# ECE2 PRECESSION AND THE HULSE TAYLOR BINARY PULSAR.

by

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ABSTRACT

It is shown that all observable precessions can be described by rotation of the ECE2 infinitesimal line element at an angular velocity $\omega$ . The theory applies to any type of precession, for example in pendula, the solar system and binary pulsars. The unrotated ECE line element also produces a precession at the Newtonian velocity due to the difference between the infinitesimals of proper time and observer time. Rotation of the ECE infinitesimal line element produces the ECE2 precession. This method is used to explain the precession of the Hulse Taylor binary pulsar, in which the Einstein field equation fails completely.

Keywords: ECE2 precession, Hulse Taylor binary pulsar.

4FT 409

INTRODUCTION

In recent papers of this series {1 - 41} it has been shown that the Einsteinian general relativity (EGR) can be refuted very simply, for example in UFT406. The conventional theory of the Thomas precession was considered in UFT407 and UFT408. In Section 2 of this paper it is shown that the rotation of the ECE2 infinitesimal line element defined in recent papers produces the ECE2 precession. The rotation takes place at an angular velocity $\omega$ . It is shown that the origin of the rotation of the infinitesimal line element is spacetime torsion. The latter is omitted completely from EGR, and as shown in the classic UFT88 for example, the omission of torsion means that the metrics EGR are incorrect. The theory of ECE2 precession is applied in this paper to the observed precession of the Hulse Taylor binary pulsar, which is about twice the precession predicted by the Einstein field equation. ECE2 precession is applied to the binary pulsar and describes the data straightforwardly in a far simpler way than EGR.

This paper is a brief synopsis of extensive calculations in the notes accompanying UFT409 on www.aias.us. Note 409(1) develops the theory of planetary precession and light deflection due to gravitation in terms of precessions. Note 409(2) relates the linear velocity of rotation to the Newtonian velocity. Note 409(3) shows that rotation at the Newtonian velocity gives the Lorentz factor, which can therefore be derived by rotation as well as through a Lorentz boost. The latter gives the ECE2 infinitesimal line element which gives a precession. Note 309(4) applies the theory to the well known Hulse Taylor Binary pulsar (UFT375) and shows that the Einstein field equation fails completely to give the experimental result. ECE2 precession gives the experimental result precisely in terms of the angular velocity of rotation. Note 409(5) shows that the origin of the frame rotation is spacetime torsion. The latter is missing completely from EGR Notes 409(6) and 409(7) give the correct calculation of precession from a rotating infinitesimal line element.

## 2. THE ECE2 PRECESSION

The infinitesimal line element of the ECE2 theory is described in detail in previous UFT papers and in plane polar coordinates is:

$$ds^2 = c^2 dt^2 - dr^2 - r^2 d\phi^2 \qquad -(1)$$
$$= c^2 d\tau^2$$

where $\tau$ is the proper time and t the time in the observer frame. The notes accompanying UFT409 show that the origin of Eq. ( 1 ) is a four rotation. Now rotate the infinitesimal line element ( 1 ) as follows:

$$\phi' = \phi + \omega t \qquad -(2)$$

where $\omega$ is the angular velocity of the rotation. As shown in the notes for UFT409, the radial velocity of the rotation is:

$$v_\phi = \omega r . \qquad -(3)$$

Eqs. ( 1 ) and ( 2 ) give:

$$ds^2 = c^2 dt^2 - dr^2 - r^2 d\phi^2 - 2\omega r^2 d\phi\, dt - \omega^2 r^2 dt^2$$
$$= (c^2 - v_\phi^2) dt^2 - 2\omega r^2 d\phi\, dt - dr^2 - r^2 d\phi^2 . \qquad -(4)$$

By definition, the angular velocity is

$$\omega = \frac{d\phi}{dt} \qquad -(5)$$

so:

$$d\phi = \omega\, dt . \qquad -(6)$$

It follows that:

$$2\omega r^2 d\phi\, dt = 2\omega^2 r^2 dt^2 = 2 v_\phi^2 dt^2 \qquad -(7)$$

so Eq. ( 4 ) becomes:

$$ds^2 = (c^2 - 3v_\phi^2)dt^2 - (dr^2 + r^2 d\phi^2). \quad -(8)$$

The Newtonian velocity is defined by:

$$v_N^2 = \left(\frac{dr}{dt}\right)^2 + r^2\left(\frac{d\phi}{dt}\right)^2 \quad -(9)$$

so:

$$dr^2 + r^2 d\phi^2 = v_N^2 dt^2 \quad -(10)$$

and Eq. ( 8 ) becomes:

$$ds^2 = (c^2 - v_N^2 - 3v_\phi^2)\, dt^2 \quad -(11)$$

This result can be expressed as:

$$ds^2 = c^2 d\tau^2 = \left(1 - \frac{v^2}{c^2}\right) c^2 dt^2 \quad -(12)$$

where:

$$v^2 := v_N^2 + 3\omega^2 r^2 = v_N^2 + 3v_\phi^2. \quad -(13)$$

So the infinitesimals of proper time (time in the moving frame), $d\tau$, and of time in the static frame, dt, are related by:

$$dt = \left(1 - \frac{v^2}{c^2}\right)^{-1/2} d\tau \quad -(14)$$

Note that when:

$$\omega = 0 \quad -(15)$$

Eq. ( 14 ) reduces to the definition of the Lorentz factor:

$$dt = \gamma \, d\tau \, , \quad \gamma = \left( 1 - \frac{v_N^2}{c^2} \right)^{-1/2} . \quad -(16)$$

