430(4): General m Theory of Radiative Corrections

Start with the classical hamiltonian H of m theory used in Eq. (39) of UFT428:

$$H = \frac{1}{m(r)^{1/2}} \frac{p^2}{2m} \left(1 + \frac{U_0}{2mc^2} \right) + m(r)^{1/2} \left(U_0 + mc^2 \right) \quad -(1)$$

Here m is particle mass and p is particle momentum. The anomalous g factor of the electron is found from Eq. (1) using the minimal prescription and the hamiltonian:

$$H_2 \phi = \frac{ie\hbar}{2m} \underline{\sigma} \cdot \underline{\nabla} \frac{1}{m(r)^{1/2}} \underline{\sigma} \cdot \underline{A} \phi \quad -(2)$$

as in UFT429. This gives:

$$g = \frac{2}{m(r)^{1/2}} \quad -(3)$$

The second method gives the hamiltonian:

$$H_3 = \frac{p^2}{m\left(\frac{\hbar\omega}{mc^2} + m(r)^{1/2} \right)} + m(r)^{1/2} \left(U_0 + mc^2 \right) \quad -(4)$$

So:

$$g = \frac{4}{\frac{\hbar\omega}{mc^2} + m(r)^{1/2}} \quad -(5)$$

For the rest particle $\hbar\omega_0 = mc^2$ $\quad -(6)$

and

$$g \rightarrow \frac{4}{1 + m(r)^{1/2}} \quad -(7)$$

In the Dirac theory:

$$m(r) = 1 \quad -(8)$$

) and both eqs. (3) and (7) give:

$$g = 2 \quad -(9)$$

which is, self consistently, the g factor in Dirac theory.

This is far simpler than quantum electrodynamics, and shows that the nature of space is responsible for the g factor of the electron. In my theory, the anomalous g factor of the electron is "the vacuum", i.e. the nature of space itself.

In my theory the Lamb shift is described as in UFT428 by considering part of the hamiltonian (1):

$$H_4 = \frac{1}{m(r)^{1/2}} \frac{p^2}{2m} + m(r)^{1/2} U_0 \quad -(10)$$

Eq. (10) is obtained by assuming:

$$U_0 << 2mc^2 \quad -(11)$$

and

$$H_4 := H - m(r)^{1/2} mc^2 \quad -(12)$$

In the SU(2) basis:

$$H_4 = \frac{1}{2m} \underline{\sigma} \cdot \underline{p} \frac{1}{m(r)^{1/2}} \underline{\sigma} \cdot \underline{p} + m(r)^{1/2} U_0 \quad -(13)$$

and this is quantized using:

$$\underline{p} \phi = -i\hbar \underline{\nabla} \phi. \quad -(14)$$

In the hydrogen atom:

$$U_0 = -\frac{e^2}{4\pi \epsilon_0 r} \quad -(15)$$

is the Coulomb interaction between the electron and

3) proton, so:

$$E_n = -\frac{\hbar^2}{2m}\left(\int \phi^* \frac{1}{m(r)^{1/2}} \nabla^2 \phi \, d\tau + \int \phi^* \underline{\nabla}\left(\frac{1}{m(r)^{1/2}}\right) \cdot \underline{\nabla} \phi \, d\tau\right)$$

$$- \frac{e^2}{4\pi\epsilon_0} \int \phi^* \frac{m(r)^{1/2}}{r} \phi \, d\tau \quad -(16)$$

These H atom energy levels show shifts and splittings controlled by $m(r)$.

The Lamb shift between $2P_{1/2}$ and $2S_{1/2}$ is described exactly by choice of $m(r)$. Any other type of Lamb shift can be described. In a full scale supercomputer computation the relevant wavefunctions would be used. The Dirac theory gives:

$$E_{nj} = E_n\left(1 + \left(\frac{\alpha}{n}\right)^2\left(\frac{n}{j+1/2} - \frac{3}{4}\right)\right) \quad -(17)$$

and does not give a Lamb shift because n and j are the same in $2P_{1/2}$ and $2S_{1/2}$.

This theory is far simpler and more effective than quantum electrodynamics because in m theory there is no need for regularization and renormalization.

The classical Casimir force is found as in Note 430(3):

$$F = -\frac{dm(r)}{dr} \frac{\rho^2}{2m(r) - r\frac{dm(r)}{dr}} \quad -(18)$$

+) from the kinetic energy term in Eq. (1):

$$E = \frac{1}{m(r)^{1/2}} \frac{p^2}{2m} \quad -(19)$$

Eq. (19) quantizes to the first two terms in Eq. (16)'s right hand side.

Finally the quantized Casimir force is:

$$F\psi = -\frac{\nabla^2}{2m}(f\psi) \quad -(20)$$

where

$$f(r) = -\frac{dm(r)}{dr}\left(\frac{1}{2m(r) - r\frac{dm(r)}{dr}}\right). \quad -(21)$$

so the force quantum levels are:

$$\langle F_0 \rangle = \frac{\hbar^2}{2m}\int \psi^* \nabla^2 (f(r)\psi)\, d\tau \quad -(22)$$

These can be evaluated for all atoms and molecules in terms of $m(r)$ and $dm(r)/dr$. This gives rise to the Casimir force quanta.