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A STUDY ON THE RELATIONSHIP BETWEEN FORCE (FUNDAMENTAL INTERACTION) AND SPEED

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Abstract:

This article argues that when the speed of particles increase, the mass of the particle doesn't increase according to special relativity, but electric field or gravitational field exerts less force on the particles. And the relationship between force（fundamental interaction） and speed is discussed. The equation is proposed:

$$F = F_0\sqrt{1-\frac{v^2}{C^2}}$$

And this article analyzes an example about a cosmic ray particle which travels at a very high speed into a black hole to support the argument of this article and concludes that the mass (momentum / energy) and speed relationship of special relativity is incorrect.

Key Words: Special Relativity, Theory of Relativity, Albert Einstein, Speed of Light, Frame of Reference, Theoretical Physics, Relationship between Force and Speed, Red Shift, Blue Shift, Black Hole, Superluminal

Main Text:

In my previous article [A Study on Why Particles cannot be Accelerated to the Speed of Light], it is suggested that the force electric field exert on an electron can be different when the relative speed of the electron as to the electric field is different, i.e., the degree of interaction between an electrically charged particle and an electric field is dependent upon the speed of the particle. The core of this suggestion is that, when the speed of particles increase, the mass of the particle doesn't increase according to special relativity, but electric field exerts less force on the particles.

Specifically, when v stands for the speed of the particle and F stands for the force an electric field exerts upon the particle:

[1]. When a charged particle is static inside an electric field (v=0), the force electric the field exerts on the particle is F_{static}.

[2]. Because electric field travels at the speed of light when a charged particle inside an electric field is travelling at the speed of light (v=C) and in the same direction as the electric field, the force the electric field exerts on the particle F = 0.

[3]. when a charged particle is travelling at a speed lower than the speed of light ($0<v<C$) and in the same direction as the direction of the electric field, the force electric field exerts on the particle F is between 0 and F_{static}, i.e., $0<F<F_{static}$.

For [1], F is electric field force, which is fundamentally Coulomb force. Interestingly, the Coulomb force is exactly defined as the force exerted on charged particles which is STATIC. It is as if saying that the force between moving charged particles will be different, giving support to this very article.

For [2], current mainstream views believe that an electron, or any other particles whose rest mass is not zero, can never be accelerated to the speed of light. This may be untrue in reality. Let's suppose, if there is an electron which is travelling at the speed of light inside an electric field and in the same direction as the electric field, will this electron receive any force from the electric field? It is common sense that this electron will not receive any force from the electric field, i.e. there will be no interaction between the electric field and the electron. This is in line with common sense because when a sand inside a river is travelling at the same speed as the speed of river water, the river water will neither increase nor decrease the speed of the sand. Let's further imagine that if an electron is travelling faster than the speed of the electric field (the speed of light), the electric field will actually slow the electron down according to common sense.

For [3], we would try to find the specific relationship between F and v. This should not be difficult because we can do some experiment and measure the results of the experiment and summarize the relationship between F and v.

Actually, according to current data, all previous experiment results are in line with the theory of special relativity when we assume that the mass of particles increase when the speed of particles increase.

This means, it is a fact that it becomes more difficult to accelerate particles under the same electric field when the speed of particles increase. This means, when the speed of particles increase, the acceleration (a) of particles will decrease under the same electric field.

Now we look into it:

Because F=Ma, a=F/M. And a_0, F_0, and M_0 stand for the acceleration of a particle, the force the electric field exerts on the particle, and the mass of the particle respectively when the particle is static, and a, F, and M stand for the acceleration of a particle, the force the electric field exerts on the particle, and the mass of the particle when the speed of the particle is v.

