Improving the quality of lasers by using 3D motion of photon

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Abstract: When the excited electron emits a photon, it is moving. Therefore, the motion of the photon is affected by the motion of its source, Electron. So the photons have 3-Dimentional motion, helical motion. To have the tight spot beam of laser we should consider this motion. The front view of helical motion is a circle with the radius of R, so it is not possible to have a tight spot with a radius less than the R.

1. Introduction

In 1960, Theodore H. Maiman at Hughes Research Laboratories has built the first laser based on Charles Hard Townes and Arthur Leonard Schawlow theory. The spatial distinctions of laser from other sources of light are coherent, monochromaticity and illuminance [1]. Spatial coherence allows a laser beam to stay narrow over great distances (collimation), enabling applications such as laser pointers. Spatial coherence also allows a laser to be focused to a tight spot, enabling applications such as laser cutting and lithography. To have a laser with the best coherence, we need to know how the motion of each photon exactly is. [2,3] In this article we have focused on photon motion in order to have better coherence in laser.

2. Relation of Photon Motion and Laser Beam

Photons are generated by excited electrons. As the electrons have 2 different types of motion so photons must demonstrate such motions in its behavior.

Electrons normally have rotational motion around itself and around the protons and neutrons in the atom. When we give the enough Energy to an electron, it will go to the excited state. But it is temporary and after a while the electron should come back to the grand state and emit a photon. This photon is emitted from the moving source, electron, not the static one. So it is usual to have the motion that demonstrates the motion of its source. This shows that an emitted photon from moving electron must have 3-dimensional motion not 2.

Saleh Theory has proved that by considering 3D motion of photon, helical motion, (Fig.1) we could solve the wave and particle manner of photon at the same time and also some other difficulties like: ß decay, Redshift, different between red and blue evanescence in optical fiber, etc.[4,5]

The front view of helical motion of photon is a circle with radius of R that has relationship with frequency. The change in R will cause the frequency change and therefore the color change. In side view, this 3D motion of photon (helical) is like the sinusoidal motion which is the same as was defined in electrodynamics theory. So in this article based on Saleh Theory we assume a helical motion for photons and to have the tight spot beam we should know that it depends on frequency and there is a minimum in each frequency too.

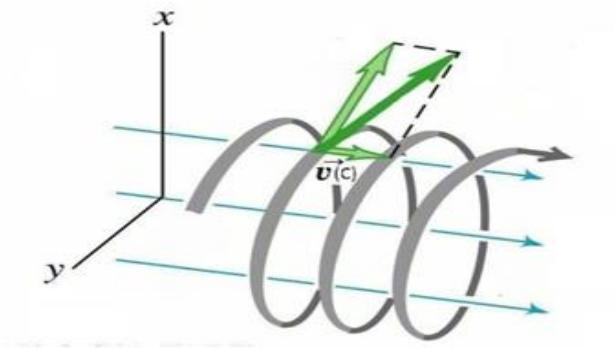

Fig.1. Helical motion of photon [3]

3. Conclusions

All theories, to have tight spot and narrow beam, try to localize the photons based on the photon motion. And they consider the 2 dimensional motion of photon. But in Saleh Theory photons have motion that is 3 dimensions. So in this paper we have focused on 3-Dimensional motion of photon regarding the motion of its generator, Electron, and have found the minimum range to tight the laser beam with their reasons.

References

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