

# Time Dilation Cosmology 2

Joseph H. (Cass) Forrington

Managing Editor, Journal of Cosmology, California, USA

Email: [captcass@captcass.com](mailto:captcass@captcass.com)

**How to cite this paper:** Forrington, J.H. (Cass) (2024) Time Dilation Cosmology 2. *Journal of Modern Physics*, 15, 448-461. <https://doi.org/10.4236/jmp.2024.154020>

**Received:** January 21, 2024

**Accepted:** March 19, 2024

**Published:** March 22, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

This paper is a further elaboration of the author's Time Dilation Cosmology (TDC) holographic model that ties gravitation and celestial mechanics and kinematics directly to time dilation, resolving all the major conundrums in astrophysics, and ties astrophysics directly to quantum physics. It begins with a brief summary of the TDC model and contains the new derivation for the time dilation version of the formula for summing relativistic velocities, Einstein's gravitational constant and the time dilation versions for the Lorentz factor and the Euclidean norm of the 3d velocity vector, the two of which can then be used in the Four-velocity formula. It is demonstrated how orbital curvature is manifested as the resultant of two time dilation-manifested velocities. It also explains why an interferometer cannot distinguish free fall from zero gravity and further elaborates on the author's previous explanations of how spiral galaxies are formed, and contains mathematical proof that Black Holes are actually Magnetospheric Eternally Collapsing Objects (MECOs) that are massless spacetime vortices.

## Keywords

Gravitation, Time, Time Dilation, Celestial Mechanics, ISM: Kinematics and Dynamics, Cosmology: Theory, Galaxies: Evolution

## 1. Introduction

In the author's first paper, "General Relativity: Effects in Time as Causation" [1], published in the *Journal of Cosmology* in 2019, and revised in 2022, the primary time dilation formula for all gravitationally induced velocities inside a "Kepler Zone", where Kepler's laws and General Relativity accurately derive velocities, is derived from the formula for the time dilation factor,  $T_o$ , and expressed in terms of  $(1 - T_o)$ :

$$v = c\sqrt{1 - T_o} \quad (1)$$

where  $c$  is the speed of light. This term is then used to replace the velocity element in numerous physics formulas. Furthermore, it is demonstrated that when the solution is divided by the  $\sqrt{3}$ ,

$$v = c\sqrt{1-T_o}/\sqrt{3} \quad (2)$$

we get the anomalous velocities of stars outside the Kepler Zone of large spiral galaxies, beyond the corotation ring, where Kepler's laws and General Relativity fail to derive the velocities, eliminating the need for Cold Dark Matter.

In the author's second paper, "Time Dilation Cosmology" [2], published in the *Journal of Modern Physics* in 2023, this formula is further reduced to:

$$v = c\sqrt{dRt} \quad (3)$$

where " $dRt$ " equals  $(1 - T_o)$ , and is the difference in the rate of time between the invariant 1 s/s rate of time of the universe as a whole and the coordinate point, and solutions are provided for the other time dilation-based formulas, a summation of which is in Section 7 of this paper, where it is used to replace the velocity element, proving that all gravitationally induced velocities are merely compensation for the apparent slower rates of time in masses in a holographic spacetime continuum evolving forward in the forward direction of time at  $c$ .

In this paper, additional time dilation-based derivations are provided for the formula for summing relativistic velocities, Einstein's gravitational constant and for the Lorentz factor and Euclidean norm of the 3d velocity vector, the latter two of which can then be used in the Four-velocity formula and it is demonstrated how orbital curvature is manifested as the resultant of two  $dRt$ -manifested velocities.

This paper also explains why an interferometer cannot distinguish free fall from zero gravity and further elaborates on the author's previous explanations of how spiral galaxies are formed, and contains a mathematical proof that Black Holes are actually Magnetospheric Eternally Collapsing Objects (MECOs) that are massless spacetime vortices.

The reader will find it helpful to read both "General Relativity: Effects in Time as Causation" [1] and "Time Dilation Cosmology" [2] for solutions for previously derived formulas and an in-depth understanding of the Time Dilation Cosmology (TDC) holographic model that ties gravitation and celestial mechanics and kinematics directly to time dilation, resolving all the major conundrums in astrophysics, and ties astrophysics directly to quantum physics. Together, these papers have thousands of views by professors worldwide and the viewing and download patterns indicate that the model is now being presented to astrophysics and/or quantum physics students in at least 6 universities.

