Photon and Electron Wavelengths and Mills

Horace Heffner Dec 4, 2002

The following comments are in regard to the Mills hydrino concept, which hypothesizes the existence of sub-ground state hydrogen atoms.

The kinetic energy K of an electron in Bohr orbit radius r is given by:

K = q^2/((8Pi)(e0)(r)) = (1/2)(m)(v^2)

So speed v is:

v = (q^2/((4pi)(e0)(r)(m))^0.5

and momentum is thus ~ 1/r:

p = mv = ((m)(q^2)/(4(pi)e0(r))^0.5

Given that the radius is quantized to:

r = (n^2) ((h^2)(e0))/((pi)(q^2)(m)), for n = 1,2,3, ...
(or in Mills' case: n = 1/2, 1/3, ...)

so:

v = [q^2/(2(e0)(h))] (1/n)

and thus:

v ~ 1/n

The lower the quantum state (i.e. n being a fraction less than 1), the smaller the radius, and the higher the kinetic energy and momentum.

When an ordinary excited atom radiates, the electron drops from a high potential to low potential. Half the potential change is radiated, the other half is converted into orbital electron kinetic energy. If the process is reversed in ordinary atoms, and a photon absorbed, then a change in potential of twice the photon energy is involved, half coming from the photon, and half in the reduction in kinetic energy of the electron.

In hydrino formation, if the (external) energy hole is filled is 27.2 eV, then, twice that energy might be involved in the external hole, 27.2 eV being absorbed, and 27.2 eV coming from the change in kinetic energy of the external atom's electron(s). However, this point is moot, in that what happens to the external energy hole is likely unimportant.

Now, looking at the hydrino formation, if we have:

r = (n) ((h^2)(e0))/((pi)(q^2)(m)), , for n = 1/2,1/3,1/4, ...

instead of the normal quantized Bohr radius:

r = (n^2) ((h^2)(e0))/((pi)(q^2)(m)), for n = 1,2,3, ...

then we have an electron velocity of:

v = [q^2/(2(e0)(h))] 1/(n^0.5), for n = 1/2,1/3,1/4, ...

v = 2.1876914x10^6 m/s 1/(n^0.5), for n = 1/2,1/3,1/4, ...

and kinetic energy of the hydrino electron of:

Ke = (1/2)(m)(v^2)

= 2.179874x10^-18 J [1/n]

= 13.605698 eV [1/n], for n = 1/2,1/3,1/4, ...

so the full potential change for hydrino formation is:

Kp = 2 * 13.605698 eV [1/n], for n = 1/2,1/3,1/4, ...

= 27.21140 eV [1/n], for n = 1/2,1/3,1/4, ...

At this point it would superficially appear the first hydrino state requires a 54.5 eV energy exchange, not a 27.2 eV exchange. However, as with the ordinary atom, an explanation is that only the 27.2 eV is taken by the hole in making the first hydrino state. The rest comes from the change in state of the hydrino electron, which drops 54.5 eV in potential energy, but only retains 27.2 in eV kinetic energy. Only 27.2 eV need be taken by the hole, as Mills says. However, if this is the case, there is no energy left over for trapping a photon inside the hydrino (as Mills requires.) It makes no sense that there is a photon in there. That further makes no sense because there is no room for a low energy photon inside the hydrino. Not by a log shot, because the (minimum) 47 keV is not available to make the photon that is small enough to fit in there, as we shall see.

If you assume the photon involved is trapped inside the hydrino, its wavelength lambda must be less than r:

lambda < r = (n) ((h^2)(e0))/((pi)(q^2)(m)),

for n = 1/2,1/3,1/4, ...

lambda < (n) 5.291773x10^-11 m, for n = 1/2,1/3,1/4, ...

so, by Plank's equation:

Ep = h*nu = (h*c)/lambda

lambda = h*c/E < r = (n) ((h^2)(e0))/((pi)(q^2)(m)),

for n = 1/2,1/3,1/4, ...

and we see that the size of the hydrino decreases as n increases, i.e. 1/n decreases. We have the energy of the photon Ep:

Ep > (h*c)/[(5.291773x10^-11 m) (n)], for n = 1/2,1/3,1/4, ...

Ep > 23,429.6 eV (1/n), for n = 1/2,1/3,1/4, ...

So, for the first state to contain a photon, the photon energy must be about 47,000 eV! It gets worse as the state numbers get smaller.

