Relativistic mass paradox.

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Abstract:

Relativistic mass is still considered to be a misleading thing by many scientists. But it is very popular in calculating the force required to move an electron and so on. From the relativistic equation, equivalent mass of an object moving with respect to an observer tends to reach infinity when the speed approach the speed of light in vacuum. This paper aims at almost disproving the concept of relativistic mass by a thought experiment. The logic here is that whatever may the relative velocities of the multiple observers, they cannot see two different eventualities for the same object at the same time from the same reference frame.

1. Introduction:

According to the theory of relativity, mass of an object is minimal when it is at rest with respect to an observer. This is called as rest mass. When it is having relative velocity with respect to the observer, then the mass of the object appears to me more and it is called as equivalent mass. It is given by the equation=

$$M_{eq} = \frac{M_s}{\sqrt{(1 - v^2/c^2)}} \quad \dots(1)$$

Where,

M_{eq} = equivalent mass, as seen by the observer moving relative velocity = v ,

M_s = Mass of the star, for observer moving at relative velocity = zero.

v = velocity of the object with respect to the observer

c = speed of light in vacuum.

The so called ‘proof’ for this will be given with the example of trying to move an electron, using a cyclotron. It is known that it is difficult to increase the speed of the electron, as the speed approaches the speed of light. But it has not been experimentally demonstrated that such a fast moving electron will really massive and attracts nearby particles at a grater force. So, this effect may be due to some other reason like the one explained at the end of the paper.

2. Contradiction to relativistic mass concept.

let us consider a thought experiment:

Let there be two observers A and B. A is near a star of mass equal to that of the Sun. He is assumed to be on a planet near the star. So, he is not moving away with respect to the star, but revolving around it and not falling in to it.

Observer B is millions of light years away from the star, but he is seeing the star and the observer A. To him, star and the observer A are moving towards him with a velocity $=v=0.8c$. A is seeing that B is moving towards him at $v=0.8c$.

Applying relativistic mass equation, for the above example, and substituting M_0 (Where M_0 is the mass of the Sun) for M_s we get

FIGURE-1

On simplifying we get, $M_{eq} = 1.67M_0$,

There are two types of life cycle for stars.

Case1.

If the initial mass of the star is less than $1.4 M_0$ (called Chandrasekhar's limit), then it will end up as white dwarf.

Case2

If the initial mass of the star is $>1.4M_0$, then it will continue till it becomes a neutron star or a black hole.

Let us assume that both the observers will live for billions of years and see the full life of the star. Then:

Observer A should see the star ending up as white dwarf because according to him, the initial mass of the star was $=M_0$, which was less than Chandrasekhar's limit.

Observer B should see the star ending up as neutron star because according to him, the initial mass of the star was $=1.6M_0$, which was more than Chandrasekhar's limit.

Of course, the time required from light to reach the observer B is also several million years delayed from that of A. That is, when A sees the star as white dwarf, B will be still seeing it as red giant. Let there be any amount of time delay between them, but the final event must be same as they will be in the same inertial frame.

Who is correct?

Also, observer B will finally reach the position of A instantaneously stay with A. Then what will he

see?

According to theory of relativity, two observers in the same inertial frame in the same place should see the same thing at the same time. But what will they see?

If B sees it from the beginning as white dwarf, then relativistic mass concept is wrong.

3. Conclusion

Even though the relativistic mass parameter is helpful in some calculations, it will not be like the actual mass. Thus the concept of actual increase in mass of an object when there is a relative motion with respect to the observer appears to be wrong. So, from the beginning, mass of the star appears to be same irrespective of their velocities with respect to star and hence the final conclusion of B will be same as that of A. Or is it a paradox?

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