## 2. A Brief Summary of the TDC Model

Because of our subjective view of the universe, we have always considered it to be made up of separate objects moving through a pre-existing fixed space. Quantum

physics has now allowed us to consider it to be a quantum continuum, where “particles”, and the objects they comprise, are actually continuously evolving waveforms, neither a particle nor wave, that only exist in a state of superposition until they are actually observed, and can even be in two places at the same time.

Astrophysics has been plagued with conundrums for over 100 years because it has not been adapted to this model, which the holographic TDC model now does.

Space and time are not two different things, but merely two aspects of a single thing, “spacetime”. That being said, if something can be explained in spatial terms, it can also be explained in terms of time, which is what the TDC model does. In the TDC model, spacetime is the quantum continuum, a 3D holographic energy field evolving forward at  $c$  in the forward direction of time.

Traditionally, we have considered events in space to be evolving forward “over time”. In the TDC model we see that it is, rather, that time is evolving spatial events forward. This makes time the fundamental, irresistible, force in the universe. If time slows, the frequency of photons slows and energy, which is dependent on frequency, decreases. If time appears to stop, we see frequencies, and all motion, reduce to zero and there is no energy. As the rate of time increases, the frequency of photons increases and energy increases.

Because the holographic spacetime continuum has three spatial dimensions, we see all the distances and angles we are used to within it. But because the holographic field is evolving forward in the forward direction of time at  $c$ , and time has no depth, the holographic field, itself, has no depth.

This changes our perspective from the classical view of individual objects moving through a fixed space, to densities evolving forward within the evolving spacetime/quantum continuum. A proof of this dynamic is that when we sent the IBEX satellite to the leading edge of the heliopause to measure the shock wave generated by the heliosphere’s 231 Km/s velocity “through space”, no shock wave was detected. The “dead zone” discovered by Voyager 1 beyond the heliopause, where we expected to find high interstellar winds, also confirms this model.

All masses are therefore spatial densities within the fabric of the continuum. These densities are more difficult for time to evolve forward than thinner, “empty”, space and we see the rate of evolution and, therefore, time, appear to slow. This is time dilation.

As the continuum cannot have different parts evolving forward at different rates without it stretching out over time, the slower rates are compensated for through velocities. This is clearly proven by the time dilation formula for velocities, where the only variable determining the velocity of a mass is the difference in the rate of time,  $dRt$ :

$$v = c\sqrt{dRt} \quad (4)$$

All masses must therefore have a velocity and that velocity is solely dependent on the  $dRt$  of the mass or coordinate point in a system with a predominant central mass.

A proof that spacetime is a continuum is that it is not just the mass that is

time dilated, but also the space around the mass and that dilation field is the gravitational field. We now see two forward directions of time, the Fundamental Direction of Evolution, FDE, in the forward direction of time, and the Gravitational Direction of Evolution, GDE, down the time dilation gradients surrounding masses. This downgradient evolution is gravity and is why gravity only has one direction and why it overpowers all the other forces so easily, even though it seems so weak. It, too, like the FDE, is an irresistible evolutionary force in time.

A proof that gravity is an evolution in time down time dilation gradients is the fact that an interferometer cannot distinguish free fall from zero gravity. This is because, in freefall, it is evolving downgradient along with the Gravitational Direction of Evolution, GDE. The GDE is not passing through it, so the sensors are not distorted as they are on the Earth's surface, where faster time is up and slower time is down, and the interferometer is fixed in space on the ground. In a gravitational field, a sensor on the ground must shorten at the up end to maintain  $c$ . When a gravity wave, a ripple in the rate of time, passes through the gravity wave detector, LIGOS, an interferometer, the variance in the rate of time distorts space and, hence, the shape of the sensor, as the gravity wave passes through it. In freefall, the interferometer is in the constant 1 s/s rate of time of the inertial frame, as per Special Relativity, and there is no distortion.

When we have a system, like a stellar system, it is the greatest  $dRt$  that determines the velocity. So, the planets surrounding a star have a velocity dependent on the  $dRt$  of the coordinate point, as does a moon's around a planet, rather than the planet or moon's individual  $dRt$  based upon its own mass. We call such a zone within a gravitational field the "Kepler Zone", where Kepler's laws and General Relativity work to describe the satellite's velocity and motion.