Denote:

$$dt_1 := \left( 1 - \frac{v^2}{c^2} \right) dt \quad -(17)$$

so that the infinitesimal line element is defined by:

$$ds^2 = c^2 dt_1^2 = c^2 d\tau^2 \quad -(18)$$

The ECE2 precession is defined by:

$$\Delta \phi := \omega_0 \left( dt - dt_1 \right) \quad -(19)$$

where $\omega_0$ is a given angular velocity. For an orbit of $2\pi$ radians:

$$\Delta \phi = 2\pi \left( \left( 1 - \frac{v^2}{c^2} \right)^{-1/2} - 1 \right) \xrightarrow[v \ll c]{} \pi \frac{v^2}{c^2} \quad -(20)$$

Note carefully that when:

$$\omega = 0 \quad -(21)$$

the precession ( 20 ) defines the Lorentz factor. The latter is defined by a Lorentz boost which produces the orbital precession ( 20 ), meaning that the orbit advances by $\Delta \phi$ for a rotation of $2\pi$ , and is no longer a closed orbit. The orbit is a closed orbit only in the classical limit:

$$\gamma \rightarrow 1 . \quad -(22)$$

Any type of precession can be described precisely by adjusting the angular velocity $\omega$ of frame rotation.

In UFT110, the standard theory of Thomas precession was accepted uncritically. The standard theory uses:

$$ds^2 = (c^2 - v_\phi^2)\,dt^2 - 2\omega r^2\, d\phi\, dt - dr^2 - r^2 d\phi^2,$$
$$= \left(1 - \frac{v_\phi^2}{c^2}\right)\left(c^2 dt^2 - 2\Omega r^2\, d\phi\, dt\right) - dr^2 - r^2 d\phi^2 \quad -(23)$$

where :

$$\Omega := \omega\left(1 - \frac{v_\phi^2}{c^2}\right)^{-1}, \quad -(24)$$

and the precession is defined as:

$$\Delta\phi = \Omega\, d\tau - \omega\, dt. \quad -(25)$$

However, the arbitrary definition ( 24 ) produces an incorrect result:

$$\Delta\phi \overset{?}{=} 2\pi\left(\left(1 - \frac{v_\phi^2}{c^2}\right)^{-1/2} - 1\right) \xrightarrow[v_\phi \ll c]{} \pi\frac{v_\phi^2}{c^2} \quad -(26)$$

and the precession vanishes when $v_\phi$ becomes zero, i. e. when there is no frame rotation. The correct result is given for the first time in this Section, and is Eq. ( 20 ).

The theory of ECE2 precession can be applied to any observed precession. In Note 409(5) it is applied to the Hulse Taylor binary pulsar using the data of UFT375. In the binary pulsar two objects of nearly equal mass orbit each other, so care must be taken as in Note 409(4) to use the correct reduced mass. When this is done the Einsteinian theory of general relativity produces the precession:

$$\Delta\phi_E = \frac{6\pi G}{\alpha c^2}\left(\frac{m_2^2}{m_1 + m_2}\right) \quad -(27)$$

where $m_1$ and $m_2$ are the masses of the two objects in the binary pulsar and where $\alpha$ is the half right latitude of the orbit:

$$\alpha = 5.3671 \times 10^{8}\ m$$
$$G = 6.67408 \times 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \quad -(28)$$
$$c = 2.9979 \times 10^{8}\ m s^{-1}$$
$$m_1 \sim m_2 = 2.804 \times 10^{30}\ kg .$$

More accurately, $m_1$ and $m_2$ are as given in UFT375. Eq. (27) produces

$$\Delta \phi_E = 3.157 \times 10^{-5} \quad -(29)$$

radians per orbit. The orbit of the Hulse Taylor binary pulsar takes 7.75 hours and using:

$$1 \text{ radian} = 57.296^\circ \quad -(30)$$

the Einstein precession is:

$$\Delta \phi_E = 2.368^\circ \text{ per earth year} \quad -(31).$$

The experimental result is:

$$\Delta \phi = (4.226 \pm 0.002)^\circ \text{ per earth year} \quad -(32)$$

so the Einstein field equation fails completely. This failure is remedied in the standard EGR by use of a non-linear Einstein field equation, which is effectively just the use of empiricism.

The theory of ECE2 precession gives the experimental result exactly using:

$$v = 1.366 \times 10^{6}\ m s^{-1} \quad -(33)$$

without the use of empiricism and without the use of gravitational radiation. The shrinking of the orbit of the binary pulsar is described by a gradual change in v. In ECE2 theory there is no gravitational radiation from the Hulse Taylor binary pulsar. The gravitational radiation of ECE2 is described by the ECE2 gravitational field equations in exactly the same way as electromagnetic radiation, but is about twenty three orders of magnitude weaker. Finally

Note 309(5) shows in all detail how the rotation of the frame originates in spacetime torsion.

Section 3 is a description of the velocity v needed to describe some planetary precessions. In general v is always greater than the Newtonian orbital velocity $v_N$. For a given point r in the orbit, this velocity can be used to find the angular velocity of frame rotation. This is a measure of the underlying spacetime torsion.

## 3. SOME ECE2 VELOCITIES FOR PLANETARY PRECESSIONS.

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