151(3): Minkowski Metric, Added Inverse Square Attraction

This metric is:

$$ds^2 = c^2 d\tau^2 = c^2 dt^2 \left(1 - \frac{r_0}{r}\right) - d\underline{r} \cdot d\underline{r} \quad -(1)$$

where

$$d\underline{r} \cdot d\underline{r} = dr^2 + r^2 d\phi^2 \quad -(2)$$

It is the Minkowski metric with time changed to:

$$dt^2 \rightarrow dt^2 \left(1 - \frac{r_0}{r}\right). \quad -(3)$$

It is not a solution of Einstein's field equation, but the latter is no longer relevant to contemporary physics. It is however a solution of the orbital theorem because it is:

$$ds^2 = c^2 d\tau^2 = c^2 dt'^2 - dr'^2 - r'^2 d\phi'^2 \quad -(4)$$

with:

$$dt' = \left(1 - \frac{r_0}{r}\right)^{1/2} dt, \; dr' = dr, \; r' = r, \; d\phi' = d\phi \quad -(5)$$

Its constants of motion are:

$$E = mc^2 \left(1 - \frac{r_0}{r}\right)\left(\frac{dt}{d\tau}\right), \quad L = mr^2 \frac{d\phi}{d\tau}. \quad -(6)$$

These are the same as in the gravitational metric. Its equation of motion is:

$$\left(1 - \frac{r_0}{r}\right)\left(\frac{dr}{d\tau}\right)^2 = \frac{E^2}{mc^2} - \left(1 - \frac{r_0}{r}\right)\left(mc^2 + \frac{L^2}{mr^2}\right) \quad -(7)$$

and its orbital equation is:

$$\left(\frac{dr}{d\phi}\right)^2 = r^4 \left(\frac{1}{b^2}\left(1 - \frac{r_0}{r}\right)^{-1} - \left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right) \quad -(8)$$

2)

Therefore:

$$\boxed{\phi = \int \frac{1}{r^2}\left(1-\frac{r_0}{r}\right)^{1/2}\left(\frac{1}{b^2}-\left(1-\frac{r_0}{r}\right)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)\right)^{-1/2} dr} \quad -(9)$$

For comparison, the ϕ from the gravitational metric is

$$\phi\,(\text{grav}) = \int \frac{1}{r^2}\left(\frac{1}{b^2}-\left(1-\frac{r_0}{r}\right)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)\right)^{-1/2} dr \quad -(10)$$

Therefore for a given a and b, the integrals (9) and (10) can be computed and compared.

Because of the shocking errors in the obsolete physics, there is no way of choosing theoretically between (9) and (10). Both types must be compared with data. The metric (1) gives:

$$\left(\frac{E^2}{mc^2}-mc^2\right) = \frac{1}{2}m\left(1-\frac{r_0}{r}\right)\left(\frac{dr}{d\tau}\right)^2 - \frac{mMG}{r} + \frac{L^2}{2mr^2} - \frac{MGL^2}{mc^2r^3} \quad -(11)$$

and the gravitational metric gives:

$$\left(\frac{E^2}{mc^2}-mc^2\right) = \frac{1}{2}m\left(\frac{dr}{d\tau}\right)^2 - \frac{mMG}{r} + \frac{L^2}{2mr^2} - \frac{MGL^2}{mc^2r^3} \quad -(12)$$

So the effective potential is the same in both.

3)

This fact illustrates that it is possible to obtain the same result for orbital precession using two different metrics. This is because the precession depends only on the effective potential. It becomes clear that orbital precession is not due to the Einstein field equation at all.

Also, since:

$$r_0 << r \quad -(13)$$

for light deflection by the sun, it is difficult to decide which metric is preferred experimentally, i.e. eq. (9) or eq. (10). The assumption of circular orbits cannot be used, because if such is made, both (9) and (10) become infinite. The so called precision tests of the Einstein equation are therefore useless, because they deal only with the solar system, in which everything is Newtonian essentially.

In whirlpool galaxies however, everything is essentially non-Newtonian and also non-Einsteinian, the orbit is the log spiral:

$$r = r_0 \exp(\beta\phi) \quad -(14)$$

and the metric is a Minkowski metric constrained by eq. (14).