As satellites; planets, moons, asteroids, etc.; have a faster rate of time than the central mass, they are evolving forward faster than the central mass within that particular system. Since they cannot move "ahead" of the central mass and the rest of the continuum "in space", they revolve around the central mass in their orbits. Thus, the Earth has an average velocity of  $\sim 29.79$  Km/s relative to the Sun and the distance it evolves ahead of the Sun is in its orbit.

When we step outside the solar system, in the galactic system we see that the Sun has a much higher velocity, 231 Km/s, in its orbit around the galactic center due to its greater  $dRt$ .

In large spiral galaxies, we see the dilation gradient of the central mass weaken to a point where the individual stars'  $dRt$  are greater than the galaxy's. This appears to be in the area of the corotation ring. When that occurs, it is the individual stars'  $dRt$  that determine the stars' velocities and we find that the velocities are equal to the primary velocity formula divided by  $\sqrt{3}$  :

$$v = c\sqrt{dRt}/\sqrt{3} \quad (5)$$

This eliminates the need for Cold Dark Matter, CDM, to explain the anomalous velocities outside the Kepler Zone where Kepler's laws and General Relativi-

ty do not work to derive the velocities.

The TDC model describes an apparently eternal and infinite universe with no Big Bang origin or accelerating expansion and the 2022 discovery of the new far distant galaxies, with a redshift,  $z$ , of up to 13.2, by the James Webb space telescope, where most expected to find a “dark age” that would have followed the supposed Big Bang instead, was predicted by this author in both of his previous papers [1] [2]. These observations, therefore, also confirm the TDC model.

The veracity of the stable TDC model is verified by deriving the Hubble shift as an acceleration of  $2.2686 \times 10^{-18}$  s/s in the rate of time within lifeforms, rather than as an acceleration of objects in space away from the observer. This is derived using a Hubble Constant,  $H_0$ , of 70. The proof this acceleration exists is in the trees and other plants that grow upward against gravity. It is not possible to move upward against gravity without acceleration. So, when we look out into space, we are not just looking back into older time, we are also looking at slower time and, at the cosmological horizon, we reach a “Limit of Relativity” where time appears to stop due to time dilation. As we cannot get to a place where time actually stops, if we could approach this horizon, the dilation gradient would shift and more galaxies would come into view. The other Limit of Relativity where time appears to stop is the apparent event horizon of the MECOs (black holes) within the galaxies, which are a branching of the universe, as discussed in Section 4 on MECOs/black holes. The Hubble shift derivation can be found in both “General Relativity: Effects in Time as Causation” [1] and “Time Dilation Cosmology” [2].

For this derivation to work, we must discuss something that is usually not discussed in science papers because the acceleration has to accumulate over time. This discussion is not just necessary for the Hubble shift derivation, but also to explain non-locality.

Life only comes from life. It does not begin at any point, say in the womb. It is passed on from generation to generation of *lifeforms*.

When we see an amoeba, we see one *lifeform* inhabited by one life. When the amoeba reproduces itself through division, we now see two *lifeforms*, but still just one life. Likewise, both the sperm and ovum are alive. But when the sperm penetrates the ovum to form an egg and completes the genetic map for a new *lifeform*, we still see only one life inhabiting the *lifeform*. Thus, all *lifeforms* are just different points of view for a single life that inhabits succeeding generations of *lifeforms*.

The proof of this is found in the phenomenon of non-locality. We have experimentally proven that what affects entangled particles affects both simultaneously at any distance and over time, no matter the distance and time passed since their entanglement. In quantum physics, we speak of an electron being a waveform that exists in an infinite potential well. The author postulates that two entangled particles are actually a single particle when in superposition. They most certainly behave that way.

The fact that the experiment’s traditional two observers, Alice and Bob, can simultaneously observe this entanglement, means Alice and Bob are also entangled. It is the only explanation why the experiment and phenomenon can work. This means Alice and Bob are also one in superposition and are just two different points of view for the same observer.

We also know that, even though observers affect the observed, subsequent observers see events as they would normally progress in time. If a tree existed in a forest that no one had ever observed, it would exist in superposition in all possible states; a seed, a young tree, a middle-aged tree, an old tree, a dead tree rotting on the ground and all possible states in between. If the first observer sees the tree for the first time and sees a 2-year-old tree, an observer seeing the same tree 10 years later will see a 12-year-old tree. Of course, the tree is self-aware and humans are not the only observers, so such a tree could never exist, and this is only an illustration of the principle to demonstrate how the acceleration in time in lifeforms is cumulatively shared over time.

