THEORETICAL DETERMINATION OF THE VALUE OF NEWTON'S UNIVERSAL GRAVITATION CONSTANT THROUGH THE RELATIVITY TENSOR

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Summary

The value of Newton's universal gravitation count has been calculated based on the relativity tensor, the speed of light, the Hubble constant and the radius of the universe. The result obtained is very close to the experimental value.

1.- Speed of expansion of space-time

According to the relativity tensor, the linear differential element of it is given by

$dl^2 = -c^2dt^2+dx^2+dy^2+dz^2$

that in spherical coordinates and in spherical symmetry problems results:

$r^2 = x^2 + y^2 + z^2 = (r\ \text{sen}\phi\ \cos\mu)^2 + (r\ \text{sen}\phi\ \text{sen}\mu)^2 + (r \cos\phi)^2$

$d\ r^2 = d\ (x^2 + y^2 + z^2) = dx^2+dy^2+dz^2$

$dl^2 = -c^2dt^2+dr^2$

$dl = (-c^2dt^2+dr^2)^{1/2}$

where r = Hdt, with H being the Hubble constant or rate of expansion of space.

$dl = (-c^2dt^2+H^2dt^2)^{1/2}$

di/dt = space-time expansion rate = $(-c^2+H^2)^{1/2}$

it is an imaginary number of value of its modulus less than the speed of light and that only depends on the speed of light and the Hubble constant being very close to the speed of light.

2.- Calculation of the acceleration of the gravitational field at the ends of the universe

The gravitational field, according to the theory of generalized relativity, is created because of our movement in space-time, the same thing that happens to us with centrifugal force when we travel in a car in a curve. If our motive is space-time and its velocity which we have calculated being the radius of our curve the radius of the universe, we can calculate the value of the acceleration centrifuge at the ends of the universe that will match the value of the acceleration of gravity there, resulting in

$a = V^2/r$

$a = (-c^2+H^2) / R$

R being the radius of the Universe $1{,}37.10^{26}$ m:

$a = (-9.10^{16} + (7.10^4)^2) / 1.37.10^{26} = (-9.10^{16} + 49.10^8) / 1{,}37.10^{26} = 6{,}569.10^{-10}$ m/seg^2

acceleration of the gravitational field at the ends of the universe caused by the curvature of space-time.

3.- Calculation of Newton's gravitation constant

The experimental value of the universal gravitation constant is as follows, reference (a):

$G = 6{,}674.10^{-11}$ N.m^2/ Kg

like

1 Newton = 0,102 Kg

In Kg the value of G turns out to be:

$G= 6{,}543 .10^{-10}$

According to Newton:

$F = G\, M.m/ r^2$ (1)

$F = M.a$ (2)

According to these formulas and posing an equation with the values that we express below, the acceleration that we have calculated must coincide with the value of G since, if M represents the mass of the universe, m a mass of 1Kg, r is 1 meter, we have according to (1) and (2):

$(M+1).a = G\, M$

As M is much higher than 1Kg we have that the value of G will coincide with the value of "a"

THEN FOR THE UNIVERSAL GRAVITATION CONSTANT THE VALUE CALCULATED IS $6{,}569.10^{-10}$, the experimental value is = $6{,}543 .10^{-10}$, the calculation seems correct.

(a) **4.- References**

Constante de gravitación universal - Wikipedia, la enciclopedia libre