Re: an electron question

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- *From*: "FrediFizzx" <fredifizzx@xxxxxxxxxxx>
- *Date*: Sun, 15 Jan 2006 12:38:43 −0800

"srp" <srp2@xxxxxxxxxxxxxxxx> wrote in message
news:43CA7998.6070905@xxxxxxxxxxxxxxxxxxx
| FrediFizzx a écrit :
| > "srp" <srp2@xxxxxxxxxxxxxxxx> wrote in message
| > news:43C99997.9040608@xxxxxxxxxxxxxxxxxxx
| >|
| >|
| >|FrediFizzx a écrit :
| >|>"srp" <srp2@xxxxxxxxxxxxxxxx> wrote in message
| >|>news:43C7EA49.8000602@xxxxxxxxxxxxxxxxxxx
| >|>| FrediFizzx a écrit :
| >|>| > "srp" <srp2@xxxxxxxxxxxxxxxx> wrote in message
| >|>| > news:43C5D0BE.9020604@xxxxxxxxxxxxxxxxxxx
|
| [snip]
|
| > | > |
| > | > | Indeed! Wish I had that option on my hand calculator.
| > | > |
| > | > | Hey, maybe you'd be curious about my latest baby:
| > | > |
| > | > |
| >
http://pages.globetrotter.net/srp/discrete_electromagnetic_fields.pdf
| > | > |
| > | > | Totally mks however :−]
| > | > |
| > | > | André Michaud
| > | >
| > | > Hi André,
| > | >
| > | > Read your paper above. Your equation (34) seems to be 6 orders
| > | > of magnitude too big for the absolute value of the B_0 magnetic
field
| > | > of a photon. This is easy to see in your conversion to the
|E_0|
| > | > field in equation (38). Plugging in a 10 centimeter wavelength
gives
| > | > a value of

| > | > about 14.6 volts/meter. This certainly has to be way too big
for a
| > | > photon with a 10 cm wavelength. I am getting deja vous here.
;−) I
| > | > think we were discussing this before a few months ago. My
| > | > calculations give me about 1.06E−5 volts/meter for a 10 cm
photon.
| > | > Which seems much more reasonable. In SI units my equations for
a
| > | > free space photon are,
| > | >
| > | > |E_0| = e/(2*eps0*sqrt(alpha)*lambda^2)
| > | >
| > | > |B_0| = mu0*e*c/(2*sqrt(alpha)*lambda^2)
| > | >
| > | > So I think you made a mistake somewhere leading up to equation
(34)
| > | > but I have not pin−pointed it yet. I am sure it has something
to
| > | > do with the 1/alpha^3 factor. I don't know exactly what you
mean
| > | > by "absolute" wavelength either.
| > |
| > | OK, I'll definitely look again (thanks for caring to have a look
| > | yourself). I remember the conversation we had but I couldn't
pinpoint
| > | either any error in my sequence of derivation from Marmet's
equations
| > | at the time, and I trippled checked that Marmet's derivation were
| > | clean to start with.
| > |
| > | What comforts me that there may be no mistake, despite
appearences,
| > | is that the actual relativistic velocities of the electron can be
| > | calculated with precision for any carrying energy from these
| > | derivations.
| > |
| > | But I will recheck your point.
| >
| > Well, we can do some simple dimensional analysis also. The energy
of a
| > photon is E = hbar*w; it should also be of the order of E =
| > eps0*E_0^2*volume. Equating we get,
| >
| > |E_0| = sqrt(hbar*w/(eps0*vol))
| >
| > We can sub 2pi*c/lambda for w,
| >
| > |E_0| = sqrt(2pi*hbar*c/(eps0*vol*lambda))
| >
| > Assuming the volume is of order of the photon wavelength we sub

lambda^3
| > (IOW, a *whole* photon of a certain wavelength can't really fit in a
| > volume much smaller than this−−it maybe comes out to lambda^3/2pi in
| > actuality),
| >
| > |E_0| = sqrt(2pi*hbar*c/eps0)(1/lambda^2),
| >
| > and we note that sqrt(2pi*hbar*c) = e/sqrt(2*eps0*alpha),
| >
| > |E_0| = e/(eps0*sqrt(2*alpha)*lambda^2)
| >
| > So we can see that this is only different from my original |E_0| by
a
| > factor of 1/sqrt(2). For your equation (40), I think you would have
to
| > have a volume that a whole photon wouldn't fit into. It would be
much
| > too small wrt its wavelength. Some time ago, I ran across a Cavity
QED
| > experiment that was using an expression close to mine in value for
E_0
| > of a photon and getting sensible answers, but I can't find the
| > experiment now. I think they were simply using,
| >
| > |E_0| = sqrt(hbar*c)/lambda^2 in cgs units. Mine is,
| >
| > |E_0| = 2pi*sqrt(hbar*c)/lambda^2 in cgs units.
| >
| > So I am pretty sure it is close to being correct. At least of the
same
| > magnitude.
|
| Ok, I'll analyze what you are saying here. But from the calculations
| I just made, I can tell you that I agree with your equations (I'll
| explain further next), so what you just wrote will most probably
| also make sense to me upon analysis.
|
| When I say I agree with your equations for E_0 and B_0. Upon
| resolving vor U, we obviously obtain the total amont of energy
| in joules for one .1 meter wavelength photon if it were alone
| in one cubic meter of space, but on the other hand, this doesn't
| localize the energy of the photon anywhere into that volume as
| a local lump of energy, an energy that if it were concentrated
| in a local lump, would locally have a density way higher (per
| cubic meter) than if it were evenly spread out over the whole
| unit volume of 1 m^3.