This concludes our summary of the TDC holographic model. The reader is encouraged to review both previous papers [1] [2] for a fuller understanding of the TDC model.

### 3. Einstein’s Gravitational Constant and the Curvature of Evolution

Einstein’s field equations are supposed to represent distortions in a fixed space due to the presence of mass. In the TDC model, there is no fixed space and no spatial distortion, just differences in the rate of time. It is, rather, an evolving holographic field. Therefore, we do not discuss different kinds of “manifolds”. Of the fixed space models, it is most closely represented by the flat universe; infinite and with no curvature. But it must be stressed that it is not a fixed space. It is an evolving 3D energy field with no actual depth.

If we look at Einstein’s gravitational constant,

$$\frac{8\pi G}{c^4} = 2.076647442844 \times 10^{-43} \tag{6}$$

we see that it can be expressed in terms of the difference in the rate of time,  $dRt$ :

As

$$v^2 = GM/r = c^2 (dRt) \tag{7}$$

$$G = \frac{rc^2 (dRt)}{M} \tag{8}$$

Therefore, in Einstein’s field equations:

$$R_{uv} - \frac{1}{2}Rg_{uv} + \Lambda g_{uv} = \frac{8\pi G}{c^4}T_{uv} \tag{9}$$

$$\frac{8\pi G}{c^4} = \frac{\frac{8\pi rc^2 (dRt)}{M}}{c^4} = \frac{8\pi r (dRt)}{c^2 M} \tag{10}$$

$$R_{uv} - \frac{1}{2}Rg_{uv} + \Lambda g_{uv} = \frac{8\pi r(dRt)}{c^2 M} T_{uv} \quad (11)$$

And, as the Time Dilation Cosmological model does not have universal expansion, the Cosmological Constant can be eliminated, leaving:

$$R_{uv} - \frac{1}{2}Rg_{uv} = \frac{8\pi r(dRt)}{c^2 M} T_{uv} \quad (12)$$

The time dilation factor,  $T_o$ :

$$T_o = \sqrt{1 - \frac{2GM}{rc^2}} \quad (13)$$

Earth/Sun distance at Perihelion  $r = \sim 147095 \times 10^6$  m

Sun Mass,  $M = 1.98847 \times 10^{30} \text{ +/- } 0.00007$  Kg

$$T_o = \sqrt{1 - \frac{(2 \times 6.67430 \times 10^{-11}) \times (1.98847 \times 10^{30})}{(147095 \times 10^6) \times 299792458^2}} = 0.99999998996111561613 \quad (14)$$

$$dRt = 1 - T_o = 1 - 0.99999998996111561613 = 1.003888438387 \times 10^{-8} \quad (15)$$

Therefore, using  $r = 147095.7390011 \times 10^6$  m, which is 0.0005% greater than  $147095 \times 10^6$  m, and  $M = 1.98848 \times 10^{30}$  kg, the time dilation-based stress-energy tensor formula is:

$$\begin{aligned} & \frac{8\pi r(dRt)}{c^2 M} T_{uv} \\ &= \frac{8 \times 3.14159265359 \times (147095.7390011 \times 10^6) (1.003888438387 \times 10^{-8})}{299792458^2 \times (1.98848 \times 10^{30})} T_{uv} \quad (16) \\ &= 2.076647442842 \times 10^{-43} T_{uv} \end{aligned}$$

In “Time Dilation Cosmology” [2], we provide the following time dilation-based formula for the Earth’s orbital gravitational acceleration:

Earth’s Orbital Gravitational Acceleration;

$$\alpha c = v^2/r = 29780^2 / (1.49598262 \times 10^{11}) = 0.005928 \text{ m/s}^2 \quad (17)$$

$$\begin{aligned} \alpha c &= c^2(dRt)/r \\ &= 299792458^2 \times (9.870951 \times 10^{-9}) / (1.49598262 \times 10^{11}) \quad (18) \\ &= 0.005930 \text{ m/s}^2 \end{aligned}$$

We can now demonstrate how the orbital curvature manifests as the continuum evolves forward, without curved space.