Now to consider the de Broglie wavelength of the Mills' orbital electron, and compare it to the orbital radius. Assuming the electron kinetic energy in a hydrino is:

v = 2.1876914x10^6 m/s 1/(n^0.5), for n = 1/2,1/3,1/4, ...

and given de Broglie's:

lambda = h/p

we have the electron wavelength in a hydrino given by:

lambda_e = h/(m*v)

lambda_e = 3.324914x10^-10 m [n^0.5], for n = 1/2,1/3,1/4, ...

but this seems to conflict with:

r = (n) ((h^2)(e0))/((pi)(q^2)(m)), for n = 1/2,1/3,1/4, ...

= (n) 5.291773x10^-11 m, for n = 1/2,1/3,1/4, ...

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Taking even the first hydrino state, n = 1/2:

lambda_e = 2.351069x10^-10 m

but:

r = 2.645887x10^-11 m

a ratio of 8.885. The problem gets worse as n gets smaller, because r ~ n and lambda_e ~ n^0.5, so:

r/lambda_e = n/n^0.5 = n^0.5

and r shrinks in proportion to lambda as n gets smaller.

How does that big electron fit into that little hydrino? No matter how you cut it, the electron is not going to fit right into a sub-ground state hydrogen atom (at least not very long) and a photon of less than keV energy is way way too big.

Some later thoughts now follow.

Given that the radius is quantized to:

r = (n^2) ((h^2)(e0))/((pi)(q^2)(m)), for n = 1,2,3, ...
(or in Mills' case: n = 1/2, 1/3, ...)

we have:

v = [q^2/(2(e0)(h))] (1/n) = [q^2/(2(e0)(h)(n))]

instead of the Mills velocity:

v = [q^2/(2(e0)(h))] 1/(n^0.5), for n = 1/2,1/3,1/4, ...

Uncertainty of momentum (delta mv) for a particle (electron) constrained by distance delta x is given by Heisenberg as:

delta mv = h/(2 Pi delta x)

but 2r acts as our delta x because the electron is contained within the orbitsphere, so we have (substituting 2r for delta x in the above):

delta mv = h/(2 Pi [2 (n^2) ((h^2)(e0))/((pi)(q^2)(m))])

delta mv = [h (q^2)(m)] / [4 (n^2)(h^2)(e0)] delta mv = (q^2)(m) / [4 (n^2)(h)(e0)]

and an uncertainty in velocity delta v:

delta v = (q^2) / (4 (n^2)(h)(e0))

So now the question is how does delta v compare to v? That is to say is the uncertainty on v small in comparison to v? To see, let's look at the ratio:

(delta v)/v = [(q^2) / (4 (n^2)(h)(e0))] / [q^2/(2(e0)(h)(n))]

(delta v)/v = [(2)(e0)(h)(n)] / [(4)(n^2)(h)(e0)]

(delta v)/v = [(2)(n)] / [4 (n^2)]

(delta v)/v = 1 / (2n)

However, with normal (non-Mills) orbitals, n is a whole number, so delta v remains small with respect to v. There is not the large imbalance which is the subject of discussion here, which occurs because (1) n is a fraction, and (2) the exponents in the Mills equations differ such that as n goes to increasingly lower values, i.e. n = 1/x as x gets large, we have

delta v = (1/2) (x^0.5) v

for Mill's, and the resulting velocity and thus energy gets way out of whack in states other than n=1.

The above relations for K, v, p remain valid for inner electrons in the Bohr or Mills model (ignoring relativistic effects). With n = 1 in these inner states, it appears r is valid for either model, thus either model works fine for the inner electrons. Neither then violates Heisenberg. It is only the hypothesized (by Mills) fractional quantum states that violate Heisenberg.

Analysis from this perspective should have a dramatic effect on feasible catalysts, energy availability, and potential device design.

Notes from Dec 29, 2005 follow.

The above demonstrates that Heisenberg and de Broglie severely limit the half-life of hydrinos or hydrino like assemblies. Heisenberg doesn't actually preclude fractional orbits. It only necessarily predicts a half-life for them that is shorter the smaller the fraction n = 1/2,1/3,1/4, ...

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Making practical use of hydrinos then is a matter of generating them in an environment where they quickly cause nuclear reactions. A condensed matter environment is thus a good environment to utilize the hydrinos, but a difficult environment in which to generate them. A gaseous environment is less than ideal because a short half-life precludes high reaction rates. A liquid environment naturally provides both high density and the ability to create hydrinos. The blue glow regime near the anode then may be an ideal regime to create and utilize hydrinos or hydrino like assemblies.