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La Symmetry Theorem

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Abstract: I believe that in physics, everything should be absolute. I came across this theory of decaying of light and thus concluded into writing this paper. This paper deals with what happens to a dying photon-does it ever die? If yes then what happens to the energy. This paper is about putting an absolute limit to the lifetime of any photon.

Keywords: Photon, Decaying of photon, Speed of light, mass energy symmetry, energy decay

1. Continuous decay of photon violates theory of relativity

From the theory of relativity, *The velocity of light in free space is constant and is independent of the relative motion of the source and the observer*. It implies that no matter which frame you are in, In vacuum, the light will always travel at the speed of c= 299792458 m/s with respect to you which, in turn means that irrespective of the frame of reference of the observer, light can never be stationary with respect to him, i.e. - you can't travel at the speed of light.

Now from the mass-energy equivalence theorem,
We know,

$E2 = (m_oc2)2 + (pc)2$ -----(7)

For photon,
$m=m_o=0$,
Therefore,

E=pc. ----(8) Where p is the momentum and c the speed of light.

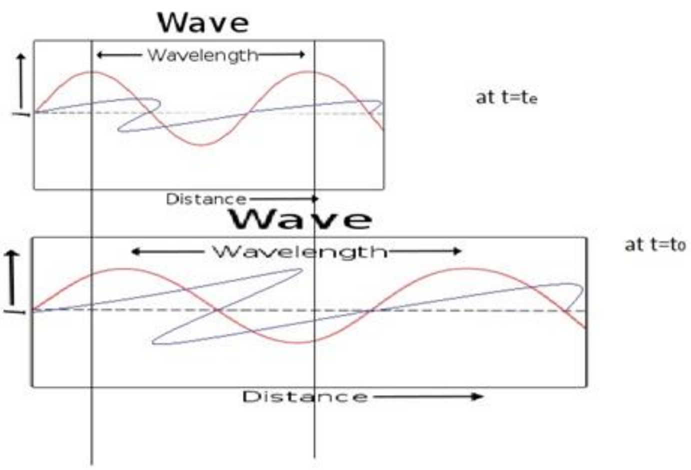
Now if it dies out,
Then E=0, thus p=0 too, i.e. the photon won't have any momentum which implies it will become stationary which will violate the theory of relativity. Thus, a photon can never die.

2. Energy decay

2.1. Module -1: The Problem & Proof

Why a photon loses its energy, traveling over space-time (it has to die)

The space is expanding. The expansion however, has no effect on relative distance between two particles when they are bounded by some 'potential' Field. But light is not a bounded system. It is a 'disturbance' in space-time fabric. Hence, with the expanding space, the disturbance over it will also spread. Thus, the wavelength gets stretched thereby shifting the radiation towards the red end of the spectrum



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We see that when space expands, the wave gets stretched in every way.

When the light was emitted at time t=te , let its wavelength be λe.

Then the energy,

$E_e=hc/\lambda_e$ -----(1)

Then again at the time of being observed t=to,

$E_o=h_c/\lambda_o$, where λo>λe -------(2)

From equations (1) and (2),

We see that as time changes from te to to , the energy decreases . Thus due to the expansion of space, light keeps losing energy.

Proof (example) - The Cosmological red shift

2.2. Module-2: The remedy

On Quantum level, the principle states that you can lend energy from vacuum but you have to return it. The more energy [mass] you borrow, the quicker you have to return it back.

Since light hast to lose energy, to decide the fate of photon, All that is left to determine is whether anything can compensate the loss of energy?

Keeping vacuum as the frame of reference, and considering quantum model of vacuum- we know that here, particles [photons] keeps appearing in pairs and instantly disappearing back.

