Photons

HOME: The Physics of Bruce Harvey

We believe light consists of discrete packages of electromagnetic energy which we call photons. The primary evidence for this is the photoelectric effect in which photons hitting a metal surface eject electrons. While the intensity of light affects the rate at which electrons are ejected, there is for each metal a cut off frequency below which ejection does not occur. This leads to the empirical result that the energy of a photon is $E = h\nu$ where h is Planck's constant and ν the frequency.

We do not accept the way in which the standard model treats photons as particles. While it is a discrete package, we are convinced that its internal structure and processes must be controlled by the laws of electromagnetism. That is to say, it must be subject to Maxwell's laws.

One solution of Maxwell's equation is:

- A bundle of electric and magnetic flux moving with velocity $\vec{c}$
- $\vec{B}$ continuous and perpendicular to $\vec{c}$
- $\vec{D}$ orthogonal to $\vec{B}$ and $\vec{c}$
- The energy densities of electric and magnetic flux everywhere equal

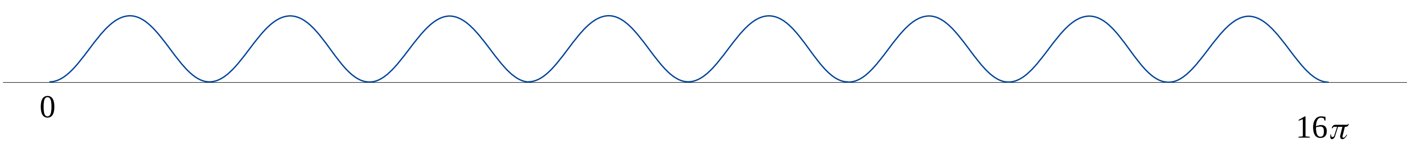
Under these conditions, the motion of the magnetic flux generates the electric intensity $\vec{E}$ resulting the electric flux density $\vec{D} = \varepsilon_0 \vec{E}$ and the motion of the electric flux generates the magnetic intensity $\vec{H}$ resulting in the magnetic flux density $\vec{B} = \mu_0 \vec{H}$.

If we admit to the quantisation of both electric and magnetic flux, we can deduce from this solution that the energy content of a photon is $E = \frac{n}{m} h\nu$ where $\frac{n}{m}$ is a fraction formed from two integers. This leads to a photon of 8 phases each consisting of a magnetic flux quantoid Φ_0 and an electric flux quantoid of $\frac{1}{6}e$.

Light possesses both wave like and particle like behaviour. Wave like behaviour is associated with the wave equation. This is a combination of two other equations, one which describes things which oscillate and the other which describes things moving past us. The first is a function of time, the second a function of position. The two functions add together to form the wave equation which is a function of time and position:

$$\frac{d^2}{dx^2} f(x - vt) = -\frac{d^2}{dt^2} f(x - vt)$$

The function $f()$ can be more or less any variable which describes the wave. For radio waves, it can be any one of 6 parameters D, E or ϕ of the electric field, B, H or A of the magnetic field. The solutions normally quoted involve sine and cosine functions or exponential functions. In fact, the solution is any function which is twice differentiable and has smooth tails. Here is the function which we suggest describes the photon. It is smooth, single valued, has a finite domain which moves with a velocity v to the right and its ends merge smoothly into the axis.



$$f(x - vt) = 1 - cos(x - vt) \qquad : \qquad 0 \leqslant (x - vt) \leqslant 16\pi$$

We have chosen this function because it behaves well under integration and differentiation and has the desired properties.

$$\int_0^{2\pi} 1 - cos\left(x - c\,t\right)\, dx \;=\; 2\pi; \qquad \int_0^{2\pi} (1 - cos\,(x - c\,t))^2\, dx \;=\; 3\pi$$

$$f \;=\; 1 - cos\left(x - c\,t\right); \qquad f' \;=\; sin\left(x - c\,t\right); \qquad f'' \;=\; cos\left(x - c\,t\right)$$

Since both integrals are simple multiples of the interval, we will have no difficulty finding a solution which gives the flux as an integer multiple of Φ_0 and the energy as $h\,\nu$.

In particular, its differentials are those of a sinewave so that any fields induced by its passing will have the required sinusoidal oscillation.

It differs from traditional solutions in that each phase consists of a single quantum fluxoid of magnetic flux. The magnetic flux in all eight phases is in the same direction.

Our photon also bears a striking resemblance to a deep ocean wave train. The chaos of storm waves sort themselves out over thousands of miles to form distinct wave trains which are usually only a few hundred metres wide and contain 7 significant crests slowly moving the train in the direction it is moving.

A more detailed account is given in Waves and Particles.