The curvature is the resultant of two  $dRt$ -induced velocities: the average orbital velocity, 29,780 m/s, and the gravitational acceleration, which manifests as a velocity in a stable orbit, 0.005930 m/s.

$$\text{Tan } \theta = \frac{0.005930}{29780} = 0.0000001991269308 \quad (19)$$

$$a \text{Tan } \theta = \theta = 0.000011409133^\circ \quad (20)$$

and there are  $3.154 \times 10^7$  s/year, so,

$$0.000011409133 \times (3.154 \times 10^7) = 359.84^\circ \quad (21)$$

Of course, we do not get  $360^\circ$  because we are using average velocities, the Earth's orbit is elliptical, not circular, and is influenced by the orbits of the other planets.

#### 4. MECOs (Black Holes)

Black holes are actually Magnetospheric Eternally Collapsing Objects, or MECOs. This is the latest advancement in our understanding of what we used to consider to be "black holes" of incredible mass. It is beyond the scope of this paper to get fully into their physical aspects, which are well-documented by Astrophysicist Rudolph Schild of the Harvard-Smithsonian Center for Astrophysics, who led a team that was the first to find an intrinsic magnetic field in quasar Q0957 + 561, with a hypothetical "massive" central object surrounded by apparently empty space, in 2006 [3].

As noted in Section 2, all gravitationally induced velocities are directly related to the apparent time dilation and are merely compensation for the apparent slower rates of time in masses so the continuum is not being continuously stretched out. As all masses have velocities, and those velocities are higher the larger the mass, if a MECO (black hole) had a huge mass, it would have to have an incredibly high velocity relative to other masses to compensate for the time dilation, which we do not see.

If the Milky Way's central MECO, Sagittarius A\*, (Sgr A\*), was  $\sim 4.3$  million times the mass of the Sun, as currently estimated, and has a diameter of  $23.5 \times 10^6$  kilometers, then its Mass =  $8.5527 \times 10^{36}$  Kg and its Radius =  $11.75 \times 10^6$  Km.

If these figures were accurate, we would still have to use a radius of  $12.702744 \times 10^6$  Km to even get a positive time dilation factor where  $T_o = 0.000121$  and the  $dRt = 0.999879$ .

As the MECO's dilation factor would determine its own velocity, like stars outside the Kepler Zone, its velocity formula is:

$$v = \frac{c\sqrt{dRt}}{\sqrt{3}} = \frac{299792.458\sqrt{0.999879}}{\sqrt{3}} = 173074 \text{ km/s} \quad (22)$$

This unobservable velocity eliminates the possibility of there being such huge, "massive", MECOs/black holes.

However, the magnetic field being manifested by such a huge, slowly rotating mass would also be manifested by a spacetime vortex spinning at relativistic velocities.

Within such a spacetime vortex, we see the expected relativistic velocities required by the time dilation as the FDE vortex tightens and deepens and the GDE reaches those relativistic velocities. The energy in the accretion disk mass is conserved as it is translated into stress in Schild's apparently empty space as the accretion disk mass densities are broken down into their constituent waveforms (particles) and attenuated by the relativistic velocities. Excess, uncontainable stress in MECOs is emitted as luminosity and the electromagnetic jets we see in



quasars like Q0957 + 561 [3].

## 5. Spiral Galaxy Formation

We see all systems as circulation events due to the satellites having a faster rate of time than the central mass, resulting in orbits around the central mass. The central masses also rotate on their axes. Thus, spins are the cosmic norm. Even though the satellites are evolving faster than the central masses in the FDE, resulting in their orbits, they are also evolving down the dilation gradients in the GDE. We can, therefore, picture all these systems as vortices in spacetime. MECOs, with their apparently empty centers, are clearly the penultimate vortices in spacetime. In a MECO, we see both the FDE and GDE go into a spin and the GDE nearly catches up to the FDE, which is evolving forward at  $c$  in its spin. We can deduce this due to the velocity of the GDE  $\rightarrow c$  at the event horizon, where time appears to stop. The GDE cannot catch up to the FDE due to the inertia of space. When time spins, space, attenuated masses and the Cosmic Microwave Background Radiation, CMBR, spin, which produces the MECO's magnetic field.

This being so, in the empty space within a MECO, we are actually looking into the FDE, which is the only place we can discern this. As it is not possible to get to a place where time actually stops, if we could approach the cosmological horizon, the dilation gradient would shift and recede, bringing more galaxies into view, as noted in Section 2.

