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A STUDY OF COSMIC RAY PARTICLES ACCELERATED BY THE GRAVITY OF THE SUN

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Abstract:

According to special relativity, the hugely increased mass of a high-speed particle becomes an obstacle for the acceleration process when using electric field to accelerate a particle. However, it is different when using gravitational field to accelerate the particle because the gravity force is proportional to the mass of the particle. Thus, gravitational field can not only accelerate a particle to be very near to the speed of light so that its mass can be much bigger than our universe, but also gravitational field can accelerate a particle to be faster than light speed. Hence, the theory of relativity is problematic.

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

Main Text:

It is now a public knowledge that, according to special relativity, the mass (momentum/energy /inertia) of a particle (or any matter) will increase when its speed increase. And when the speed of the particle is very near to the speed of light, the mass (momentum/energy/inertia) of the particle will become extremely big, theoretically, even possibly bigger than the mass of the entire universe. This is usually called the mass-velocity relation of special relativity. The most well-know proof of the mass-velocity relation is that current accelerators cannot accelerate particles to be faster than the speed of light. When using accelerators to accelerate particles, no matter how powerful the accelerators are, the speed of the particles can only approach the speed of light but can never reach the speed of light, let alone surpassing the speed of light. Because according to special relativity, when a particles is accelerated to be near the speed of light, its mass (momentum / energy / inertia) will become extremely big so that the accelerating force will be negligible compared with its mass (momentum / energy / inertia). As a result, its speed will always be slower than the speed of light.

This seems to be of scientific logic. But there can also be another reason that explains the phenomenon that a particle can never be accelerated by accelerators to be faster than the speed of light. Thus the fact that a particle can never be accelerated to be faster than the speed of light may not be a valid proof for the mass-velocity relation of special relativity.

In order to find the truth about this, we conduct a study about high speed cosmic ray particles travelling towards the sun.

It is a well know fact that there are cosmic ray particles travelling at speeds equal to or higher than 99.99999999% speed of light and that the travelling directions of cosmic rays are essentially randomized. Thus, there must be many cosmic ray particles travelling through earth orbit towards the sun at speeds no lower than 99.99999999% speed of light each year.

Now let's study one of these particles. (It needs to be mentioned that it is also possible to use high-speed cosmic ray particles whose speeds are lower than 99.99999999% speed of light to conduct this study. But we choose to study particles whose speeds are no lower than 99.99999999% speed of light to make the result of discussion more easy and obvious.)

When this high-speed particle is near earth orbit and moving towards the sun, it will be accelerated by the gravitational field of the sun. And according to mass (momentum/energy/inertia) and velocity relation of special relativity, the mass (momentum/energy/inertia) of this particle will increase dramatically because of its speed increase. Unlike a particle accelerated by electric field, the increased mass (momentum/energy/inertia) of the high-speed particle accelerated by the gravitational field of the sun will not be an obstacle for further acceleration, because the accelerating force (gravitational force) exerted on the particle is 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

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

That is to say, the acceleration of a high speed particle attracted by the sun is not influenced by the mass of the particle, nor is it influenced by the quick and huge mass increase due to the theory of special relativity. So the rate of speed increase of the particle will not decrease even if the speed of the particle is already very near to light speed.

Thus when we calculate a particle moving through earth orbit towards the sun, if the speed of it is 99.99999999% speed of light when at earth orbit, we can find that, according to previous equation, the acceleration of the particle when at earth orbitis

$$a = \frac{GM_{sun}}{r^2} = \frac{6.67\times10^{-11}\times2\times10^{30}}{(1.496\times10^{11})^2} = 5.96\times10^{-3}\,m/s^2$$

And, when the particle travels toward the sun, its acceleration will always become larger (always larger than $5.96\times10^{-3}m/s^2$). This means, after every 1 second, the speed of the particle will increase by at least $5.96\times10^{-3}m/s$. Thus, when it travels to the sun, the particle will be very easily accelerated by the sun to be extremely close to the speed of light so that its mass will be much bigger than the sun, the whole solar system, our galaxy, or even the whole universe. In addition, we can also find that nothing will prevent this particle from being further accelerated to be faster than the speed of light. Because no matter how huge its mass becomes, it will still be attracted by the gravity of the sun and be further accelerated at INCREASING rate. Its acceleration has nothing to do with its enormously increased mass.

As a result, for a particle whose speed is 99.99999999% light speed (v_0=light speed × 99.99999999% = 299792458 × 99.99999999% = 299792457.970021m/s) when the particle is near earth orbit, its speed will surpass light speed after at most 5.1 seconds when this particle travels towards the sun ($v=v_0+\Delta v>v_0$ + 5.1s × $5.96\times10^{-3}m/s^2$ = 299792457.970021m/s+0.030396m/s=299792458.000417>light speed).

In sum, according to special relativity, the mass of the particle will become infinite (This is apparently absurd and unrealistic and untrue. Because if it were true, it would have already happened before. But it never happened) before reaching the speed of light, and then, this particle will become faster than the speed of light (this is also against the theory of relativity).

Thus this study fundamentally questions the mass-velocity relation of special relativity. Because the mass-velocity relation uses the same scientific logic as that of length-shrinkage and time-dilation, special relativity length-shrinkage and special relativity time-dilation could also be untrue, as supported by previous publications of the author. Especially if we ask, as a matter of fact, whether any high speed cosmic ray particles has already been accelerated by the sun or other celestial bodies to be faster than speed of light? The possible answers will be very interesting. If the answer is “yes, some high speed cosmic ray particles has already been accelerated by the sun or other celestial bodies to surpass speed of light”, it apparently means that the system of special relativity is incorrect. If the answer is “no, high speed particles has never been accelerated by gravitational fields to surpass light speed”, then it must not be because of mass-velocity relation but be because of other reasons, as discussed by previous publications by the author: <A STUDY ON THE RELATIONSHIP BETWEEN FORCE (FUNDAMENTAL INTERACTION) AND SPEED>.

Results:

This will lead to a conclusion that special relativity is in question. Specifically, when the speed of a particle increases, the mass of the particle doesn’t increase, time doesn’t slow down, and length doesn’t shrink. This conclusion will bring obvious significance. Firstly, special relativity has been commonly accepted as one of the foundations of current physics system. If special relativity is incorrect, the entire current physics system needs to be re-examined. A lot of natural phenomena will need to be explained in different ways. Thus new theories will need to be invented. And these new theories will bring new benefits to the world.

Secondly, if the mass-velocity relation of special relativity is untrue, it means, when we use our current powerful particle accelerators to accelerate particles from the speed of 99% speed of light (correspond to 7 times of mass increase according to mass-velocity relation) to, for example, 99.999999% speed of light (correspond to 7071 times of mass increase according to mass-velocity relation), the energy of the particle has not increased by thousands times as we believed before. And it is very possible that it has only increased by less than 1%. This therefore means, our scientific research achievements acquired through “high-energy” particle collisions experiments may need to be re-examined (and maybe we don’t need to invest billions of dollars to build such accelerators at all).

Thirdly, if special relativity is incorrect, it will be possible that the speed of particles can actually be accelerated to be faster than the speed of light. We can then try to invent new ways to build accelerators which can accelerate particles to be faster than the speed of light. It will also become promising to overcome the speed limitation of light speed for the use of telecommunication or even for the use of space travelling.

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