

Relation between Intensity of Light and Velocity of Light photons

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Abstract: The Change in Intensity of Light is directly proportional to the change in velocity of photons emitted by that source of light.

Index Terms: Intensity, light, photons, velocity of photons.

Acknowledgement: The author wishes to thank Mrs. Anita P. Ramdasi for her help and valuable suggestion.

I INTRODUCTION

Intensity of light is measured differently in different contexts.

1. Radiant Intensity: It is radiometric quantity measured in Watts per Steradian.(W/sr).
2. Luminous Intensity: It is a photometric quantity measured in lumens per steradian(lm/sr) or Candela (cd)
3. Radiance: It is commonly called as 'Intensity in astronomy and astro physics and is measured in Watts per Steradian per meter square(W/sr.m²).
4. Irradiance: It is radiometric quantity measured in Watts per square meters (W/m²). It is the intensity (physics), name used in other branches of physics.

In this paper, we are dealing with intensity (physics). Actually a source of light or any electromagnetic radiation emits photons. Photon is the smallest quantum of light. Intensity is the power transferred per unit area where the area is measured on the plane perpendicular to the direction of the propagation of energy. The kinetic energy of a photon is given by

$$E = \frac{1}{2} mv^2$$

Where E - Kinetic Energy of photon.

m- mass of photon.

v- velocity of photon.

If n photons are emitted per unit area, then the total kinetic energy per unit area will be $\frac{1}{2} nmv^2$.

When there is increase in intensity, there is proportional increase in this total kinetic energy per unit area. As the mass of photon is constant, either there is increase in -

1. Number of photons.
2. Velocity of photons.
3. Both.

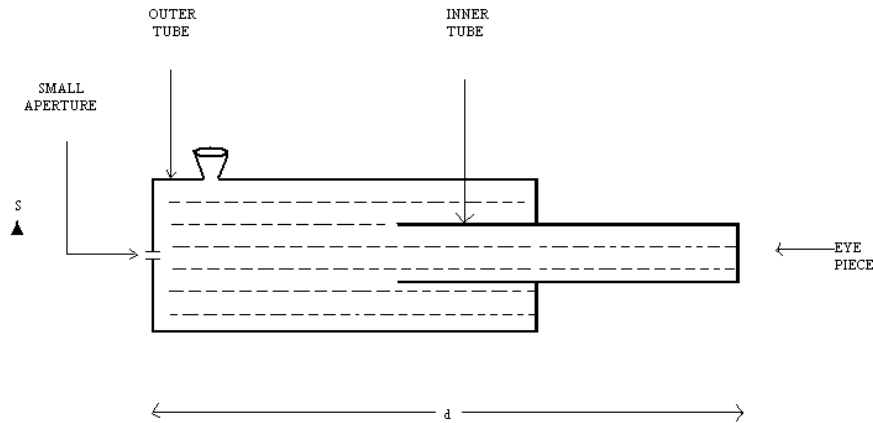
The prevailing view is that when intensity is increased, the number of photons per unit area get increased. The below given experimental result does not support this view.

To verify which of the three reasons causes increase in intensity, we will have to refer to experiment results.

II Experimental Reference

For that we will have to examine the results of the experiment.

"An experiment on the absorption of light" by Dixit Anil.



With a given voltage applied to the bulb, the telescope was adjusted until it was judged that light had become extinguished, as sensed by eye. It was seen that the depth of penetration increased with the increase in voltage applied i.e. increase in intensity (Qualitative results obtained). It is only possible, if the velocity of photons gets increased due to increase in intensity. If the number of photons were being increased due to the increase in intensity, there will not be any difference in the depth of penetration. There is no possibility also that with the increase in intensity both the number of photons and the velocity of photons may be increasing, because no such phenomenon is observed in the experiment.

Note: This author has written another paper² on the same subject, with a mathematical analysis. This paper is from a different viewpoint with an emphasis on Intensity of Light.

III Conclusion

The Change in Intensity of Light is directly proportional to the change in velocity of light photons emitted by that source.

IV References

1. Dixit A. "An experiment on the absorption of light". The Toth Maatian Review vol.10, pp. 4823-4824.(1991)
2. Dixit A. "Velocity of Light is variable and depends on the intensity of its source". IJSER vol.7, Issue 8, August 2016 ISSN 2229-5518 pp.1022 to 1024.