319(1): Possible Methods of Counter Gravitation from the ECE2 Coulomb Law.

The general method is to look for mechanisms of non-Newtonian gravitation from the ECE2 equation of general relativity. The simplest equation is the ECE2 Coulomb law:

$$\underline{\nabla} \cdot \underline{g} = \underline{\kappa} \cdot \underline{g} = 4\pi G \rho_m \quad -(1)$$

in which:

$$\underline{\kappa} = 2 \left(\frac{\underline{q}}{r^{(0)}} - \underline{\omega} \right) \quad -(2)$$

and

$$\underline{g} = -\underline{\nabla} \Phi - \frac{\partial \underline{Q}}{\partial t} + 2 \left(c\omega_0 \underline{Q} - \Phi \underline{\omega} \right). \quad -(3)$$

In the absence of a vector potential $\underline{Q}$ this structure simplifies to:

$$\underline{\nabla} \cdot \underline{g} = \underline{\kappa} \cdot \underline{g} = 4\pi G \rho_m, \quad -(4)$$

with:

$$\underline{\kappa} = -2 \underline{\omega} \quad -(5)$$

and

$$\underline{g} = -\underline{\nabla} \Phi + 2 \Phi \underline{\omega}. \quad -(6)$$

By antisymmetry:

$$\underline{g} = -2 \underline{\nabla} \Phi = -4 \Phi \underline{\omega}. \quad -(7)$$

It follows that:

$$\nabla^2 \Phi = -2\pi G \rho_m \quad -(8)$$

so Φ has the well known solutions of the Poisson equation.

2) Having found $\underline{\Phi}$ from eq. (8) the spin connection $\underline{\omega}$ can be found from eq. (7):

$$\underline{\nabla}\,\underline{\Phi} = 2\underline{\Phi}\,\underline{\omega}. \quad -(9)$$

Using eq. (1):

$$\underline{\kappa}\cdot\underline{g} = 4\pi G\rho_m \quad -(10)$$

where

$$\underline{\kappa} = -2\underline{\omega} \quad -(11)$$

and

$$\underline{g} = -4\underline{\Phi}\,\underline{\omega} \quad -(12)$$

so

$$8\,\Phi\omega^2 = 4\pi G\rho_m \quad -(13)$$

Therefore:

$$\omega^2 = \frac{\pi G\rho_m}{2\Phi}. \quad -(14)$$

However the absence of a vector potential leads to a contradiction because in the Newtonian limit:

$$\underline{g} = -\frac{MG}{r^2}\underline{e}_r \quad -(15)$$

and

$$\underline{\nabla}\cdot\underline{g} = -2\underline{\omega}\cdot\underline{g} \quad -(16)$$

so

$$\omega = \frac{1}{2r}. \quad -(17)$$

However the scalar potential is:

$$\underline{\Phi} = -\frac{MG}{r} \quad -(18)$$

5) so from eqs. (9) and (18):

$$\omega = - \frac{1}{2r} \quad -(19)$$

Therefore the complete set of equations (1) to (3) is needed with the antisymmetry constraint:

$$\underline{g} = 2\left(- \underline{\nabla} \Phi - \frac{\partial \underline{Q}}{\partial t} \right) = 4\left(c\omega_0 \underline{Q} - \Phi \underline{\omega} \right) \quad -(20)$$

The force due to gravitation is:

$$\underline{F} = m\underline{g} \quad -(21)$$

From eqs. (1) and (20):

$$2\left(\nabla^2 \Phi + \underline{\nabla} \cdot \left(\frac{\partial \underline{Q}}{\partial t} \right)\right) = -4\pi G \rho_m \quad -(22)$$

i.e.

$$\nabla^2 \Phi + \frac{\partial}{\partial t}\left(\underline{\nabla} \cdot \underline{Q} \right) = -2\pi G \rho_m \quad -(23)$$

In the Newtonian limit:

$$\underline{g} = -\frac{MG}{r^2} \underline{e}_r = -\underline{\nabla} \Phi - \frac{\partial \underline{Q}}{\partial t} \quad -(24)$$

so Φ and $\underline{Q}$ can be found by solving eqs. (23) and (24) simultaneously. Also:

$$\underline{g} = -\frac{MG}{r^2} \underline{e}_r = 4\left(c\omega_0 \underline{Q} - \Phi \underline{\omega} \right) \quad -(25)$$

4) The Newtonian theory is

$$\mathbf{g} = -\nabla\phi \quad -(26)$$

where

$$\phi = -\frac{MG}{r} \quad -(27)$$

so in ECE2 it is developed as:

$$\nabla\phi \rightarrow \nabla\Phi + \frac{\partial \mathbf{Q}}{\partial t} \quad -(28)$$

Therefore ECE2 reduces to Newton when:

$$\nabla\Phi = \frac{\partial \mathbf{Q}}{\partial t} = \frac{1}{2}\nabla\phi \quad -(29)$$

However, ECE2 allows for deviations from the Newtonian theory if eq. (29) is not obeyed.

Also, ECE2 allows for zero $\mathbf{g}$ or positive $\mathbf{g}$ because:

$$\mathbf{g} = 4\left(c\omega_0 \mathbf{Q} - \Phi\boldsymbol{\omega}\right) \quad -(30)$$

So ~~g~~ if:

$$c\omega_0 \mathbf{Q} = \Phi\boldsymbol{\omega} \quad -(31)$$

then

$$\mathbf{g} = \mathbf{0} \quad -(32)$$