So:

$$\frac{a}{a_0} = \frac{F/M}{F_0/M_0} = \frac{FM_0}{F_0M}$$

Inside the system of special relativity, F doesn't change when the relative speed of particles changes, so $F=F_0$ no matter what is the speed (v) of particles.

$$\frac{a}{a_0} = \frac{F/M}{F_0/M_0} = \frac{FM_0}{F_0M} = \frac{M_0}{M}$$

And, according to special relativity, the relationship between mass and speed is:

$$M = M_0 \div \sqrt{1 - \frac{v^2}{C^2}}$$

So:

$$\frac{a}{a_0} = \frac{M_0}{M} = \sqrt{1 - \frac{v^2}{C^2}}$$

Thus, according to current data, this equation ($\frac{a}{a_0} = \sqrt{1 - \frac{v^2}{C^2}}$) is true.

Based on this, if what we argue in this article is true, that is, when the speed of particles increase, the mass of the particle doesn't increase according to special relativity($M=M_0$), but electric field exerts less force on the particles, then we have:

$$\frac{a}{a_0} = \frac{FM_0}{F_0M} = \frac{F}{F_0} = \sqrt{1 - \frac{v^2}{C^2}}$$

Then we have a result:

$$F = F_0\sqrt{1 - \frac{v^2}{C^2}}$$

This means, the force an electric field exerts on a particle will decrease when the speed of the particle increases. And when the speed of the particles is almost speed of light, the force an electric field exerts on a particle is almost zero.

However, when the speed of the particle is in the opposite direction as the electric field, i.e., the particle is not accelerated but decelerated in the electric field, the force(F) the electric field exerts on the particle can be should not be smaller than the force(F_0) the electric field exerts on the particle when the particle is static.

So, when the speed of the particle is in the opposite direction as the electric field, the relationship between F and F_0 should logically be:

$$F = F_0\sqrt{1 + \frac{v^2}{C^2}}$$

Well, anyway, we can do some experiments and try to accurately measure the force (F) at different speeds (v) of a charged particle in a given electric field and the measurement results of the experiment will enable us to find the correct equation to describe the relationship between F and v.

(As can be seen, it will be more convenient that finally experiment-proved equation is $F = F_0\sqrt[3]{1 - \frac{v^3}{C^3}}$ or $F=F_0(1-v/C)$, then we would not need to worry about the moving direction of the particles. But anyway, what we can logically know is that F is negatively correlated with v. So if current data accurately support $\frac{a}{a_0} = \sqrt{1 - \frac{v^2}{C^2}}$, then $F = F_0\sqrt{1 - \frac{v^2}{C^2}}$ will be only correct. But if experiment data can show otherwise, we should be able to easily summarize the correct equation used to describe the relationship between F and v.)

As the discussion comes to here, we should point out that the relationship between force (interaction) and speed is not restricted within electromagnetic interaction. All fundamental interactions should be governed by this law of physics.

For example, if a cosmic ray particle (an electron or a proton) travels at a very high speed (e.g., 99.99999999% speed of light, which is not uncommon according to our scientific observation), and this particle is moving in the direction of entering into a black hole, then according to the argument of this article (when the speed of particles increase, the mass of the particle doesn't increase according to special

Relativity ($M=M_0$), but electric or gravitational field exerts less force on the particles when the direction of particle's speed is in the same direction as the field), the black hole will exert on the particle a very small gravitational force even if the overall gravitational force of the black hole is super huge. And this is just because the speed of the particle is very high. As a result, the particle will enter into the black hole at a speed lower than the speed of light.

Actually this example is of solid scientific significance. It can prove that mass (momentum / energy) and speed relationship of special relativity is incorrect. Because, if we suppose that mass (momentum / energy) and speed relationship of special relativity is correct, then this particle will be accelerated when approaching and entering into the black hole. Unlike a particle accelerated by electric field, the increased mass (momentum/energy/inertia) of the high-speed particle inside huge gravitational field of the black hole will not be an obstacle for further acceleration, because the accelerating force (gravitational force) exerted on the particle will also be proportional to the mass of the particle no matter how fast the particle is travelling and how huge its mass becomes. This can be seen by the following equation:

$$a = \frac{F}{M_{particle}} = \frac{GM_{particle}M_{blackhole}/r^2}{M_{particle}} = \frac{GM_{blackhole}}{r^2}$$

