Reductio ad Absurdum Modern Physics' Incomplete Absurd Relativistic Mass Interpretation And the Simple Solution that Saves Einstein's Formula.

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Abstract

This note discusses an absurdity that is rooted in the modern physics interpretation of Einstein's relativistic mass formula when v is very close to c. Modern physics (and Einstein himself) claimed that the speed of a mass can never reach the speed of light. Yet at the same time they claim that it can approach the speed of light without any upper limit on how close it could get to that special speed. As we will see, this leads to some absurd predictions. Because even if a material system cannot reach the speed of light, an important question is then, "How close can it get to the speed of light?" Is there really no clear-cut bound on the exact speed limit for an electron, as an example?

Key words: Relativistic mass, maximum velocity of subatomic particles, boundary condition, Haug maximum velocity.

1 Introduction

Einstein's relativistic energy mass formula [1, 2] is given by

$$\frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}. \tag{1}$$

Further, Einstein commented on his own formula

> *This expression approaches infinity as the velocity v approaches the velocity of light c. The velocity must therefore always remain less than c, however great may be the energies used to produce the acceleration*[1]

Carmichael (1913) [3] came up with a similar statement in relation to Einstein's theory:

> *The velocity of light is a maximum which the velocity of a material system may approach but never reach.*

We certainly agree with Einstein's formula[2]. Our question is, How close can v be to c? Modern physics says nothing about this, except that it can approach c, but never reach c. Does this mean that one can make it as close to c as one wants? This is what we will look into here, and we will show that without a more specific boundary condition on v this can lead to truly absurd predictions.

Einstein's relativistic mass equation predicts that a mass will keep increasing as the velocity of the mass approaches the velocity of the speed of light. If $v = c$, then the mass would become infinite. Einstein and others have given an ad hoc solution to the problem, namely in claiming that indeed the relativistic mass never can become infinite, as this would require an infinite amount of energy for the acceleration.

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[1] This quote is taken from page 53 in the 1931 edition of Einstein's book *Relativity: The Special and General Theory.* English translation version of Einstein's book by Robert W. Lawson.

[2] As a matter of fact, I have proven that Einstein's formula is consistent with atomism, a belief system that I have reason to believe contains the ultimate depth of reality.

Still, they also seem to claim that the speed of subatomic particles can get as close to c as one would want.

The discussion above is also fully relevant at todays university campus. For example in the excellent text book "University Physics" by Young and Freedman (2016)[3] states that

> When the particle's speed v is much less than c, this is approximately equal to the Newtonian expression...**In fact as v approaches c, the momentum approaches infinity.**

Here I have marked part of the sentence in bold. Similarly, in another well-known and excellent university text book by Walker [5] we can read[4]

> As v approaches the speed of light, the relativistic momentum becomes significantly larger than the classical momentum, **eventually diverging to infinity as $v \to c$.**

Similar in the university physics text book by Cutnell and Johnson [6] we can read[5]

> As v approaches the speed of light c, the $\sqrt{1 - v^2/c^2}$ term in the denominator approaches zero. **Hence, the kinetic energy becomes infinitely large**. However, the work-energy theorem tells us that an infinite amount of work would have to be done to give the object an infinite kinetic energy. Since an infinite amount of work is not available, we are left with the conclusion that the objects with mass cannot attain the speed of light c.

I do not directly disagree; mathematically this is correct. My point is that modern physics does not give an exact limit on how close v can get to c, and we will soon see how this leads to absurd relativistic masses and kinetic energies.

2 The Absurdity of the Electron Following Modern Physics' Incomplete Relativistic Mass Interpretation

An electron is a very small so-called fundamental particle with a rest mass of approximately $m_e \approx 9.10938 \times 10^{-31}$ kg. Next let's look at the relativistic mass of the electron as v approaches, but never reaches, the speed of light.

Absurd One Kg Mass Electron

Assume an electron is accelerated (by for example a giant exploding star, or by the core of a galaxy) to the following velocity

$$v = c \times 0.9999999999999999999999999999999999999999999999999999999999999999999999586$$

That is 70 nines behind the decimal point followed by the number 586, or we could say it is 586×10^{-73} with nines instead of zeros after the decimal point. It gives a relativistic mass for a single electron of approximately 1 kg.

Absurd Moon Mass Electron

Assume an electron is accelerated (by for example a giant exploding star, or by the core of a galaxy) to the following velocity

$$v = c \times 0.999999999999999999999999999999999999999999999999999999999999999999999999999999999999$$
$$9999999999999999999999999999999923$$

That is 116 nines behind the decimal point followed by the number 24, or we could say it is 924×10^{-118} with nines instead of zeros after the decimal point. It gives a relativistic mass for a single electron of approximately 7.34×10^{22} kg, that is basically equal to the rest mass of the Moon. That is quite amazing, a tiny electron that suddenly has a relativistic mass equal to the rest mass of the moon! Where can we find such electrons?

