

Mechanics of Particles in the Fractal Cosmos

Harry A. Schmitz

20 Linwood Road North, Port Washington, New York 11050, +1(516) 883-3089

Email: harry@fractalcosmos.com, Internet: www.fractalcosmos.com

Abstract

A fractal particle is a three-dimensional (3D) standing wave (SW) superimposed on much smaller fractal particles, which comprise the finite substrate of one universe within an hierarchical series of fractal universes, or a fractal cosmos. In this presentation, units of absolute time and length are defined with respect to the frame of reference of a fractal universe. It is then shown that, for a fractal particle in motion, the frequency of vibration decreases (clock retardation) and the wavelength decreases in the direction of motion (length contraction) as the velocity of the particle increases with respect to the rest frame of (*i.e.*, zero-velocity in) the fractal universe. Predictions are in agreement with experimental results, yet the equations of “fractal mechanics” are derived without recourse to the controversial two principles of Einstein’s special relativity theory (SRT). The present derivation is based on Newtonian mechanics as applied to the built-in clocks and rulers of a fractal particle. It is indicated that Einstein’s *ad hoc* derivation is preposterous and superfluous in the context of the fractal cosmos and leads to unnecessary paradoxes. In conclusion, the fractal cosmos hypothesis is compatible with experimental results relating to clock retardation and length contraction, suggesting that it is a robust theory worth examining in greater detail.

Introduction

The essential elements of the fractal cosmos have been described in earlier papers [1,2]. The present paper uses fractal particles to explain the physics of clock retardation and length contraction. These papers draw their inspiration from an original treatise by H.W. Schmitz [3].

As is well known, nineteenth-century physicists supposed that light travels through a kind of soup called the “ether,” which was thought to “move around” material objects like a super-fluid liquid, and to transmit light waves like a super-elastic solid. It was supposed that, as the Earth moves through this soup at a speed at least equal to its orbital velocity (30 km/s), a light signal would appear to move slower when pointed in the same direction as the Earth’s motion and faster in the opposite direction.

In this kind of ether, you could move faster than the velocity of light and even pass a beam of light, leaving it in the dust (or, in this case, the soup). Traveling faster than light, you could hypothetically look into a mirror and not see any image of yourself in the mirror (because the light would never catch up with the mirror).

An experimental accuracy on the order of one part in 200 million would be necessary to detect this change in the velocity of light, using interferometers. We know that Maxwell was interested in this effect in the last year of his life because he wrote a letter to an astronomer at the Nautical Almanac Office in Washington, D.C., asking whether data on the eclipses of Jupiter’s moons were accurate enough to detect the Earth’s motion through the ether [4].

Of course, we all know the ending of this story. The conclusive negative result of the Michelson-Morley (MM) experiment in 1887 shocked the world of physics and forced physicists to reject the notion of soup-like ether that flows around matter.

Nonetheless, other types of ethers are consistent with the M-M experiment. For example, by 1889, Fitzgerald already had proposed that the M-M experiment makes sense if the measuring rods somehow shrunk in the direction of motion and, by 1895 Lorentz made a similar observation [4]. In 1904, one hundred years ago, Lorentz published a paper describing the Lorentz

transformation, including clock retardation and length contraction [5].

The main problem with Lorentz’s theory was that there was no physical model to go along with it. Likewise, SRT is not based on any physical model but rather is based on two preposterous assumptions. So something is missing here and has been missing for 100 years.

This paper ignores SRT and provides a model for length contraction and clock retardation without invoking Einstein. The objectives of this paper are as follows:

1. To understand the physical basis for clock retardation *experimental results*,
2. To understand the physical basis for M-M *experimental results*,
3. To explain why Einstein’s *two principles (i.e., two assumptions!)* happen to give correct results, and
4. To show that 1 and 2 are consistent with the behavior of fractal particles in the fractal cosmos, rendering 3 superfluous.

Elements of the Fractal Cosmos

A fractal universe is built upon a solid spherical substrate. The latter could be called the “ether,” but that term gets mixed up with the soup-like ether that was rightfully banished from physics by the M-M experiment (not by Einstein!). It could be called a quantum vacuum but that opens up another can of worms. So, let’s just call it a substrate, *i.e.*, the substrate of a fractal universe.

Whatever you call it, this substrate has a “particle density” that is at least a trillion trillion trillion times denser than any known matter. This substrate serves as an absolute frame of reference, relative to which real material objects really can have a zero velocity.