Thus we can see that the acceleration of a high speed particle attracted by a black hole(or even by a star or huge planet, depending on the specific data) is not influenced by the mass of the particle, nor it is influenced by the mass increase due to the theory of special relativity. If we calculate a particle attracted into the super black hole in the center of our galaxy ($M_{blackhole}=4x10^{36}$kg),

$$a = \frac{GM_{blackhole}}{r^2} = \frac{6.67\times10^{-11}\times4\times10^{36}}{r^2} = \frac{2.67\times10^{25}}{r^2}$$

Thus we can see, if the initial speed of the particle is 99.999999999% speed of light, it will be very easily accelerated by the black hole to be faster than the speed of light. But according to the theory of relativity, even if all the energy inside universe are used, it is still not enough to accelerate one particle to the speed of light, not to mention faster than the speed of light.

Thus this example alone is sufficient to disprove mass (momentum/energy) and speed relationship of special relativity.

Therefore, the arguement of this article should be correct: when the speed of a particle increase, the mass of the particle will not increase according to special relativity, but electric field or gravitational field will exert less force on the particle. Based on this argument, the particle will never be accelerated to be faster than the speed of light by a black hole.

Btw, there are 2 things that can be studied related with the discussion of this article.

Firstly, if we suppose the mass (momentum/energy) and speed relationship of special relativity is correct, some cosmic rays particle with super huge energy will collide into the soil or rock of the moon and reasonably create a unique impact on the soil or rock which could be different from the impact made by mini-meteorite. If we cannot find such unique impact in moon soil or rock, this can probably serve as a support that the mass or energy of the comic ray particles has not hugely increased even if its speed is very near to the speed of light.

Secondly, previous experiment shows that gravitational red shift exists. But is there any experiment which shows gravitational blue shift also exist? If not, it is also a strong support to the arguent of this article. However, if blue shift does exist, it cannot serve as a decisive evidence again the arguent of this article. Because blue shift is about the interaction between radiation (which is energy but not matter) and gravitational field, which can be different from the interaction between matter and gravitational field or electric field.

Well, actually, the incorrectness of special relativity is not confined within mass/speed relationship, but can be discussed in many different aspects as shown by my previous articles [A Discussion about Special Relativity] and [A Discussion about Time Dilation Based on Special Relativity]. All these articles can support each other and falsify special relativity as a whole.

Conclusion:

a) When the speed of a particle increase, the mass of the particle will not increase according to $M = M_0 \div \sqrt{1-\frac{v^2}{C^2}}$

b) When a charged particle is travelling at a speed lower than the speed of light ($0<v<C$) and in the same direction as the direction of the electric field, the force electric field exerts on the particle F is between 0 and F_{static}, (F_{static} is the force electric field exerts on the particle when the particle is static), i.e., $0<F<F_{static}$.

c) When the direction of a charged particle is in the same direction as the direction of the electric field, the relationship between the force electric field exerts upon the charged particle and the speed of the particle can be described as: $F = F_{static}\sqrt{1-\frac{v^2}{C^2}}$

d) Conclusion b) and conclusion c) are not restricted within the scope of electromagnetic interaction but can also be applied to all other fundamental interactions. For example, when a particle is travelling at a speed lower than the speed of light ($0<v<C$) and in the same direction as the direction of the gravitational field, the force gravitational field exerts on the particle F is between 0 and F_{static} (F_{static} is the force gravitational field exerts on the particle when the particle is static), i.e., $0<F<F_{static}$. And the relationship between the force gravitational field exerts upon the particle and the speed of the particle can be described as: $F = F_{static}\sqrt{1-\frac{v^2}{C^2}}$

e) The example about a cosmic ray particle which travels at a very high speed into a black hole shows that the mass (momentum/energy) and speed relationship of special relativity is incorrect and that the conclusion a) of this article is correct.

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