[3] 14th edition page 1238, for full reference see [4].
[4] Fourth edition, page 1026.
[5] Ninth edition page 884.

Absurd Earth Mass Electron

Assume an electron is accelerated to the following velocity

$$v = c \times 0.99999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999884$$

That is 119 nines behind the decimal point followed by the number 884, or we could say it is 884×10^{-122} with nines instead of zeros after the decimal point. It gives a relativistic mass for a single electron of 5.9806×10^{24} kg, that is basically equivalent to the rest mass of the Earth.

Absurd Sun Mass Electron

Assume an electron accelerated to the following velocity

$$v = c \times 0.9999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999895$$

That is 130 nines behind the decimal point followed by the number 895. It gives a relativistic mass for a single electron equal to the rest mass of the Sun, that is about 1.98×10^{30} kg.

Absurd Milky Way Mass Electron

Assume an electron is accelerated to the following velocity

$$v = c \times 0.9999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999895$$

The relativistic mass of the electron at this velocity is equal to the rest mass of the Milky Way, that is about 10^{12} solar masses. Still, the electron is traveling below the speed of light, so this does not against the established modern physics.

Insane Observable Universe Electron

Assume an electron is accelerated to the velocity of

$$v = c \times 0.9999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999999996$$

That is 174 nines behind the decimal point followed by the number 6, or we could say it is 6×10^{-175} with nines instead of zeros after the decimal point. It gives a relativistic mass for a single electron of approximately 1.018×10^{52} kg, that is basically equal to the rest mass of what main frame physics claims is the approximately mass of the observable universe, see [7, 8, 9, 10]. That is quite amazing, a tiny electron that suddenly has a relativistic mass equal to the rest mass of the whole observable universe.

Modern physics leads to absurd kinetic energies for subatomic particles

The table below lists the relativistic kinetic energy of an electron traveling at various velocities, all below the speed of light. All of these velocities are valid inside the framework of modern physics, as it stipulates no precise speed limit on the velocity of an electron as long as it falls below the speed of light.

Why are we not seeing a single electron (or other subatomic particle) with a relativistic mass equal to (even at the most moderate level) the rest mass of the Moon? Such an electron would have enormous kinetic energy, causing a gigantic impact with collision with the Earth, or other planets in our solar system. We suspect that current mainstream physics does not have a good answer to this question. Maybe such fast-traveling electrons exist, but they are very uncommon and therefore have a very low probability of occurring? What if, as a counterpoint, a single electron wiped the dinosaurs out? Are we doomed? And why have we not heard physicists discussing such velocities for electrons? Perhaps they simply dont like to talk about such things, as they have no good explanations on why such very fast electrons have never been observed.

Velocity of electron % of light:	**Relativistic electron mass = rest mass off**	**Kinetic energy:**[a]	**Ton TNT equivalent:**[b]
923×10^{-120} (9'ns in front)	Moon	6.597×10^{39} J	1.58×10^{30}
884×10^{-122} (9'ns in front)	Earth	5.375×10^{41} J	1.28×10^{32}
895×10^{-133} (9'ns in front)	Sun	1.787×10^{47} J	4.27×10^{37}
895×10^{-145} (9'ns in front)	Milky Way	1.787×10^{59} J	4.27×10^{49}

Table 1: The table shows the kinetic energy for an electron traveling at various velocities below the speed of light.

[a]The Kinetic energy is calculated as $E_k = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} - mc^2$.

[b]One ton TNT equivalent is about 4.184 giga joules.

3 A Simple Solution to the Absurdity that Saves Einstein's Relativistic Mass Formula

Einstein's special relativity formula is perfectly correct, but it lacks an exact boundary condition on the velocity for mass. Such a boundary condition has recently been derived by Haug [11, 12, 13]. The maximum velocity any subatomic particle can take as measured by Einstein-Poincaré synchronized clocks[6] is given by

$$v_{max} = c\sqrt{1 - \frac{l_p^2}{\bar{\lambda}^2}} \tag{2}$$

where $\bar{\lambda}$ is the reduced Compton wavelength of the mass in question, and l_p is the Planck length [15]. When inserted into Einstein's relativistic mass equation, this show that the maximum relativistic mass that any "fundamental" particle can take actually is the Planck mass. The Planck mass is approximately 2.17651×10^{-8} kg. It is enormous compared to the electron, but still it is miniscule compared to the mass of the Moon, Earth or the Sun. Further, the Planck mass only can last for an instant, as pointed out by Haug. In other words, this seems to make perfect sense.