Absolute velocities can at least be defined, and could perhaps also be measured, with respect to a coordinate system fixed in the substrate, whose radius R_0 could serve as an absolute unit of length. If the substrate is associated with an acoustic velocity (c) then the time T_0 for a disturbance to travel this distance R_0 could

be considered an absolute unit of time, independent of the particles.

According to the fractal cosmos hypothesis, the fractal particles in a fractal universe are 3D standing waves, as described elsewhere [1-3]. These waves could be called potential waves but really they are just pressure waves. Pressure is energy per unit volume. At the center of these waves, the pressure reaches a maximum value and the incoming wave bounces to become an outgoing wave. The outgoing wave eventually bounces against the inside surface of the universe, reverses direction and becomes the incoming part of the standing wave.

Derivations

A 3D SW at rest has a wavelength ($4r_0$), a wave velocity (c) and a frequency equal to $c/4r_0$. A 3D SW at rest can be compared with one in motion. Let's consider the behavior of the SW in the direction normal to the velocity of the particle. The time to travel a distance of a half wavelength "out" and a half wavelength "in" varies with the velocity of the particle.

$$\vec{c}_\perp = \vec{c} - \vec{v} \quad (1)$$

$$c_\perp = \sqrt{c^2 - v^2} \quad (2)$$

As shorthand, these conventional definitions apply:

$$\beta \equiv \frac{v}{c} \quad (3)$$

$$\gamma \equiv \frac{1}{\sqrt{1 - \beta^2}} \quad (4)$$

So that

$$c_\perp = c\sqrt{1 - \beta^2} \quad (5)$$

The period in the stationary frame is

$$t_0 = \frac{\lambda}{c} = \frac{4r_0}{c} \quad (6)$$

The period in the moving frame is

$$t'_0 = \frac{\lambda}{c_\perp} = \frac{4r_0}{c\sqrt{1 - \beta^2}} \quad (7)$$

Therefore

$$t'_0 = t_0\gamma \quad (8)$$

Notice we didn't introduce any special postulates to get this result. Clock slowing is easily understood in terms of Newtonian mechanics. Clocks are regulated by restrictions on the oscillation of the standing waves normal to the direction of motion.

The period for one oscillation is dilated by the factor γ . Of course, the same would apply to ten oscillations, 1000 oscillations or any time interval. And this clock retardation would apply to the behavior of mechanical clocks as well.

Likewise, length contraction is regulated by the following factors:

- 1) The period of the moving standing wave pattern, t'_0
- 2) The period of the forward moving wave train, t_f
- 3) The period of the reverse moving wave train, t_r

$$t'_0 = \frac{t_f}{2} + \frac{t_r}{2} = \frac{4r_0}{c\sqrt{1 - \beta^2}} \quad (9)$$

$$t_f(c - v) = 4r_v \quad (10)$$

$$t_r(c + v) = 4r_v \quad (11)$$

$$\frac{2r_v}{c - v} + \frac{2r_v}{c + v} = \frac{4r_0}{c} \frac{1}{\sqrt{1 - \beta^2}} \quad (12)$$

$$\frac{2r_v}{c} \left(\frac{1}{1 - \beta} + \frac{1}{1 + \beta} \right) = \frac{4r_0}{c} \frac{1}{\sqrt{1 - \beta^2}} \quad (13)$$

$$r_v(1 + \beta + 1 - \beta) = 2r_0 \frac{(1 - \beta)(1 + \beta)}{\sqrt{1 - \beta^2}} \quad (14)$$

$$r_v = r_0 \left(\frac{(1 - \beta^2)^{1/2}}{(1 - \beta^2)^{1/2}} \right) \quad (15)$$

$$r_v = r_0 \sqrt{1 - \beta^2} \quad (16)$$

$$r_v = \frac{r_0}{\gamma} \quad (17)$$

The above derivations use high-school algebra and physics. They are simple, intuitive and satisfying. We can gain additional insight with a little trigonometry.

Forward moving wave:

$$\frac{\omega_f}{k} = c - v \quad (18)$$

$$\omega_f = k(c - v) \quad (19)$$

Reverse moving wave:

$$\frac{\omega_r}{k} = c + v \quad (20)$$

$$\omega_r = k(c + v) \quad (21)$$

Sum of forward and reverse moving wave:

$$\phi = \cos(kx - \omega_f t) + \cos(kx + \omega_r t) \quad (22)$$

$$\phi = \cos[kx - k(c - v)t] + \cos[kx + k(c + v)t] \quad (23)$$

$$\phi = \cos[(kx + kv t) - kct] + \cos[(kx + kv t) + kct] \quad (24)$$

The following "product formula" can be found in any trigonometry text or math reference book:

$$\cos(a + b) + \cos(a - b) = 2 \cos a \cos b \quad (25)$$

Application of Eq. 25 to Eq. 24 yields the following equation.

