ECE2 COVARIANT THEORY OF ALL PRECESSIONS

by

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ABSTRACT

It is shown that all precessions of an object of mass m orbiting an object of mass M can be described by an ECE2 covariant infinitesimal line element defined in a space with finite torsion and curvature. Notable examples include the gravitational precession previously attributed to Einsteinian general relativity (EGR), the geodetic or de Sitter precession and the Lense Thirring precession. These are described simply and transparently by rotating the ECE2 line element. This theory leads to a severe criticism of the data reduction of Gravity Probe B.

Keywords: ECE2 theory, orbital precessions, line element rotation.

UFT405

1. INTRODUCTION

In immediately preceding papers of this series {1 - 41} it has been shown that the origin of precession is spacetime fluctuation. "Spacetime" in this context is interpreted as the vacuum or aether and there appears a gravitational force due to the vacuum as part of the ECE2 force equation. In a nearly circular orbit, the precession due to this force can be calculated using the well known apsidal method. In Section 2 it is shown that all the precessions present when an object of mass m orbits an object of mass M can be described by rotation of the ECE2 covariant infinitesimal line element, which is defined in a space with finite torsion and curvature. The precessions attributed to Einsteinian general relativity (EGR) can be explained in a far simpler way through the velocity of the rotation of the line element. EGR has been refuted many times in the UFT series of papers on www.aias.us, and independently by Stephen Crothers. This paper is a brief synopsis of calculations in the notes accompanying UFT405 on www.aias.us. Note 405(1) describes the Thomas, Lense Thirring and geodetic precessions, together with the Einsteinian precession. These are obsolete concepts of the standard model and are reviewed for the sake of reference only. Note 405(2) develops orbital precession as the rotation of the ECE2 covariant infinitesimal line element. Note 405(3) describes the geodetic precession in a similar way. Section 2 is based on Notes 405(4) and 405(5), which develop an ECE2 covariant theory of all precessions.

The data reduction process used in Gravity Probe B is severely criticised. For example the Einsteinian gravitational precession is omitted completely and the de Sitter and Lense Thirring precessions are separated in an arbitrary way. In general all three precessions occur in the orbit of m about a rotating M. The only thing that can be observed is their sum. This is always true of any orbit, for example a planet about the rotating sun, a satellite around the rotating earth, and so on. It is impossible to isolate each precession without assuming the theory that is to be proved.

2. GENERAL THEORY OF ALL PRECESSIONS.

Consider the ECE2 equation of the orbit of m about M

$$\underline{F} = m\underline{g} = -m\underline{\nabla}\phi_0 + m\underline{\omega}\phi_0 \quad -(1)$$

where ϕ_0 is the gravitational potential:

$$\phi_0 = -\frac{MG}{r}. \quad -(2)$$

Here G is Newton's constant, r the distance between m and M and $\underline{\omega}$ the vector spin connection of ECE2 theory. The vacuum force is:

$$\underline{F}(vac) = m\underline{\omega}\phi_0 \quad -(3)$$

and produces any observable precession.

The origin of any precession is considered to be the rotation of the ECE2 covariant line element:

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

in plane polar coordinates (r , ϕ). The rotation is defined by:

$$\phi' = \phi + \omega_0 t \quad -(5)$$

where ω_0 is the angular velocity of the rotation and t the time. The rotated infinitesimal line element is:

$$ds'^2 = \left(1 - \frac{v^2}{c^2}\right)\left(c^2 dt^2 - 2r^2 \Omega \, d\phi \, dt\right) - dr^2 - r^2 d\phi^2 \quad -(6)$$

in which the ECE2 covariant angular velocity is:

$$\Omega = \omega_0 \left(1 - \frac{v^2}{c^2}\right)^{-1} \quad -(7)$$

The same rotation produces:

$$d\tau^2 := \left(1 - \frac{v^2}{c^2}\right) dt^2 \qquad -(8)$$

so the precession in a rotation of 2π is:

$$\Delta\phi = 2\pi\left(\left(1 - \frac{v^2}{c^2}\right)^{-1/2} - 1\right) \qquad -(9)$$

where the linear velocity v is defined by:

$$v := \omega_0 r \qquad -(10)$$

If:

$$v \ll c \qquad -(11)$$

then the precession is:

$$\Delta\phi \sim \pi\left(\frac{v}{c}\right)^2. \qquad -(12)$$

The EGR precession of an object m orbiting an object M anywhere in the universe is claimed experimentally to be:

$$\Delta\phi_g = \frac{6\pi MG}{c^2 a (1 - \epsilon^2)} \qquad -(13)$$

where a is the semi major axis and ϵ the eccentricity. Note carefully that this is not assumed to be due to EGR, because the latter theory has been refuted in so many ways, notably in the famous UFT88 on www.aias.us. Eq. (13) is interpreted as an experimental result of astronomy. From Eqs. (12) and (13), the velocity v needed to produce the experimental data exactly is:

$$v^2 = \frac{6MG}{a(1-\epsilon^2)} \quad -(14)$$

For Gravity Probe B:

$$\begin{aligned} M &= 5.98 \times 10^{24}\ \text{kg} \\ G &= 6.67 \times 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \\ a &= 7.027 \times 10^{6}\ \text{m} \\ \epsilon &= 0.0014 \end{aligned} \quad -(15)$$

so:

$$\Delta \phi_g = 1.19 \times 10^{-8} \text{ radians per GPB orbit.} \quad -(16)$$

