430(2): The Casimir Force in m Theory, and the Casimir Shift.

The Casimir force was inferred in about 1948 and is usually described in standard physics as a "vacuum force". The force due to m space has been derived using both Euler Lagrange and Hamilton developments of m theory. In UFT427 the results were shown to be the same:

$$F = -\frac{mc^2}{2}\gamma\frac{\partial m(r_1)}{\partial r_1} = -\frac{E}{m(r_1)^{1/2}}\frac{\partial}{\partial r_1}\left(m^{1/2}(r_1)\right) \quad -(1)$$

in the (r_1, ϕ) frame. Here E is the total relativistic energy of m theory:

$$E = \gamma m(r_1) mc^2 \quad -(2)$$

$$= m(r_1)\left(p_1^2c^2 + m^2c^4\right)^{1/2}$$

where p_1 is the relativistic momentum of m theory. Therefore the force due to m space is:

$$F = -xE \quad -(3)$$

where

$$x = \frac{1}{m(r_1)^{1/2}}\frac{\partial}{\partial r_1}\left(m^{1/2}(r_1)\right) \quad -(4)$$

$$-(5)$$

From eqs. (1) and (2):

$$-\frac{mc^2}{2}\gamma\frac{\partial m(r_1)}{\partial r_1} = -\frac{m(r_1)\gamma mc^2}{m(r_1)^{1/2}}\frac{\partial}{\partial r_1}\left(m^{1/2}(r_1)\right) \quad -(6)$$

so

$$x = \frac{1}{2m(r_1)}\frac{\partial m(r_1)}{\partial r_1}$$

so the force due to m space is:

$$\boxed{F = -\frac{1}{2m(r_1)}\frac{\partial m(r_1)}{\partial r_1}E} \quad -(7)$$

) where E is the total relativistic energy due to m space.

It is reasonable to assume that E is related to the experimentally well known Casimir force.

Now use:

$$\frac{dm(r_1)}{dr_1} = \frac{dm(r)}{dr}\frac{dr}{dr_1} \quad -(8)$$

to transform into frame (r, ϕ). Here:

$$r_1 = \frac{r}{m(r)^{1/2}} \quad -(9)$$

So

$$\frac{dr_1}{dr} = \frac{1}{m(r)}\left(m(r)^{1/2} - r\frac{d}{dr}m(r)^{1/2}\right) \quad -(10)$$

where:

$$\frac{d}{dr}\left(m(r)\right)^{1/2} = \frac{1}{2m(r)^{1/2}}\frac{dm(r)}{dr} \quad -(11)$$

Therefore:

$$\frac{dr}{dr_1} = \frac{m(r)}{m(r)^{1/2} - \frac{r}{2m(r)^{1/2}}\frac{dm(r)}{dr}}$$

$$= \frac{2m(r)^{3/2}}{2m(r) - r\frac{dm(r)}{dr}} \quad -(12)$$

From eqs. (8) and (12):

$$\frac{dm(r_1)}{dr_1} = \frac{dm(r)}{dr}\left(\frac{2m(r)^{3/2}}{2m(r) - r\frac{dm(r)}{dr}}\right) \quad -(13)$$

3) From eqs. (7) and (13):

$$\boxed{F = -\frac{dm(r)}{dr}\left(\frac{m(r)}{2m(r) - r\frac{dm(r)}{dr}}\right)^{1/2} E} \quad -(14)$$

It can be assumed that this is the expectation value of the Casimir force, Q.E.D.

Under the condition:

$$2m(r) = r\frac{dm(r)}{dr} \quad -(15)$$

the expectation value F is amplified to infinity.

Denoting:

$$f(r) = -\frac{dm(r)}{dr}\left(\frac{m(r)}{2m(r) - r\frac{dm(r)}{dr}}\right)^{1/2} \quad -(16)$$

then:

$$F = \langle F \rangle = \langle f(r) E \rangle \quad -(17)$$

where:

$$\langle f(r) E \rangle = -\frac{\hbar^2}{2m}\int \psi^* \nabla^2 \left(\frac{f(r)}{m(r)^{1/2}}\right)\psi \, d\tau \quad -(18)$$

The Casimir force in this theory is:

$$\langle F \rangle = \frac{\hbar^2}{2m}\int \psi^* \nabla^2 \left(\frac{dm(r)}{dr} \cdot \frac{1}{\left(2m(r) - r\frac{dm(r)}{dr}\right)}\right)\psi \, d\tau \quad -(19)$$

) and in general the Casimir force of in space splits and shifts the energy levels of the H atom.

So in addition to the Lamb shift there is a Casimir shift.

Under the condition (15) the Casimir shift can be greatly amplified. It would be very interesting to evaluate eq. (19) by computer, using the H atom wave functions. In practical experiments the Casimir force is measured with a capacitor, and results in the plates being slightly attracted to each other.

It seems that the concept of a Casimir shift is new to the work.
