, on the contrary, shrinks like free-flowing streams, or liquids. This is an interesting behavior of the laser beam [35]. In this case, although the laser beam is expected to spread, it is believed that it changes depending on the environment.

Figure 5. Obtaining the laser beam as liner. This is a particular case. It is converted into the linear part following the output of laser source. The spread of the laser beam is thus limited. The length of the linear part can be adjusted. The laser beam moves on this vector path in its direction of arrival.

Our other works on the bending of light have been provided in the references numbered [34-36]. Laser source has a finite energy. Therefore, the laser bent also has a finite energy and it is weakened after reaching a certain length and time. The properties of the lens used in the experimental study are provided in the patent of 2011/0911 TPI.

3. Conclusion

In this experimental study, the laser beam obtained through a semiconductor laser diode has been bent through a lens and a new method has been applied to calculate this bending. The results of the study have been obtained in accordance with the method developed.

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