The geodetic precession of Gravity Probe B is claimed experimentally to be:

$$\Delta \phi_{deS} = 5.48 \times 10^{-9} \text{ radians per GPB orbit} \quad -(17)$$

and the Lense Thirring precession of Gravity Probe B is claimed experimentally to be:

$$\Delta \phi_{LT} = 3.25 \times 10^{-11} \text{ radians per GPB orbit.} \quad -(18)$$

Using Eq. (12) with Eqs. (16) to (18) it is found that:

$$\begin{aligned} v_g &= 1.84 \times 10^{4}\ \text{ms}^{-1} \quad -(19) \\ v_{deS} &= 1.25 \times 10^{4}\ \text{ms}^{-1} \quad -(20) \\ v_{LT} &= 5.70 \times 10^{3}\ \text{ms}^{-1} \quad -(21) \end{aligned}$$

from:

$$v = 1.691 \times 10^{9} (\Delta\phi)^{1/2}. \quad -(22)$$

Therefore the ECE2 covariant theory produces each result exactly with the velocities (19) to (21) of rotation of the ECE2 covariant infinitesimal line element, Q. E. D.

However, the data reduction methods of Gravity Probe B completely omit consideration of the largest precession, the EGR precession (19). The second largest is the geodetic or de Sitter precession (20), and the smallest of the three is the Lense Thirring precession (21). Gravity Probe B could have observed only the sum of the three precessions and could not have isolated each precession without assuming a theory. It probably assumed the EGR theory, which is incorrect in many ways. So Gravity Probe B could not have proven EGR to great precision. This seems obvious in retrospect. Not only is this an insurmountable difficulty in Gravity Probe B, but also in any claim to have proven EGR with precession. So there is no way in which EGR could have been proven by such data, it could not have been proven qualitatively let alone to high precision.

In ECE2 physics we accep tthe fact that the actually observable precession can be described by a velocity v of rotation of the ECE2 line element. In ECE2 physics the separate existence of the three standard model precessions is not accepted.

In immediately preceding papers it was shown that the ECE2 force equation produces the precession:

$$\Delta\phi = \frac{r^2}{2}\left(\frac{\omega}{r} - \frac{\partial\omega}{\partial r}\right) = \frac{4}{3}\frac{\langle \delta\underline{r}\cdot\delta\underline{r}\rangle}{r^2} - \frac{1}{3r}\frac{\partial}{\partial r}\langle \delta\underline{r}\cdot\delta\underline{r}\rangle \quad -(23)$$

where ω is the magnitude of $\underline{\omega}$, and where $\langle \delta\underline{r}\cdot\delta\underline{r}\rangle$ is the isotropically averaged mean square fluctuation of the vacuum. Defining:

$$f(r) := \langle \delta\underline{r}\cdot\delta\underline{r}\rangle \quad -(24)$$

Eq. (23) can be written as:

$$4f(r) - r\frac{\partial f(r)}{\partial r} = 3r^2\Delta\phi. \quad -(25)$$

Both Maxima and Wolfram give the solution:

$$\langle \delta\underline{r}\cdot\delta\underline{r}\rangle = \frac{3}{2}r^2\Delta\phi + C_1 r^4 \quad -(26)$$

where C_1 is a constant of integration. Assuming that this is zero:

$$\frac{\langle \delta \underline{r} \cdot \delta \underline{r} \rangle}{r^2} = \frac{3}{2} \Delta \phi \quad -(27)$$

From Eqs. (12) and (27):

$$\frac{\langle \delta \underline{r} \cdot \delta \underline{r} \rangle}{r^2} = \frac{3}{2} \pi \left(\frac{v}{c} \right)^2 \quad -(28)$$

Accepting Eqs. (19) to (21) for the sake of argument, then:

$$\left(\langle \delta \underline{r} \cdot \delta \underline{r} \rangle / r^2 \right)_g = 1.785 \times 10^{-8} \quad -(29)$$

$$\left(\langle \delta \underline{r} \cdot \delta \underline{r} \rangle / r^2 \right)_{deS} = 8.22 \times 10^{-9} \quad -(30)$$

$$\left(\langle \delta \underline{r} \cdot \delta \underline{r} \rangle / r^2 \right)_{LT} = 1.70 \times 10^{-9} \quad -(31)$$

However, all that can be said is that Gravity Probe B observed the sum of the three precessions:

$$\Delta \phi = \Delta \phi_g + \Delta \phi_{deS} + \Delta \phi_{LT} = 1.741 \times 10^{-8} \text{ radians per GPB orbit} \quad -(32)$$

and it is not possible to separate the precessions in any meaningful way.

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