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On Gravitational Mass and Inertial Mass

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Abstract

Gravity is an impedance of matter to its stable state changes, manifested as attraction to other objects, and gravitational mass is a measure of the magnitude of this property of matter. Microscopic particles and solid particles within a macroscopic object, along with their motion, endow the object with inertial mass. These particles and their motion, along with the relative motion of the object in a gravitational field, collectively endow the object with gravitational mass. Therefore, gravitational mass is the total mass of an object, and inertial mass is only a part of it.

*The relationship between gravitational mass and inertial mass is derived from the hypothesis of the Energy-Momentum Conservation and the modified Newton's gravity formula as follows: gravitational mass=inertiaI mass+inertial mass * V/C.*

Keywords: Gravity, Gravitational Mass, Inertial Mass, Universal Motion Law

1. Introduction

Inertial mass and gravitational mass are two different physical concepts.

Any object has the property of attracting other objects, and gravitational mass is a measure of this property of an object. Gravity, along with electromagnetic force, weak interaction, and strong interaction, is one of the four fundamental forces in the universe. Newton's law of gravity was proposed in 1687, which states that every particle in the universe attracts other particles with a force [1]. This force is directly proportional to the product of the masses of each particle and inversely proportional to the square of the distance between them. Its mathematical expression is

F = GmM/r^2

where F gravity, G gravity constant, m, M mass, r distance.

Newton's second law states that the magnitude of an object's acceleration is proportional to the resultant external force and inversely proportional to the object's mass. The mathematical expression is F=ma, where F is the external force, m is the mass of the object, and a is the acceleration. The mass m in the formula is called inertial mass, which is a measure of the inertia of an object [2].

All matter in the universe is in motion, including the motion of microscopic particles and solid particles within macroscopic objects, as well as the uniform and variable speed motion of macroscopic objects in gravitational fields. Everything in the universe has gravity. Inertial mass only corresponds to microscopic particles and solid particles within a macroscopic object and their motion, while gravitational mass corresponds to microscopic particles and solid particles within an object and their motion, as well as the uniform and variable speed motion of macroscopic objects in a gravitational field. Therefore, gravitational mass is the total mass of an object, and inertial mass is only a part of it.

Further in-depth research has led to the derivation that ultra microscopic plasmids and their motion endow microscopic and solid particles with mass, microscopic and solid particles and their motion within macroscopic objects endow macroscopic objects with inertial mass, and microscopic and solid particles and their motion within macroscopic objects, together with the relative motion of objects in gravitational fields, endow objects with gravitational mass.

This article argues that gravity is an impedance of matter to its stable state changes, manifested as attraction to other objects, and gravitational mass is a measure of the magnitude of this property of matter. This viewpoint harmonizes and unifies inertial mass and gravitational mass, both of which are measures of the impedance degree of material state changes.

As can be seen from the above, gravitational mass and inertial mass originate from different physical laws, and their physical significance and equivalence have always been of concern to people, with various hypotheses and explanations proposed. Based on the hypothesis of the Energy-Momentum Conservation [3] and the modification of Newton's gravity formula [4], a new perspective has been proposed on the relationship between the two, and the conclusion has been drawn that inertial mass and gravitational mass are not equivalent.

The relationship between gravitational mass and inertial mass is derived from the hypothesis of The Energy-Momentum Conservation and the modified Newton's universal gravitation formula as follows:

Gravitational mass=Inertial mass+Inertial mass * V/C
where V is the speed of motion of the object, and C is the speed of light.

2. Discussion

For over a hundred years, humans have been trying to figure out whether inertial mass and gravitational mass are equal. Einstein discovered that motion increases the mass of an object. Further research in this article found that the macroscopic motion of an object in a gravitational field only increases its gravitational mass, but not its inertial mass. This conclusion has been confirmed by physical experimental results, that is, the inertial mass of an object with a stationary mass in motion exhibits a constant characteristic [5,6].

