264(2): Calculation of the Gravitational Time Delay with x Theory.

With reference to Fig. (1), the gravitational time delay is caused by the light deflection due to gravitation of an object of mass M.

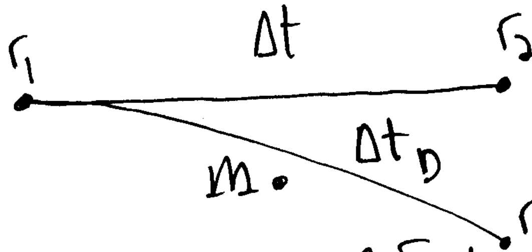

Fig (1)

If it is assumed that the undeflected light travels at c in the vacuum then:

$$c = \frac{r_2 - r_1}{\Delta t} \quad -(1)$$

and

$$\Delta t = \frac{r_2 - r_1}{c} \quad -(2)$$

In x theory the angle of deflection of light or e/m radiation by a mass M is given by:

$$\Delta\theta = 2\int_{R_0}^{\infty} \frac{d\theta}{dr}\, dr - \pi \quad -(3)$$

$$= \frac{2}{\epsilon}$$

where R_0 is the distance of closest approach and ϵ the eccentricity of the hyperbolic orbit of the light. At closest approach:

$$R_0 = \frac{\alpha}{1+\epsilon} \quad -(4)$$

where α is the half right latitude. In x theory:

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

where

$$x = 1 + \frac{r_0}{\alpha} = 1 + \frac{3MG}{c^2 \alpha} \quad -(6)$$

where G is Newton's constant. As shown in UFT262 and UFT 263 eqns (5) and (6) give the experimentally observed orbital precession per radian:

$$\Delta\theta = \frac{r_0}{\alpha} \quad -(7)$$

for all precessions observed in astronomy. Eqs. (5) and (6) also give the precisely correct light deflection due to gravitation, as shown in note 264(1).

For light deflection by the sun:

$$\left.\begin{aligned} \alpha &= 1.639992 \times 10^{14} \text{ m} \\ \epsilon &= 235,735.06 \\ \Delta\theta &= 8.4841 \times 10^{-6} \text{ radians} \end{aligned}\right\} \quad -(7)$$

from x theory, compared with the experimentally observed value of

$$\Delta\theta = 8.484 \times 10^{-6} \text{ radians} \quad -(8)$$

from NASA Cassini. For the sun:

$$\begin{aligned} R_0 &= 6.955 \times 10^{8} \text{ m} \\ M &= 1.9891 \times 10^{30} \text{ kg} \\ G &= 6.67428 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2} \end{aligned} \quad -(9)$$

From eq. (5):

$$\frac{dr}{d\theta} = \frac{x\epsilon}{\alpha} r^2 \sin(x\theta) \quad -(10)$$

$\Rightarrow$ So:

$$\frac{d\theta}{dr} = \frac{\alpha}{x\epsilon r^2 \sin(x\theta)} \quad -(11)$$

$$= \frac{\alpha}{x\epsilon}\frac{1}{r^2}\left(1 - \frac{1}{\epsilon^2}\left(\frac{\alpha}{r} - 1\right)^2\right)^{-1/2}$$

Therefore:

$$\frac{dt}{dr} = \frac{dt}{d\theta}\frac{d\theta}{dr} = \frac{mr^2}{L}\frac{d\theta}{dr}$$

$$= \frac{m\alpha}{x\epsilon L}\left(1 - \frac{1}{\epsilon^2}\left(\frac{\alpha}{r} - 1\right)^2\right)^{-1/2} \quad -(12)$$

In the solar system:

$$x \sim 1 \quad -(13)$$

so the system is Newtonian to an excellent approximation. Therefore:

$$\alpha = \frac{L^2}{m^2 MG} \quad -(14)$$

and

$$\frac{m}{L} = \frac{1}{(\alpha MG)^{1/2}} \quad -(15)$$

The time taken for the light to go from r_1 to r_2 is:

4) $$(\Delta t)_D = \int_{r_1}^{r_2} \frac{dt}{dr}\, dr$$

$$= \frac{d}{x\epsilon (dMG)^{1/2}} \int_{r_1}^{r_2} \left(1 - \frac{1}{\epsilon^2}\left(\frac{d}{r} - 1\right)^2\right)^{-1/2} dr \quad -(16)$$

in which everything is known from eqs. (7) and (9). The parameter x is known from eq. (6).

The gravitational time delay is:

$$\Delta\Delta t = (\Delta t)_D - \Delta t \quad -(17)$$

for light grazing the sun. Similarly it can be evaluated for light or electromagnetic radiation grazing any object of mass M in the observable universe. Eq. (16) is much simpler to evaluate than the obsolete and incorrect Einstein theory, and is of course based on correct geometry. The integral can be evaluated analytically.