190(12): Further Criticisms of Einsteinian General Relativity, Orbital Linear Velocity.

In Einstein's claims, the orbital linear velocity is given by:

$$v = \frac{dr}{dt} = cb\left(1-\frac{r_0}{r}\right)\left(\frac{1}{b^2}-\left(1-\frac{r_0}{r}\right)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)\right)^{1/2} \quad -(1)$$

where

$$a = \frac{L}{mc}, \quad b = \frac{Lc}{E}, \quad -(2)$$

$$r_0 = \frac{2MG}{c^2}. \quad -(3)$$

So

$$v = \frac{mc^2}{E}\left(1-\frac{2MG}{c^2 r}\right)\left(\frac{E^2}{m^2c^2}-c^2-\frac{L^2}{m^2r^2}+\frac{2MG}{r}+\frac{2MGL^2}{m^2c^2r^3}\right)^{1/2} \quad -(4)$$

However, the Newtonian limit is:

$$v = \left(\frac{2E}{m}+\frac{2MG}{r}-\frac{L^2}{m^2r^2}\right)^{1/2} \quad -(5)$$

i.e.

$$E = \frac{1}{2}mv^2 - \frac{MG}{r} + \frac{L^2}{2mr^2} \quad -(6)$$

Eq. (4) never reduces to eq. (5).

The reasons are as follows:

1) It has to be assumed that:

$$\frac{mc^2}{E}\left(1 - \frac{r_0}{r}\right) = 1. \quad -(7)$$

2) It has to be assumed that:

$$\frac{E^2}{m^2c^2} - c^2 = \frac{2E}{m} \quad -(8)$$

3) If it is assumed that in eq. (7):

$$E = mc^2, \quad 1 - \frac{r_0}{r} = 1 \quad -(9)$$

then it must also be assumed that:

$$v = cb\left(\frac{1}{b^2} - \frac{1}{a^2} - \frac{1}{r^2}\right) \quad -(10)$$

and this never gives eq. (5).

4) From eq. (8):

$$E^2 - 2Emc^2 - m^2c^4 = 0 \quad -(11)$$

i.e.

$$E = 0 \text{ or } 2mc^2 \quad -(12)$$

and this contradicts eq. (9).

In Einstein's claim:

$$E = mc^2\left(1 - \frac{r_0}{r}\right)\frac{dt}{d\tau} \quad -(13)$$

In the metric:

$$c^2 d\tau^2 = c^2 dt^2\left(1 - \frac{r_0}{r}\right) - \left(1 - \frac{r_0}{r}\right)^{-1} dr^2 - r^2 d\theta^2 \quad -(14)$$

3) By definition:

$$c^2 d\tau^2 = c^2 dt^2\left(1 - \frac{r_0}{r}\right) - \underline{dr} \cdot \underline{dr} \quad -(15)$$

where

$$\underline{dr} \cdot \underline{dr} = v^2 dt^2 \quad -(16)$$

so

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

$$= \left(c^2\left(1 - \frac{r_0}{r}\right) - v^2\right) dt^2 \quad -(17)$$

so

$$\frac{dt}{d\tau} = \left(1 - \frac{r_0}{r} - \frac{v^2}{c^2}\right)^{-1/2} \quad -(18)$$

and

$$\boxed{E = mc^2\left(1 - \frac{r_0}{r}\right)\left(1 - \frac{r_0}{r} - \frac{v^2}{c^2}\right)^{-1/2} = \text{constant}}$$

$-(19)$

In the Newtonian limit:

$$E = \frac{1}{2}\left(mv^2 - \frac{r_0}{r}\right) \quad -(20)$$

$$= \frac{1}{2}mv^2 - \frac{MG}{r}.$$

$$= T + V = \text{constant}$$

Eq. (19) never reduces to eq. (20).

Eq. (19) may be approximated by:

4)

$$E \sim mc^2\left(1-\frac{r_0}{r}\right)\left(1+\frac{1}{2}\left(\frac{r_0}{r}+\left(\frac{v}{c}\right)^2\right)\right) \quad -(21)$$

So

$$\frac{E}{mc^2} \sim \left(1-\frac{r_0}{r}\right)\left(1+\frac{1}{2}\left(\frac{r_0}{r}+\left(\frac{v}{c}\right)^2\right)\right) \quad -(22)$$

However, from eq. (9):

$$\frac{E}{mc^2} = 1, \quad -(23)$$

so in eq. (22):

$$\frac{r_0}{r} \to 0 \quad -(24)$$

and

$$\frac{E}{mc^2} = 1 + \frac{1}{2}\left(\frac{v}{c}\right)^2 \quad -(25)$$

or

$$E = mc^2 + \frac{1}{2}mv^2. \quad -(26)$$

This result is usually interpreted as "the relativistic kinetic energy":

$$E - mc^2 \to \frac{1}{2}mv^2 \quad -(27)$$

The procedure of trying to force eq (19) to become eq (20) means that mc^2 must be subtracted from E, and $r_0/r \to 0$. In this case however, the contradiction (3) is present. Comparing eq. (26) and (9), the velocity v vanishes!

So in order to proceed we adopt the numerical procedure:

5)

$$v = cbm(r)\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2}$$

$$= \left(c^2 m^2(r) - c^2 b^2 m^3(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2}$$

$$= \left(\frac{2E}{m} + \frac{2MG}{r} - \frac{L^2}{m^2 r^2}\right)^{1/2} \quad -(28)$$

i.e.

$$\boxed{c^2 m^2(r) - c^2 b^2 m^3(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right) = \frac{2E}{m} + \frac{2MG}{r} - \frac{L^2}{m^2 r^2}} \quad -(29)$$

This is a cubic equation for $m(r)$ in terms of the constants a, b, E and L; and r. Furthermore, the function $m(r)$ from eq. (29) can be cross checked from the ellipse:

$$\left(\frac{dr}{d\theta}\right)^2 = r^4\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right) \quad -(30)$$

$$= \frac{\alpha^2 \epsilon^2 (1 - \cos^2\theta)}{(1 + \epsilon\cos\theta)^4}$$

i. e. $\quad x = 1 \quad -(31)$

in note 190(7)