

Photon Propagation in Free Space

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Abstract

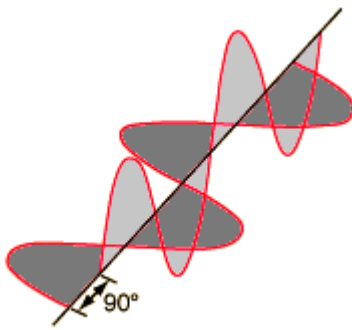
Photons or electromagnetic waves are self propagating. After being produced, the magnetic and electric fields have existence independent of the source. This is possible only if the two fields are in *phase quadrature*.

In free space, photons always travel with the fundamental speed of light ($c=3 \times 10^8$ m/s, a universal constant of relativity), at all times, in all directions, in all inertial frames, independent of the relative motion of sources and detectors.

In an electromagnetic wave:

- *An oscillating magnetic field creates an oscillating electric field.*
- *An oscillating electric field creates an oscillating magnetic field.*
- *The magnetic field energy plus electric field energy is always a constant.*
- *When the magnetic field is at its maximum, the electric field is zero and vice versa.*

The mathematical model of the free space Maxwell's equations needs to be modified so as to reflect on the phase quadrature relationship between the photon's transverse magnetic and the electric fields.



The mathematical symmetry of the free space Maxwell's equations, imply that the magnitudes of the transverse orthogonal magnetic and electric fields are physically equivalent. However, their numerical values in SI units are not equal since, the permeability and permittivity of free space have unequal numerical values in SI units.

FURTHER READING

Rajpal K L, Wave Particle Paradox and Evans
Photomagnetron, 2013.

http://www.physicsphotons.org/Wave_Particle19.pdf

07 March 2013.

Email your comments on this article to:

webmaster@physicsphotons.org

"If I can't picture it, I can't understand it." Albert Einstein.