Further, an electron can travel at a velocity very close to that of the speed of light, but its maximum velocity will still be significantly below what is described above. The maximum velocity for an electron is

$$v_{max} = c\sqrt{1 - \frac{l_p^2}{\bar{\lambda}_e^2}} = c \times 0.999999999999999999999999999999999999999999999912416 \tag{3}$$

Because there is some uncertainty in both the exact Planck length and the reduced Compton wavelength there is some uncertainty around this velocity, but it must be very close to this. We can rest assured that the electron (or any other mass) can never reach a relativistic mass close to even one kg, so there is no chance that a single electron will cause much harm no matter how fast it is accelerated. This is because there is a maximum velocity that limits both its kinetic energy and its relativistic mass.

Will modern physics accept the existence of a maximum speed limit for subatomic masses based on atomism or will they keep holding on to their absurd beliefs? If they dont accept the maximum velocity for subatomic particles given by atomism, then they must accept the following absurdities:

- That there is a wavelength shorter than the Planck length. Something that is highly unlikely and impossible under atomism.
- That there is a maximum frequency higher than the Planck frequency. Something that is highly unlikely and impossible under atomism.
- That an electron can take a relativistic mass similar to that of the Moon, the Earth, the Sun, and even the Milky Way, or even larger masses. This is, at best, truly absurd! Our theory shows that no subatomic particle can take a relativistic mass higher than the Planck mass.
- That there is no limit on the relativistic Doppler shift. This is also highly unlikely. Haug [12] has shown that the limit here is the Planck frequency Doppler shift.
- For a subatomic particle, there is a momentum close to infinity. This is absurd. The maximum momentum of a subatomic particle is actually just below the Planck momentum.
- For a subatomic particle, there is a kinetic energy close to infinity. This is, again, absurd.

[6]This also holds true if measured with clocks synchronized with very slow clock transportation method, see [14].

The newly introduced maximum velocity puts a series of limits on subatomic "fundamental particles":

- The maximum frequency is the Planck frequency: $f_{max} = 2\frac{c}{l_p}$.
- The maximum relativistic Doppler shift is equal to the Planck frequency.
- The maximum relativistic mass a subatomic particle can take is the Planck mass.
- The maximum relativistic momentum a subatomic particle can take is just below the Planck momentum.
- The maximum kinetic energy a subatomic particle can take is close to $\frac{\hbar}{l_p}c$.
- The maximum relativistic length contraction of a subatomic particle is $2l_p$, wich is the length of the Planck mass.

4 Ways to Write the Maximum Velocity Formula

There are several ways to write the maximum velocity for subatomic particles that will all give the same answer; here we present some of them

In terms of reduced Compton wavelength:

$$v_{max} = c\sqrt{1 - \frac{l_p^2}{\bar{\lambda}^2}} \tag{4}$$

In terms of particle mass

$$v_{max} = c\sqrt{1 - \frac{m^2}{m_p^2}} \tag{5}$$

where m is the rest mass of the particle and m_p is the Planck mass.

As a function of Newton's gravitational constant

$$v_{max} = c\sqrt{1 - \frac{Gm^2}{\hbar c}} \tag{6}$$

All these formulas are basically the same, but require somewhat different input:

$$v_{max} = c\sqrt{1 - \frac{l_p^2}{\bar{\lambda}^2}} = c\sqrt{1 - \frac{m^2}{m_p^2}} = c\sqrt{1 - \frac{Gm^2}{\hbar c}} \tag{7}$$

Electron the maximum velocity

For an electron, the maximum velocity can be written as function of the dimensionless gravitational coupling constant[7]

$$v_{max} = c\sqrt{1 - \alpha_G} \tag{8}$$

this is no surprise, since the dimensionless gravitational coupling constant is given by $\alpha_G = \frac{m_e^2}{m_p^2} = \frac{l_p^2}{\bar{\lambda}_e^2}$

5 Conclusion

We conclude that simply by saying that a mass must travel more slowly than the speed of light, but when it can approach the speed of light, we may get absurd predictions such as the idea that an electron could attain a relativistic mass equal to the rest mass of the Moon, the Earth, the Sun, and even the Milky Way or entire galaxy clusters. Haug has recently addressed this absurdity by showing that there must be a precise maximum velocity for anything with mass given by $v_{max} = c\sqrt{1 - \frac{l_p^2}{\bar{\lambda}^2}}$.

[7] For information about the dimensionless gravitational coupling constant see [16, 17, 18, 19].

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