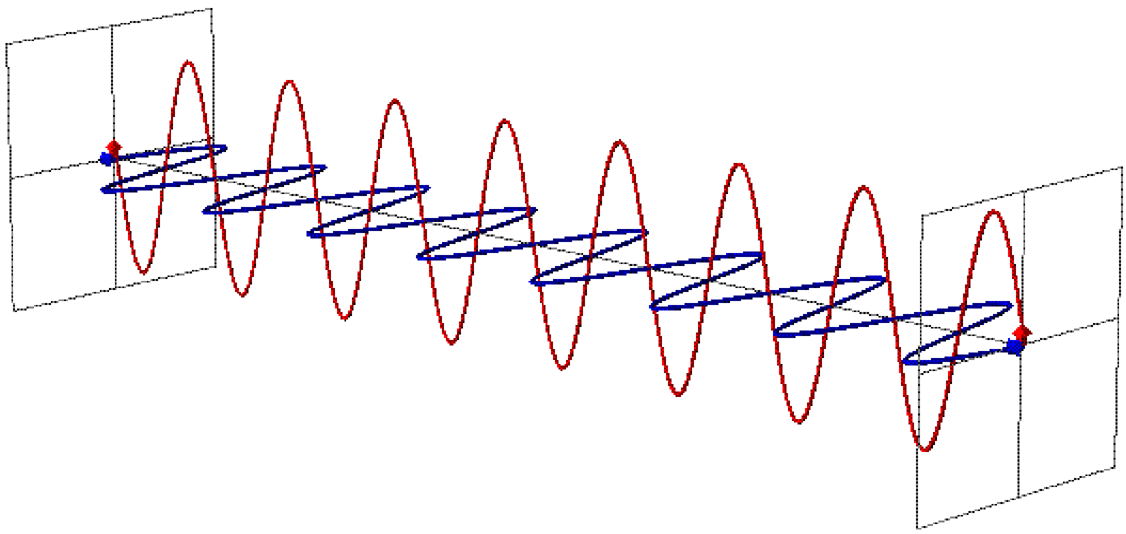
If at any point of time, this photon interferes constructively with our dying photon, then it can give it some energy. But when averaged over a time period,

∫0 T Edt/T = 0

We see that due to interfering constructively and destructively with equal probability, the net energy gained through it is 0.

Thus we see all though vacuum is a chaos; nothing can give "free energy" without taking it back at some time i.e. - "The Law of Conservation of Energy"

But what about space itself?



E=hf ------- (3)

f=V/ λ ------(4) where V=velocity of the wave, h= plank's constant

E/B=C ------(5) E, B are the electric and magnetic field intensity

Respectively.

We now have proved that when light travels through space, it has to keep losing its energy. But, then the obvious is that at some point of [our frame's] time, the photon will die out, i.e. no energy will be left! But that can't happen- the reason will be covered later. For now let's assume that it can never die. So, the only option left is that the energy has to stay constant; otherwise gradually it will die due to continuous loss of energy. Already having proved that no external agent can supply it energy analogy1b , the only option left is space itself.

Now, in order to have a constant energy,

Enet = Elost + Ecompensated ------(6)

We know,

Elost = energy lost due to expansion of space.

Therefore, from equation (3) and (4),

We see that in order to compensate, space will have to increase the velocity of the light [as 'h' is constant and 'λ' is already increasing].

But we are already working on the ideal space frame of reference, i.e. speed of light =c – the cosmic speed limit. Thus space can in no way lend energy to a 'dying' photon.

3. Module–3: Solution to the contradiction-La Symmetry Theorem

A) The proof

According to my theorem, the entire energy stored in the electric and magnetic field associated with the photon will be converted into an absolute mass and none will be left behind. The Proof is as follows:

From the poynting theorem-

∫v(E.S)dv = -∂/∂t∫v|½(μH2 +ƐE2)dv -∫s(E×H).ds

Where E, H are all vectors of respective electric and magnetic fields

Where ∫v (E.S)dv represents the rate of energy transferred by the wave into the volume V . I.e. The total power dissipated in the volume V.

And -∂/∂t∫v|½(μH2 +ƐE2)dv is the rate of decrease of energy in the volume V

And -∫s(E×H).ds the total electromagnetic energy crossing the surface boundary of the volume V

Now we can write ∫v (E.S)dv as ∫v βdv where β is the Power density per unit volume

Now consider a particle being born. Right after the instant it is born, the change in momentum will be say P.