This article argues that the micro particles and solid particles inside macroscopic objects, as well as their motion, are endowed with both inertial mass and gravitational mass, while the motion of objects in a gravitational field is only endowed with gravitational mass. This conclusion can be confirmed through relevant experiments, and detailed information can be found in Annex 1, Annex 2, and Annex 3.

If the motion of an object in a gravitational field is only confirmed by the gravitational mass of matter, the possibility of the existence of gravitons will be ruled out. The mechanism by which motion endows matter with gravity requires further research.

3. Conclusion

For the macroscopic motion of an object in a gravitational field, the inertial mass is absolute and invariant; The gravitational mass is relative and changes with the macroscopic motion of the object.

The relationship between gravitational mass and inertial mass is as follows: Gravitational mass=Inertial mass+Inertial mass * V/C.

Microscopic plasmids and their motion endow microscopic particles and solid particles with mass, microscopic particles and solid particles and their motion within macroscopic objects endow objects with inertial mass, and microscopic particles and solid particles and their motion within macroscopic objects, together with the relative motion of objects in gravitational fields, endow objects with gravitational mass.

The scientific discovery that gravitational mass is not equal to inertial mass will have a positive impact on human understanding of gravity and the nature of the universe.

4. Annexes:

4.1. Experimental Proposal for Inertial Mass Measurement

Accelerate the proton to nearly 99.999% of the speed of light, let it enter a reverse deceleration electromagnetic field, and apply a reverse deceleration electromagnetic force to it. There is a functional relationship between initial inertial mass, electromagnetic force, and velocity. The initial electromagnetic force and the initial velocity data of protons are known, and the velocity of protons can be measured after being subjected to electromagnetic fields. The initial inertial mass of protons can be calculated based on their deceleration data.

The theory of relativity holds that the inertial mass and gravitational mass are the same, and its dynamic mass is calculated to be 223.61 times that of the stationary mass. However, according to hypothesis of The Energy-Momentum Conservation, the dynamic mass is calculated to be only 1.99999 times that of the stationary mass.

4.2. Proposal for Simplified Qualitative Experiment

Apply a reverse deceleration electromagnetic impulse to the proton, the magnitude of which is equal to the proton momentum value calculated based on 1.0 and 2.0 times the rest mass.

The theory of relativity calculates that its dynamic mass is 223.61 times the static mass of a proton, and the speed of the proton is minimally affected after passing through a deceleration electromagnetic field; According to the new hypothesis of Energy-Momentum Conservation, the dynamic mass is only 1.99999 times the static mass. Even if the proton momentum value is calculated based on the new dynamic mass, the proton will stop moving.

Obviously, it is more reasonable and logical for the dynamic mass to not exceed twice the static mass.

Charged particles cannot be accelerated to the speed of light in

electromagnetic fields, and the faster their speed, the greater the energy required to continue increasing their speed. The reason is that there is a delay effect in the electromagnetic force, rather than the mass of charged particles becoming larger and larger.

4.3. Experimental Proposal for Measuring Gravitational Mass

Select two iron balls A and B, identical in volume and size, and place them side by side on a platform 19.6 meters above the ground in a vacuum setting. Iron ball A falls freely from rest, landing at position D1 after time T1; Meanwhile, iron ball B falls freely at an initial horizontal velocity of 10 meters per second, landing at position D2 after time T2. Newton's theory and relativity both predict that iron balls A and B will land simultaneously, meaning the positions of DI and D2 will coincide, and the horizontal distance D1D2 will be 20 meters. According to the revised gravitational formula, the inertial mass of an object moving horizontally on the Earth's surface remains constant, but the gravitational mass increases. Iron ball B is predicted to land before iron ball A, with a time difference of T2<T1, approximately 3.3*10^(-8) seconds and the horizontal distance will be less than predicted by Newton's theory and relativity, specifically D1D2<20 meters. This experimental result will demonstrate an effect akin to planetary precession.

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