264(6): The Gravitational Red Shift in R and x Theory

Consider the metric for R theory developed in note 263(7):

$$c^2 d\tau^2 = (c^2 - v^2)\, dt^2 \quad -(1)$$

with v defined in terms of $R = r + r_0$:

$$v^2 = \left(\frac{dR}{dt}\right)^2 + R^2 \left(\frac{d\theta}{dt}\right)^2 \quad -(2)$$

In the non relativistic limit:

$$v << c \quad -(3)$$

this is a Newtonian theory with r replaced by R:

$$R = r + r_0 = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(4)$$

precisely equivalent to:

$$r = \frac{\alpha}{1 + \epsilon \cos(x\theta)} \quad -(5)$$

where

$$x = \frac{r_0}{\alpha} = \frac{3MG}{c^2 \alpha} \quad -(6)$$

is the experimentally observed planetary precession per radian. It appears that all precessions in the universe are described by x, with precision.

2) Therefore metric (1) describes the phenomena usually attributed to the old Schwarzschild metric. Metric (1) has the structure of the Minkowski metric of special relativity, but with r replaced by R in the definition of v, eq. (2)

From eq. (1):

$$\frac{d\tau}{dt} = \left(1 - \frac{v^2}{c^2}\right)^{1/2} \quad -(7)$$

and from the ECE equivalence principle:

$$g = \frac{\partial v}{\partial t} = -\frac{\partial \phi}{\partial r} \quad -(8)$$

in an inertial frame, where the rotational part of eq. (2) is absent. Note carefully that

$$\frac{dR}{dt} = \frac{dr}{dt} \quad -(9)$$

because r_0 is a constant for given α, i.e. for a given orbit.

So:

$$v = -\int \frac{\partial \phi}{\partial r} dt = -\int \frac{mMG}{r^2} dt = -\int \frac{MG}{r^2} \frac{dr}{v} \quad -(10)$$

and

$$\frac{d\tau}{dt} = \left(1 - \frac{MG}{rc^2}\right)^{1/2} \quad -(11)$$

$$\text{if} \quad v^2 = MG / r \quad -(11a)$$

5) For:

$$v \ll c \quad -(12)$$

$$\frac{d\tau}{dt} = 1 - \frac{mG}{rc^2} \quad -(13)$$

and the gravitational red shift is:

$$\boxed{\Delta t = \frac{mG}{rc^2}} \quad -(14)$$

This has been observed with great precision and is given straightforwardly by the x and R theories without the use of the old Schwarzschild metric, Q.E.D.