Why 1 m^3? The normalization "box" for the heuristic example above for
a .1 meter photon would be 0.001 m^3.

| IF you analyze Marmet's paper, you will see that he integrates

| the magnetic energy of the electron from infinity to r_c
| precisely to localize it (concentrate it in a local lump of
| energy that more closely corresponds to the electron being
| a localized particle.
|
| Upon close analysis, that r_c (the electron classical radius)
| simply is the absolute amplitude of the wavelength of the
| electron divided by alpha.
|
| alpha has this value simply because integrating any nearer
| to r=0 would accumulate too much energy and any further from
| r=0 would not accumulate enough energy to account for the
| verified complement of energy making up the mass of the
| electron.
|
| I found that this inferior limit of integration
| (lamda/2pi)/alpha turns out to corresponds a universal lower limit
| of integration for any such spherical integration from infinity.
|
| The 3 alpha you find in my equation (alpha^3) corresponds to
| the spherical integration of the three aspects of EM energy in
| the 3 spaces model electric, magnetic, and "energy sustaining the
| velocity of the particle"
|
| The result is to give the mean "local" energy density within
| the mean volumes that the cycling energy of the particle will
| occupy, which, being way smaller than the reference 1 cubic
| meter volume, you will certainly relate to the fact that that
| local density will be higher, and most probably by many orders
| of magnitude than if the photons energy was spread out over
| the total reference volume.
|
| These local densities are what my E and B give.
|
| As for the associated volumes, I simply don't know how to assess
| them precisely since the energy probably is constantly pulsating
| (cycling between E and B states) as it moves. They may even have
| little to do with the actual wavelength, which, if you think about
| it, is simply the physical distance covered by a photon during
| one cycle of its frequency. The varying volume aspect remains
| to be addressed.
|
| There probably is a yet to be found way to brige the gap between
| your E and B equations for "uniformly spread energy into the
| reference volume" and my E and B equations for "localized lump
| of energy within the reference volume"

OK. I guess the real question here is my supposition that there is a minimum volume that a whole photon could fit into based on its wavelength. I find that minimum volume to be lambda^3/2pi. Of course this is a volume that travels with the photon at c and there should be a probability of 1 to always find the photon in that volume. From a detection perspective, this reduced to an area that is observer dependent. But this volume situation goes to Casimir effect that wavelengths longer than the distance between the plates are excluded from being inbetween the plates. However in the traveling volume scenario, I guess there might be a non−zero probability of finding a photon of a longer wavelength in a volume smaller than lambda^3/2pi. Perhaps this is not a good example to show why your "generalized" equations (34) and (40) for B_0 and E_0 of a photon would give the wrong answers if plugged into the wave equations.

What happens with your values is that you will get a photon count that is about 6 orders of magnitude smaller if we could count photons in a EMR field. IOW, since your E_0 and B_0 values are higher, it takes less photons to make up a certain EMR field. This is way off from what I have seen quoted in the literature. For example, in Jackson's "Classical Electrodynamics, 3rd Ed.", he quotes that one meter from a 100−watt light bulb the rms electric field is of order 50 volts/meter and there are about 10^15 visible photons per cm^2*second. I suppose this one might be tough to calculate. But another example he gives is 100 watt FM isotropic transmission of 10^8 Hz is rms .5 milliVolts/m at 100 kilometers and has a flux of about 10^12 photons/(cm^2*s). This one should be easier to calculate. Plug in your value from equation (40) and see if you agree.

| > | By "absolute wavelength", I mean the wavelength that the energy
| > | making up the rest mass of a particle would have it if were free
| > | energy,
| > |
| > | Lambda_A = h / m c
| > |
| > | For the carrying energy, it is the wavelength that this energy
| > | would have if it was free (not carrying a massive particle)
| > |
| > | Lambda_A = hc / E
| > |
| > | For example, the absolute wavelength of the energy making up
| > | the rest mass of the electron would be Compton wavelength,
| > | of course
| > |
| > | André Michaud
| >
| > OK, I guess you mean an invariant type of wavelength.
|
| Yes. The wavelength that any amount of energy would have it
| was moving at the speed of light.

Unfortunately the wavelength of a photon is observer dependent so I take this to mean the wavelength upon detection.

| If you dig into the second part, regarding relativistic velocities

| of moving electron, you will see how my E and B equations
| combine to allow calculating relativistic velocities strictly
| from EM considerations. To me, this is the confirmation that
| my approach by localizing the photon's energy is a promising
| avenue.

Well, you are simply carrying the same 6 order of magnitude error in both E and B so you still get the right answer at the end in equation (61). ;−) But I will try to take a closer look at what you are doing in the second part.

FrediFizzx

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- ***Follow−Ups***:
  - ***Re: an electron question***
    - *From:* srp
- ***References***:
  - ***an electron question***
    - *From:* chantal
  - ***Re: an electron question***
    - *From:* Jim Black
  - ***Re: an electron question***
    - *From:* chantal
  - ***Re: an electron question***
    - *From:* srp
  - ***Re: an electron question***
    - *From:* FrediFizzx
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