391(3): Computation of the Einstein Orbit and the Velocity Curve of a Whirlpool Galaxy

The Einsteinian orbit is computed from the Lagrangian:

$$\mathcal{L} = \frac{1}{2} m v^2 + \frac{mMG}{r} + \frac{mMGL^2}{mc^2 r^3} \quad -(1)$$

where:

$$v^2 = \dot{X}^2 + \dot{Y}^2 + \dot{Z}^2 \quad -(2)$$

and

$$r = (X^2 + Y^2 + Z^2)^{1/2} \quad -(3)$$

The well known Einstein force is:

$$F(r) = -\frac{\partial U(r)}{\partial r} = -\frac{mMG}{r^2} - \frac{3MGL^2}{mc^2 r^4} \quad -(4)$$

According to Einstein the orbit produces the precession:

$$\Delta\phi = \frac{3MG}{c^2 \alpha} \quad -(5)$$

where α is the half right latitude. This is indeed the observed result for small ϕ, but previous work has shown that it goes wild if ϕ is increased over its full range of definition. It will be interesting to see whether eq. (1) produces forward and backward precessions. The proper Lagrange variables are X, Y and Z.

On the other hand, the precessions from the ECE2 orbit remain stable for all ϕ, using:

$$\mathcal{L} = -\frac{mc^2}{\gamma} + \frac{mMG}{r} \quad -(6)$$

The orbital velocity from eq. (1) and (6) is

$$v^2 = \dot{X}^2 + \dot{Y}^2 + \dot{Z}^2 \quad -(7)$$

2) and in both cases should go to zero as r becomes large:

$$v \xrightarrow[r\to\infty]{} 0. \quad -(8)$$

In a whirlpool galaxy, the stars travel outward from the centre on a hyperbolic spiral orbit:

$$r = \frac{r_0}{\phi} \quad -(9)$$

The force law for such an orbit is inverse cubed, so the potential is a repulsive inverse squared. The lagrangian is

$$\mathcal{L} = -\frac{mc^2}{\gamma} - \frac{A}{r^2} \quad -(10)$$

where A is a constant. So:

$$U = \frac{A}{r^2} \quad -(11)$$

and

$$F(r) = -\frac{\partial}{\partial r}\left(\frac{A}{r^2}\right) = \frac{2A}{r^3} \quad -(12)$$

The velocity eq. (7) should become constant as r becomes very large. This has been shown analytically in previous UFT papers, using the relativistic Binet equation.

The computational method can be checked by using the non-relativistic limit:

$$\mathcal{L} = \frac{1}{2}mv^2 - \frac{A}{r^2}. \quad -(13)$$

In this limit the Binet equation shows that the orbit is a hyperbolic spiral, and so this orbit should emerge from the computation.

3) The two possible computational methods are the same as in the previous note:

1) Use the proper Lagrange variable:

$$\underline{r} = X\,\underline{i} + Y\,\underline{j} + Z\,\underline{k} \quad -(14)$$

2) Use the proper Lagrange variables X, Y, Z.

Finally use the methods of UFT390 to conserve antisymmetry by computing g, $\underline{\omega}$, $\underline{Q}$, ω_0 and $d\underline{Q}/dt$.

The vacuum maps in all cases are given by:

$$\omega^\mu = \left(\frac{\omega_0}{c}, \underline{\omega} \right) \quad -(15)$$