...14(2): Hamiltonian Method of Deriving the Equations of Motion

Consider the frame of reference (r, ϕ') where:

$$\phi' = \phi + \omega_1 t \quad -(1)$$

The hamiltonian in this frame is:

$$H = \frac{1}{2}m\left(\dot{r}^2 + r^2\dot{\phi}'^2\right) - \frac{mMG}{r} \quad -(2)$$

and is a constant of motion:

$$\frac{dH}{dt} = 0 \quad -(3)$$

$$= \frac{1}{2}\left(2\dot{r}\ddot{r} + \frac{dr^2}{dt}\dot{\phi}'^2 + r^2\frac{d\dot{\phi}'^2}{dt}\right) + \frac{mG}{r^2}\dot{r}$$

$$= r\ddot{r} + r\dot{\phi}'^2 + r^2\dot{\phi}'\ddot{\phi}' + \frac{mG}{r^2}\dot{r}$$

$$= r\ddot{r} - r\dot{\phi}'^2\dot{r} + 2r\dot{\phi}'^2\dot{r} + r^2\dot{\phi}'\ddot{\phi}' + \frac{mG\dot{r}}{r^2}$$

A possible solution of Eq. (3) is:

$$\ddot{r} - r\dot{\phi}'^2 = -\frac{mG}{r^2} \quad -(4)$$

and

$$2\dot{\phi}'\dot{r} + r\ddot{\phi}' = 0 \quad -(5)$$

Eq. (4) is: $\ddot{r} - r\dot{\phi}^2 = -\frac{mG}{r^2} + \Omega_r r \quad -(6)$

and Eq. (5) is:

$$2\dot{r}\left(\dot{\phi} + \omega_1 + t\dot{\omega}_1\right) + r\left(\ddot{\phi} + 2\dot{\omega}_1 + t\ddot{\omega}_1\right) = 0 \quad -(7)$$

The total angular momentum L is a constant of motion:

$$\frac{dL}{dt} = 0 \quad -(8)$$

nd

$$L = mr^2\left(\omega + \omega_1 + t\dot{\omega}_1\right) \quad -(9)$$

The spin connection Ω_r follows from:

$$\ddot{r} - r\left(\omega^2 + 2\left(\omega_1 + t\dot{\omega}_1\right)\omega + \left(\omega_1 + t\dot{\omega}_1\right)^2\right) = -\frac{MG}{r^2} \quad -(10)$$

So from these equations

$$\Phi\,\Omega_r = r\left(\omega_1 + t\dot{\omega}_1\right)\left(\omega_1 + t\dot{\omega}_1 + 2\omega\right) \quad -(11)$$

where

$$\Phi = -\frac{MG}{r} \quad -(12)$$

is the gravitational potential.

So:

$$\Omega_r = -\frac{r^2}{MG}\left(\omega_1 + t\dot{\omega}_1\right)\left(\omega_1 + t\dot{\omega}_1 + 2\omega\right) \quad -(13)$$

From eqs. (9) and (13): $\quad -(14)$

$$\Omega_r = -\frac{L}{mMG}\,\frac{\left(\omega_1 + t\dot{\omega}_1\right)\left(\omega_1 + t\dot{\omega}_1 + 2\omega\right)}{\left(\omega + \omega_1 + t\dot{\omega}_1\right)}$$

and

$$\ddot{r} - r\omega^2 = -\frac{MG}{r^2} + \Omega_r r \quad -(15)$$

$$2\dot{r}\left(\dot{\phi} + \omega_1 + t\dot{\omega}_1\right) + r\left(\ddot{\phi} + 2\dot{\omega}_1 + t\ddot{\omega}_1\right) = 0 \quad -(16)$$

) Numerical solution of eqs. (15) and (16), with spin connection (14), gives a shrinking and precessing orbit, Q.E.D.

Therefore the classical limit of an ECE2 covariant theory is sufficient to describe binary pulsars and S star systems. The Einsteinian general relativity is irrelevant and obsolete, and there is no need to postulate gravitational radiation from the Einstein equation applied to a binary pulsar.

The precession is:

$$\Delta \phi = \omega_1 T \quad -(17)$$

where

$$T = \frac{2\pi}{\omega} \quad -(18)$$

so

$$\Delta \phi = 2\pi \left(\frac{\omega_1}{\omega} \right) \quad -(19)$$

This gives a precise description of the S star precession where EGR fails by an order of magnitude.

The fully relativistic hamiltonian is:

$$H = \gamma m c^2 - \frac{m M G}{r} \quad -(20)$$

where γ is the Lorentz factor:

$$\gamma = \left(1 - \frac{v^2}{c^2} \right)^{-1/2} \quad -(21)$$

where

$$v^2 = \dot{r}^2 + r^2 \dot{\phi}^2 \quad -(22)$$