Likewise, if one were to approach a MECO, which is probably not possible due to the intense radiation due to the high concentration of stars, the dilation gradient would have to shift and the universe would open up before the traveler, meaning each MECO and galaxy containing a MECO is a branching of the universe.

In spiral galaxies, the spiral arms rotate as a unit and contain mixes of mass densities. They do not "sort themselves out". So, the galaxy is evolving in the forward direction of time as a system, just as stellar systems are. We also see that spiral galaxies follow the Fibonacci sequence. This indicates a structural pattern, not a random pattern, prevails, as it does throughout nature. Realizing that densities slow time, what we see in the spiral arms are ripples, or waves, in the rate of time, i.e., gravity waves. Time is slower in the arms and faster in between the arms. This leads us to believe the spinning MECO creates the gravity waves according to the Fibonacci sequence, and the spiral arms form in the troughs of those waves.

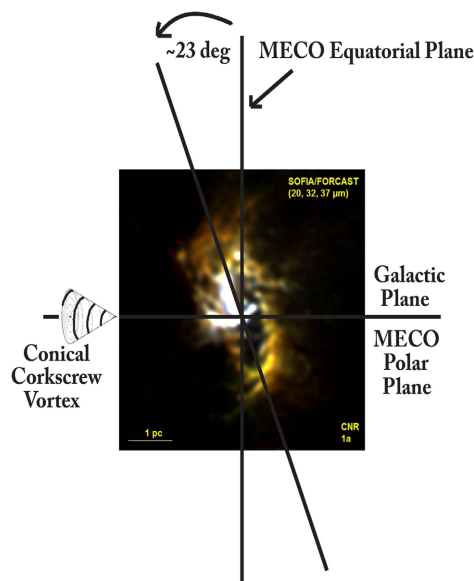
In the author's previous papers [1] [2], it is noted that slower time is lower pressure so we can equate a spiral galaxy to a cosmic hurricane. Since then, the author has become aware that the polar axis of Sgr A\* is actually aligned with the galactic plane of the Milky Way, not its equatorial axis. This gives us a clearer picture of how the spinning, and precession, of Sgr A\* manifests the gravity waves forming the spiral arms of the Milky Way.

In those papers [1] [2], the author uses Einstein's Fundamental Metric to demonstrate that time has an inherent acceleration factor of the  $\sqrt{3}$  that manifests as an acceleration factor of the  $\sqrt{2}$  in space, the difference being due to space's inertia. The  $\sqrt{2}$  first appears in the derivation of the primary velocity

formula from the time dilation formula. In “Time Dilation Cosmology” [2], it is also demonstrated that the difference in the rates of acceleration keeps a constant stress on space, and that stress manifests as the CMBR.

The accretion disk around Sgr A\* is inclined  $\sim 23^\circ$  relative to Sgr A\*'s equatorial plane. This inclination is due to the difference in the temporal and spatial acceleration factors and the resultant stress on space as the FDE and GDE spin into the vortex of the MECO. In the original papers [1] [2], the author derives that inclination and states, “In the Milky Way, the central MECO, Sgr A\*, has an accretion disk which is inclined  $\sim 23^\circ$  to the plane of the galaxy”. This was assuming the equatorial plane of Sgr A\* was aligned with the galactic plane, which is incorrect. It was assumed this slight tilt would generate the gravity waves forming the basis of the spiral arms as the tilted accretion disk rotated around the MECO, generating ripples in spacetime.

As the equatorial plane of Sgr A\* is aligned with the polar plane of the galaxy instead, the accretion disk is tilted  $\sim 67^\circ$  relative to the plane of the galaxy. Because a MECO is a conical corkscrew vortex, the frame dragging on opposite sides of the vortex is uneven. This uneven frame dragging causes the MECO to precess around its equatorial axis. The high velocity spin of the accretion disk around Sgr A\*'s equatorial axis combined with the precession of the MECO and its highly tilted accretion disk create a much greater spacetime disturbance than the  $\sim 23^\circ$  tilt would, manifesting the gravity waves, **Figure 1**.



