Re: The time it takes to emit one photon

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- *From*: "nightlight" <nightlight@xxxxxxxxxxxxx>
- *Date*: Sat, 1 Oct 2005 08:29:33 +0000 (UTC)

>> .. he would be in a shock to see a dripping faucet or
>> a leaky ceiling ... Or similarly, would one be forced
>> to conclude after seeing a broken tree in forrest
>> after a strong wind that the wind must have come in
>> a form of cannonballs or some such projectile? ...
>
> I think your falling tree analogy is not valid here.
> Trees in the forest fall down because they are too sick
> or too old, or because of some inhomogeneities in the
> wind speed. ...

It is one of innumerable analogies we can see everywhere around us. Each one has, of course, its own individual mechanism by which it converts continuum into discrete. The point is that it is a conceptually trivial matter with abundance of conceivable models one might try.

> If the wind is perfectly homogenous and all
> trees have exactly the same strength, then all trees
> will either stand together or fall down together.

When do you have all the electrons of a cathode tube or in a solid of an avalanche diode (semiconductor detector) exactly same distributed perfectly homogeneously? The vacuum fluctuations preclude this "absolutely identical" and "homogeneous" state even in principle. They are exactly sufficient (within resonant absorption mechanism and semi−classical theory) to account quantitatively for the discrete and pointlike apparence of photoeffect. That is all a very very old hat (cf. [2] on history and evolution of this problem).

> Another argument against the wave theory of light: suppose that
> we are using infrared light instead of the visible light. In
> this case, the scintillating screen may fail to work completely.

Again, you're recycling phony toy arguments from the introductory chapters of elementary QM textbooks (such as Eisberg & Resnick [1], e.g. chapter 2 on "photons", see their "example 2−1" which is what you're handwaving), which go back to Old QM (pre−1920s). The most in depth and by far the best discussion of these wave vs particle

arguments (with a very lively historical background) is in the book [2] "The tiger and the shark". As already suggested, you should also check the intro section of paper [3] to see why all that became obsolete already with Schrodinger QM, giving rise to the photon anticorrelation experiments later (it also gives more recent references refuting the Old QM arguments).

> The photon theory of light has a simple explaination: the energy
> of each photon is not sufficient to excite active scintillating
> centers.

It is "simple epxlanation" only if you look through a very small pinhole allowing you to see only the localization aspect of the phenomenon. As your puzzlement at a simple interference illustrates, the "marble−photon" imagery is quite limited. Check the intro section in [3] to see why such arguments don't do much as a motivation for the quantization of EM field.

Until you study this problem quite a bit beyond the Eisberg/Resnick's level, we're not even discussing the same subject. The topic I was discussing are the flaws in the present day non−classicality "observations" and "proofs", while you're recycling the "observations" and "proofs" from century or more ago (all long obsoleted for this purpose).

1. R. Eisberg, R. Resnick "Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles" Wiley 1985

http://www.amazon.com/exec/obidos/tg/detail/−/047187373X/qid=1127851719/sr=1−2/ref=sr_1_2/103−0363272−125

2. Bruce R. Wheaton
"The Tiger and the Shark : Empirical Roots of Wave−Particle Dualism"

Cambridge University Press; Reprint edition (July 26, 1991)

http://www.amazon.com/exec/obidos/tg/detail/−/0521358922/qid=1127853237/sr=1−1/ref=sr_1_1/103−0363272−125

3. 4. J.J. Thorn, M.S. Neel, V.W. Donato, G.S. Bergreen, R.E. Davies, M. Beck
"Observing the quantum behavior of light in an undergraduate laboratory"
Am. J. Phys., Vol. 72, No. 9, 1210−1219 (2004).
a) http://marcus.whitman.edu/~beckmk/QM/grangier/Thorn_ajp.pdf
b) Experiment Home Page: http://marcus.whitman.edu/~beckmk/QM/
c) On how it cheats:
http://www.physicsforums.com/showthread.php?t=71297

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    - ◊ *From:* Eugene Stefanovich

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