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A STUDY ON WHY PARTICLES CANNOT BE ACCELERATED TO THE SPEED OF LIGHT

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Abstract:

This article discusses 2 explanations as to why particles can never to accelerate to the speed of light or to be faster than the speed of light. Normally, people believe that particles can never be accelerated to the speed of light because when the speeds of particles increase, although the accelerating force remains the same, its mass (momentum/energy) will increase so dramatically according to special relativity that the force exerted on the particles will have a very small effect on the acceleration. But there is another explanation. That is, because the moving speed of electric field is the speed of light, particles cannot be accelerated to be faster than the moving speed of electric field that accelerates the particles. When the speeds of particles increase to be near the speed of light, its mass remain the same, but the force electric field exerts on the particles decrease dramatically. If this explanation is correct, the following 2 equations will be mistaken. And the theory of relativity (Special Relativity) should be mistaken.

$$m_R = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}, \qquad E = \frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}}$$

This article also invents a practical way to examine which explanation is correct.

Key Words: Special Relativity, Theory of Relativity, Albert Einstein, Speed of Light, particle accelerator, Theoretical Physics

Main Text:

It is known to all that particles can never be accelerated to the speed of light or to be faster than the speed of light no matter how powerful our particle accelerators are built. For example, for the SLAC National Accelerator Laboratory, the main accelerator was an RF linear accelerator that accelerated electrons and positrons up to 50 GeV. This energy corresponds to the electron traveling at a speed within 2 cm/s of the speed of light. But still, it cannot accelerate particles to the speed of light.

Why?

The commonly accepted explanation to this is the explanation given by special relativity. That is, when the speeds of particles increase to near the speed of light, its mass (momentum/energy) will increase dramatically according to special relativity. As described by these 2 equations:

$$m_R = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}, \qquad E = \frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}}$$

Thus, although the accelerating force exerted on the particle is still the same, the acceleration become much smaller. The result is: the closer the speed of particles approaching light speed, the smaller the acceleration. So the particles will never reach the speed of light. Let alone exceeding the speed of light.

This is a reasonable explanation. But there can be another reasonable explanation. That is, because the speed of electric field is the speed of light, the particles accelerated by electric field can only be accelerated near the speed of light but can never reach the speed of light. This means, when the speeds of particles increase, the force electric field exerted on it will be smaller. For example, if a particle travels at the speed of light, it's the same speed as the speed of electric field, then the electric field will not be an accelerating force to it. It's similar to the stone in the river or sand in the wind. If the river water push a stone to move, the stone can never move faster than the river water. If the wind push sands to move, the sand will not move faster than the speed of the wind.

If this explanation is correct, the 2 equations will be incorrect (And the whole system of special relativity will be mistaken):

$$m_R = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}, \qquad E = \frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}}$$

Because both of these 2 equations assume that the force exerted by electric field upon fast-moving particles are the same no matter how fast the particles travel. This also make sense according to theory of relativity. But it can be wrong.

In my previous article, I already proved that the time dilation effect deduced from special relativity is incorrect. Now if the above 2 equations are proved to be incorrect, then the special relativity are apparently mistaken systematically.

So for these 2 explanations:

- According to special relativity, when the speeds of particles increase to be near the speed of light, the force electric field exerts on the particles remain the same, but the mass (momentum/energy) of particles will increase dramatically. When the speed of particles are almost speed of light, the mass (momentum/energy) of particles is almost infinite.
- Particles cannot be accelerated to be faster than the moving speed of electric field that accelerates the particles. When the speeds of particles increase to be near the speed of light, its mass remain the same, but the force electric field exerts on the particles decrease dramatically. When the speed of particles are almost speed of light, the force electric field exerts on the particles is almost zero.

How can we prove whether A or B is correct? Or theoretically, both A and B are partially correct?

There is a practical way to prove it.

An experiment can be designed as follows:

We first accelerate an electron to a speed very close to the speed of light. For example, we accelerate it to 99.99999% speed of light.

At this time, if A is correct, then the mass (momentum/energy) of this electron has increased dramatically and is very big. If B is correct, then the accelerating force electric field exerts on the particles has decreased dramatically and is very small.

Either way, we send the electron through a M volts accelerating electric field to further accelerate the electron to a higher speed, for example 99.9999999% speed of light. Now we still don't know whether A is correct or B is correct.

Then, we send the electron with 99.9999999% speed of light to the M volts electric field again, but for this time, we send it in the opposite direction. So for this time, the electron with the 99.9999999% speed of light will go through a decelerating process.

So if A is correct, the electron will come out of the M volts decelerating electric field with exactly the speed of 99.99999% speed of light. Or at least very near to it.

But if B is correct, the electron will come out of the M volts decelerating electric field with a speed much lower than 99.99999% speed of light. This is because when the electron increase speed from 99.99999% light speed to 99.9999999% light speed, the mass remain the same but the accelerating force becomes very small because of the high speed of the electron. But when the electron go through a decelerating process through the same M volts electric field, the force electric field exerts on the particles is much bigger than when it go through an accelerating process. If we find that B is correct, we can easily use the experiment data to summarize an equation explaining the relationship between the force electric field exerts on an electron and the speed of the electron.

As said previously, it is also theoretically possible that both A and B are correct partially. Then we can also use the experiment results to arrive at a conclusion.

Additionally, if B is correct, we now have a way to accelerate particles to higher than speed of light: we can first accelerate the particles to near the speed of light. Then we accelerate it in a lateral direction. Then the final overall speed of the particles will be higher than the speed of light.

Conclusion:

- There can be 2 explanations as to why accelerators cannot accelerate particles to the speed of light:
  - The explanation given by theory of relativity. When the speeds of particles increase, the force electric field exerts on the particles remain the same, but the mass (momentum/energy) of particles will increase.
  - Particles cannot be accelerated to be faster than the moving speed of electric field that accelerates the particles. When the speeds of particles increase, the force electric field exerts on the particles will decrease, but the mass of particles remain the same.
- It is also theoretically possible that both A and B are partially correct.
- A practical experiment is designed to examine the above explanations.
- If explanation B is correct, theory of relativity will be systematically mistaken, and there is an easy way to accelerate particles to speeds higher than the speed of light.

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