**Figure 1.** Sagittarius A\*.

## 6. Summing Relativistic Velocities

Where  $v = 0.5c$  and  $u' = 0.75c$

$$u = (v + u') / \left( 1 + \frac{vu'}{c^2} \right) \tag{23}$$

So,

$$u = (149896.229 + 224844.343) / \left( 1 + \frac{149896.229 \times 224844.343}{299792.458^2} \right) = 299538.598 = 0.909c$$

As

$$v = c\sqrt{dRt} \tag{24}$$

Then,

$$\frac{v}{c} = \frac{149896.229}{299792.458} = \sqrt{0.25} = \sqrt{dRt_v} \tag{25}$$

And

$$\frac{u'}{c} = \frac{224844.343}{299792.458} = \sqrt{0.5625} = \sqrt{dRt_{u'}} \tag{26}$$

And

$$\begin{aligned} u &= \left( c\sqrt{dRt_v} + c\sqrt{dRt_{u'}} \right) / \left( 1 + \frac{c\sqrt{dRt_v} \times c\sqrt{dRt_{u'}}}{c^2} \right) \\ &= c \left( \sqrt{dRt_v} + \sqrt{dRt_{u'}} \right) / \left( 1 + \frac{c^2 \sqrt{dRt_v} \times \sqrt{dRt_{u'}}}{c^2} \right) \\ &= c \left( \sqrt{dRt_v} + \sqrt{dRt_{u'}} \right) / \left( 1 + \sqrt{dRt_v} \times \sqrt{dRt_{u'}} \right) \\ &= 299792.458 \times (\sqrt{0.25} + \sqrt{0.5625}) / (1 + \sqrt{0.25} \times \sqrt{0.5625}) \\ &= 272538.598 = 0.909c \end{aligned} \tag{27}$$

### 7. The Lorentz Factor and the Euclidean Norm of the 3d Velocity Vector

Lorentz factor:

$$\gamma = 1 / \sqrt{1 - v^2/c^2} \tag{28}$$

For the Earth moving relative to an observer on the Sun:

$v = \sim 29.7848$  km/s (average)

$$\gamma = \frac{1}{\sqrt{1 - (29.7848^2/299792.458^2)}} = 1.0000000049353502 \tag{29}$$

As

$$v = c\sqrt{dRt} \tag{30}$$

And

$$\frac{v^2}{c^2} = dRt \tag{31}$$

And, where  $T_0$  = the time dilation factor for the coordinate point,

$$T_0 = 1 - dRt \tag{32}$$

And,

$$dRt = 1 - T_0 \tag{33}$$

Thus,

$$\gamma = \frac{1}{\sqrt{1-dRt}} = 1/\sqrt{T_0} \quad (34)$$

Therefore, for the Earth, where:

$$dRt = 0.0000000987070041$$

$$T_0 = 0.9999999012929959$$

$$\gamma = \frac{1}{\sqrt{1-0.00000009870603}} = 1.000000049353502 \quad (35)$$

and

$$\gamma = \frac{1}{\sqrt{0.999999901293970}} = 1.000000049353502 \quad (36)$$

And the Euclidian norm,  $u$ , of the 3d velocity vector  $\vec{u}$  is:

$$u = \|\vec{u}\| = \sqrt{c^2 dRt_x + c^2 dRt_y + c^2 dRt_z} \quad (37)$$

These formulations of  $\gamma$  and  $\vec{u}$  can then be used for the Four-velocity,  $U$ :

$$U = \gamma(c, \vec{u}) \quad (38)$$

## 8. Summary

In Section 2, we have provided the reader with a brief summary of the holographic time dilation-based cosmological model. The reader is encouraged to refer to the author's previous papers, "General Relativity: Effects in Time as Causation" [1] and "Time Dilation Cosmology" [2], for more detailed information and specific mathematical derivations and solutions using the derived time dilation-based formulas.

In Section 3, we have provided a derivation of the time dilation-based formula for Einstein's gravitational constant and demonstrated how orbital curvature is manifested as the continuum evolves forward using two dRt-induced velocities, rather than through a curved space.

In Section 4, we have provided a mathematical proof that what we have traditionally called "black holes" are actually Magnetospheric Eternally Collapsing Objects, "MECOs", that are massless vortices in apparently empty spacetime.

We then show, in Section 5, how this model relates to the formation of spiral galaxies, using the Milky Way and its central MECO, Sagittarius A\*, as an example.

In Sections 6 and 7, we provide new time dilation-based formulas for summing relativistic velocities and for the Lorentz Factor and the Euclidean norm of the 3d velocity vector, the latter two of which can then be used for a time dilation-based version of the Four-velocity formula.

