1)

Paper 59 (1): H Atom Mexican Group Resonance

This is described by:

$$(\square + kT) q^a_\mu = 0 \qquad (1)$$

which is the weak field limit is:

$$\nabla^2 q^a_\mu = kT q^a_\mu \qquad (2)$$

which is a Schrödinger equation:

$$\hat{H} \phi = E \phi. \qquad (3)$$

The binding energy in H is 13.6 eV from the 1s orbital and is given to an excellent approximation by the Coulomb Law. The mass deficit in H is given by:

$$m(e) + m(p) = m(H) + m(\gamma) \qquad (4)$$

and the energy deficit by:

$$mc^2(e) + mc^2(p) = mc^2(H) + mc^2(\gamma) \qquad (5)$$

The combination of a proton and electron produces electromagnetic energy γ. The mass deficit is about $1 : 10^8$.

So for the H atom, the Coulomb Law holds to an excellent approximation.

2)

This means that:

$$d \wedge (d \wedge A + \omega \wedge A) = 0 \quad -(6)$$

The Hodge dual of this equation is:

$$d \wedge (d \wedge B + \omega \wedge B) = \mu_0 J \quad -(7)$$

Here:

$$J = \frac{A^{(0)}}{\mu_0} \left(\tilde{R} \wedge q - \omega \wedge \tilde{T} \right)$$

$$= \frac{A^{(0)}}{\mu_0} \tilde{R} \wedge q . \quad -(8)$$

The resonance equation is therefore:

$$\boxed{d \wedge (d \wedge B + \omega \wedge B) = A^{(0)} \tilde{R} \wedge q} \quad -(9)$$

The Coulomb Law current is part of:

$$J = A^{(0)} \tilde{R} \wedge q \quad -(10)$$

The mass deficit is given by $\tilde{R} \wedge q$. The electromagnetic J is transformed into a mass deficit.

More generally:

$$j = \frac{A^{(0)}}{\mu_0} \left(R \wedge q - \omega \wedge T \right) \neq 0$$

3)

and $\tilde{T}$ in eq. (8) is not zero. The amplitude of B in eq. (7) can be amplified at resonance. This gives the Mexican Group effects. To detect any deviation from the Coulomb Law requires high precision H spectra. Eq. (9) has the structure:

$$\ddot{x} + 2\beta\dot{x} + \omega_0^2 x = \alpha \cos\omega t \quad -(12)$$

The $\omega_0^2 x$ term is needed to define a resonance frequency. This is missing in the standard model.