So the force will be F = d/dt(P)

The work the particle does at that instant is ∫F.dl

i.e, ∫ (d/dt (P)).dl

Or, W = ∂/∂t ∫P.dl

Then the power dissipated from the particle will be

Pd = - ∂/∂t2∫P.dl, where the - sign signifies power loss

Using Stokes theorem,

Pd = - ∂/∂t2∫s (∇× P).ds

Again using Gauss Theorem,

Pd = - ∂/∂t2∫v∇. (∇× P).dv

Now this should be equals to the power associated with the wave i.e ∫v βdv

But we see that Pd = 0 as cos90º = 0

Therefore ∫v βdv = 0

What does this means? It means that once a photon is manifested as a particle with momentum then it can no longer lose any power as a wave.

Now as ∫v βdv = 0,

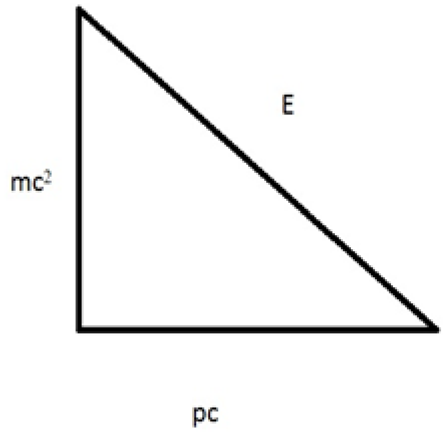
Then -∂/∂t∫v|½(μH2 +ƐE2)dv -∫s(E×H).ds = 0

Or, -∂/∂t∫v|½(μH2 +ƐE2)dv = ∫s(E×H).ds

Which means that the net energy being stored in the electromagnetic field inside the volume V is equal to the net energy crossing the surface boundary.

THE MASS CALCULATION

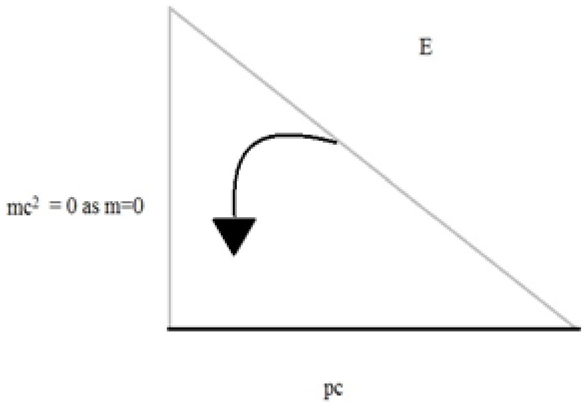
Let us consider a triangle, reason being that Pythagoras Theorem being unaffected by increase in dimensions



Applying Pythagoras's theorem, we get

E2 = (mc2)2 + (pc)2 which is nothing but equation (7)

Now putting m=0,

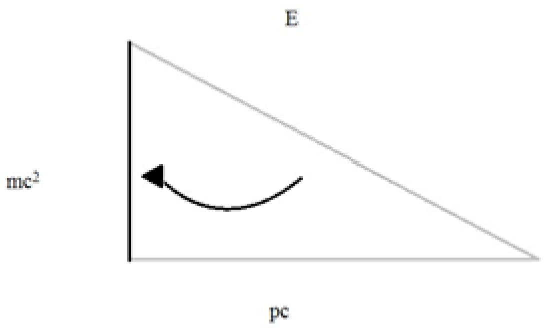


The perpendicular becomes zero, i.e. the triangle becomes a line and we get the equation for photon.

E = pc, which is equation (8)

Now,

When the photon keeps losing its energy to the point that it becomes a 'tired light' and is about to die out, the photon gets converted to mass.



The base becomes zero and the triangle becomes a line again.

But this time, we get E=mc2

That is, it's entire energy (E) gets converted into mass (m=E/c2) .

THE POSTULATES OF LA SYMMETRY THEOREM

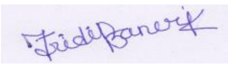
Once the particles gets manifested, the photon cannot exist or interact with space. i.e, it cannot lose any energy further

The particle born is unaffected by the expansion of space

Mass of the particle born is equals E/mc2

THE THEOREM

There exists a divine symmetry on account of which, all the energy [light] in the universe ultimately manifests itself into an absolute mass equivalent (m=E/ c2), E being the energy of the photon and c the cosmic speed limit.



POSSIBL PROOF

If we could just calculate the mass content at the beginning of the universe and the mass content of the present universe, and if the mass content of the present universe is more than that when it was born, clearly La Symmetry theorem is valid.

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