We also cite observational proof of the TDC model based on the findings of IBEX, which did not find the expected shock wave at the leading edge of the heliopause, Voyager 1, which found no interstellar winds beyond the heliopause, and the James Webb space telescope, which found more galaxies where it was expected a "dark age" following the supposed Big Bang existed, as well as the fact that an in-

terferometer cannot discern the difference between freefall and zero gravity.

A summary of the time dilation-based formulas to date is:

**Formulas:**

$$V_{Co} = c\sqrt{dRt} \text{ for simple, nearly circular, orbits within a Kepler Zone.} \quad (39)$$

$$V_{Eo} = \sqrt{2c^2(dRt) - c^2(dRt_\alpha)} \text{ for elliptical orbits within a Kepler Zone.} \quad (40)$$

$$V_{Go} = c\sqrt{dRt}/\sqrt{3} \text{ for galactic rotation velocities for stars outside the Kepler Zone. This is the fundamental compensatory velocity formula.} \quad (41)$$

$$E = mc^2\sqrt{1 + dRt} \text{ for Einstein's energy formula.} \quad (42)$$

$$F = (mc^2)(dRt)/r \text{ for centripetal force \& gravity.} \quad (43)$$

$$F = \frac{(Mm)rc^2(dRt)}{Mr^2} \text{ for the force in Newtons for 2-body systems.} \quad (44)$$

$$F = (Mm)R_E c^2(dRt_E) / (M_\odot (RM)^2) \text{ for a 3-body solution for the force in Newtons for 2-body systems, in this case Earth, Moon and Sun.} \quad (45)$$

$$M_\odot = \frac{c^2(R - T_0)}{G} \text{ for the mass inside a stellar circle.} \quad (46)$$

$$G = rc^2(dRt)/M \text{ for the empirical gravitational constant.} \quad (47)$$

$$\frac{M}{R} = c^2 \left( 1 - \left( 1 - \frac{3 \times (V_{Go})^2}{c^2} \right)^2 \right) / 2G \text{ for the Mass/Radius ratio of stars outside}$$

the Kepler Zone in spiral galaxies. (48)

$$H = \sum_i \frac{(m_i c^2)(dRt)}{2} + \sum_{i < j} (m_i c^2)(dRt)(r_i - r_j) \text{ for the Hamiltonian.} \quad (49)$$

$$u = c(\sqrt{dRt_v} + \sqrt{dRt_{u'}}) / (1 + \sqrt{dRt_v} \times \sqrt{dRt_{u'}}) \text{ for summing relativistic velocities.} \quad (50)$$

$$\gamma = \frac{1}{\sqrt{1 - dRt}} = 1/\sqrt{T_0} \text{ for the Lorentz Factor.} \quad (51)$$

$$u = \|\vec{u}\| = \sqrt{c^2 dRt_x + c^2 dRt_y + c^2 dRt_z} \text{ for the Euclidean norm of the 3d velocity vector.} \quad (52)$$

$$U = \gamma(c, \vec{u}) \text{ for the Four-Velocity.} \quad (53)$$

$$\frac{8\pi r(dRt)}{c^2 M} \text{ for Einstein's Gravitational Constant.} \quad (54)$$

## 9. Conclusion

The Time Dilation Cosmology model of the universe remains the only comprehensive model to date to replace what has now proven to be a failed Big Bang/ $\Lambda$ CDM model that continuously fails to make accurate predictions about what our satellites like IBEX and Voyager 1, and our deep space telescopes like

the James Webb, will find, and that is riddled with conundrums and improbable postulates such as the Big Bang, cold dark matter, dark energy and an infinitely accelerating expansion of the universe into an unknown, cold, dead, void. It also provides the only rational explanation for non-locality that is in accordance with the principle of superposition in quantum physics and the only model to date to tie astrophysics directly to quantum physics.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

### References

- [1] Forrington, J.H. (Cass) (2022) *Journal of Cosmology*, **27**, 15110-15145.  
<https://thejournalofcosmology.com/General%20Relativity%20and%20Effects%20in%20Time%20as%20Causation%20JoC.pdf>
- [2] Forrington, J.H. (Cass) (2023) *Journal of Modern Physics*, **14**, 839-864.  
<https://doi.org/10.4236/jmp.2023.146049>
- [3] Schild, R.E. and Leiter, D.J. (2008) Black Hole or MECO? Decided by a Thin Luminous Ring Structure Deep within Quasar Q0957.  
<https://doi.org/10.48550/arXiv.0806.1748>