$$\phi = 2 \cos(kct) [\cos(kx + kv t)] \quad (26)$$

Note that

$$k = \frac{2\pi}{4r_v} \quad (27)$$

And

$$kc = \omega' = 2\pi \left(\frac{c}{4r_v} \right) \quad (28)$$

Then

$$\phi = 2 \cos \omega' t \cos \frac{2\pi}{4r_v} (x + vt) \quad (29)$$

This result shows that when a 3D SW moves with some velocity there is a contraction of its wavelength. It is well known that any static solution for the wave equation (*i.e.*, with the time variable frozen) is also a static solution for a wave traveling at some velocity, with the length transformed by the Lorentz factor. See, *e.g.*, the book on waves by Pierce [5].

It appears from Eq. 28 that the frequency of the standing wave increases as r_v decreases, but Eq. 28 is a one-dimensional simplification of the 3D standing wave. In reality, the circulation of inertial energy, or the kinetic energy of motion, slows the fre-

quency of the 3D wave pattern. The frequency is regulated by the behavior of the standing waves normal to the velocity of the particle, in accordance with Eq. 8 above.

This intuitive result provides real insight into physical processes, including how kinetic energy is stored in a moving particle. It allows one to visualize inertia.

Discussion

To paraphrase Shakespeare, "I come to bury [Einstein], not to praise him." Although special relativity theory (SRT) is mathematically elegant and correctly predicts the outcome of several important experiments, many thinking scientists are uneasy about it because it lacks something. In fact, there is a voluminous literature critical of SRT, *e.g.*, [7].

Einstein began with two postulates (or fundamental principles) that allow for a shortcut derivation of the Lorentz transformations, bypassing any physical understanding of why they should work. That is backwards! Einstein's two fundamental principles are one possible *consequence* of the Lorentz transformation. Thus, Einstein's SRT is literally preposterous! The word "preposterous" is derived from the Latin word *praeposterus*, meaning "inverted," which has a literal meaning of "having the first thing last." Even though Einstein was declared "man of the century" by the popular press, his SRT has resulted in a dogmatic slumber among physicists that perhaps has no historical precedent.

Selleri isolated the difficulties with SRT as stemming from the purely conventional assignment of the coefficient of x in the transformation of time [8-10]. Whereas SRT uses a special value of the "synchronization parameter," which introduces symmetry between space variables and time, Selleri proposed a value of zero for the synchronization parameter, and modestly suggested that modified Lorentz transformations be called "inertial transformations" [8]. In the same paper, Selleri shows that the inertial transformations account for all of the experimental results traditionally cited as "proving" special relativity theory.

Hatch has adopted the Selleri transformation into a modified Lorentz ether theory that also involves 3D standing waves [11-12]. As regards SRT, he says the following [11].

Specifically, SRT ascribes all the relativistic effects to kinematics and the source of the effects are left to some magical property of space-time, *i.e.*, no causative agent is ever identified. By contrast, if there is an absolute ether frame, the relativistic effects must be due to dynamic forces rather than kinematics and an explanation of the forces is needed. But, if we can find the forces involved, the delightful reward is a conservation of energy and momentum across all inertial frames.

Conclusion

The next time someone tells you that the ether is superfluous, rest assured that his or her opinion is biased by the preposterous mathematical theory of Einstein. It is true that one can obtain the Lorentz transformation via the two principles but, while mathematically elegant, it results in nothing but dogma.

When SRT is set aside, the laws of mechanics no longer need be accepted on faith but can be seen to be a natural consequence of the behavior of standing waves. The circulating energy results in a slowing of the frequency of oscillation of the particles. The wave pattern of the particle stores kinetic energy, which reduces the wavelength in the direction of motion and imparts a velocity

to the particle. For a particle moving at a constant speed, there is a constant flow of energy, in the direction of motion, across the plane dissecting the particle, normal to the direction of motion.

The study of the behavior of these 3D standing wave patterns, including how they store and release energy, and how they interact, could be called "fractal mechanics" or "neomechanics." I think that particle interactions, including electrodynamics and gravity, can be understood in terms of such a physical model.

Could a better understanding of these particles perhaps lead to innovative approaches to tap into abundant sources of energy? My father believed that progress in new energy would be hindered without a deeper understanding of nucleons and electrons. We have only begun to delve into fractal mechanics. It was my father's fondest aspiration that future generations might be inspired to study these problems in greater detail from this fresh new perspective.

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