The Essential Relationship between Mass and Energy

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Abstract: *This paper introduces the essences of mass, time, length and energy, as well as their standard measure units; analyzes mass-velocity relationships in different theories, and comments on them; negates the mass-velocity equation and the mass-energy equation in special relativity; analyzes the source and generating way of atom energy. The author deems that mass is mass, energy is energy; mass cannot transform into energy and energy cannot transform into mass. The two can't convert into each other. There are mass conservation and energy conservation.*

Key words: *special relativity; mass; energy; velocity of light; mass-velocity equation; mass-energy equation*

In Newtonian mechanics, the mass, time, length and energy are independent respectively; but in the special relativity, these four quantities all have something to do with speed, and mass and energy can convert into each other, which makes the physics academia in a great mess. Therefore, people should do everything from the angle of philosophy, discuss the original relationship between mass and energy and clean the false influence of the special relativity.

1. Mass, time, length and energy

The definition of mass: mass is one of the material's essence attributes. Mass refers to the amount of matter that an object contains. There is nothing in the world whose mass is zero. As long as it is matter, its mass is greater than zero. The standard unit of mass is kilogram. In the international unit system, "kilogram" is set by the mass of platinum- iridium etalon in BIPM which locates near Paris. Someone thinks that the mass standard of "kilogram" in different countries grows at a 0.5 gamma rate annually and this kind of change has already exceeded "kilograms" accuracy of international comparison. People are looking for a better way [1].

T*he definition of time*: time is one of the matter's existence forms. Time is the persistence and sequentially of matter's moving procession, is the objective existence which dose not depended on people's consciousness and it is eternal. Time is unidirectional, equably passing and having no start, nor end point. The standard unit of time is second. The 13th International Calculating Conference(1967) made the definition for TA second: the time unit second is the lasting time of 9,192,631,770 periods which are radiated by the transition caused by Cs -133 atomic basic state's two hyperfine energy levels". Before 1960, time unit second referred to UT0 second: Added all year's true solar days together and then divided by 365, people can get the true solar day, which is usually called "mean solar day" , and unbiasedly partitioned it into 86,400 parts, and one part is one second; Afterwards people discovered that there are slim differences between earth's revolution and rotation speed, which would cause the difference in second; The research discovered that Cs -133 transition speed was much steadier, so they adopted this new definition. The purpose is to minimize the variation of the second length[2-3]. According to the materialism philosophy view, the transition between the atomic basic state's two hyperfine energy levels must be affected by temperature, pressure and other field factors. As the deepening of research, the definition of second will be more precision and more scientific.

The definition of length: Space is one of the matter existence forms. The space is infinite and boundless. Space is three dimensional and isotropic. The coordinate of three dimensional space can be expressed by length. The length is the extensive property in some direction. Its standard unit is meter .The 17th national calculating conference held in 1983 decide that the length unit meter adopts the definition of the velocity of light in the vacuum: "Meter is the distance light travels in the vacuum in 1/299,792,458 second interval ". The velocity of light c becomes a conventional value in this definition, and as an exact value, the uncertainty is zero. Metter was worked out by French academy of sciences during the French Revolution. At that time a meter referred to the distance that is 1/10,000,000 from the equator and by way of Paris and then North Pole of the Earth meridian; then it evolved as the distance between the two scales on the meter standard in BIPM near Paris; Afterwards, people discovered that distance would have small variety with the environment; so they adopted the more stable length, which is the above-mentioned definition. Some researchers point out that vacuum is not empty, there are fields in the vacuum, and the velocity of light in the vacuum changes along with some factors. Some people can even hold photon stopped. For this, the definition

concerning with the length should be more rigorous and scientific.

The definition of energy: Energy is used to show object's working ability, is its state attribute. Energy has various existence forms, such as the kinetic energy, potential energy, heat energy, chemical energy, electromagnetic energy and atomic energy etc. In nature, energy always keeps spreading from an object to another, or transforms from one form to another. In the transforming process, an object lost energy, the other one must have acquired the energy then. Potential energy reduces and kinetic energy increases; chemical energy reduces and heat energy increases; atomic energy reduces then kinetic energy and potential energy increase; one loses energy then the other must have acquired the energy, and the total energy is constant. These are also the conservation and transformation of energy theorem. The unit of energy is joule, is a derived unit. One joule equals to the work that one Newton force makes the object to move along its direction in one meter's distance.

2. The relationship between mass and speed

2.1 Newton's theories

Newton's theories hold that mass is the build-in attribute of an object, and it doesn't change with object's velocity.

2.2 Special relativity [4]

Einstein supposed that mass is the function of object's speed:

$$m = \frac{m_0 c}{\sqrt{c^2 - v^2}} \qquad (1)$$

In the equation, m_0 is object's static mass; m is the moving mass, v is the motion velocity.

This is the result of special relativity, and its premise is absurd.

2.3 The open system of entering momentum

Supposes there is a still object whose mass is m_0, if the outside input object whose momentum density is Q along some direction, the momentum added value of the system is

$$\mathrm{d}P = Q\,\mathrm{d}m \qquad (2)$$

P is the momentum of the system.

Using $P = mv$ and $m\big|_{v=0} = m_0$, there is

$$m = m_0 \frac{Q}{Q - v} \qquad (3)$$

The input momentum of that system equals to the total momentum.

Equation (3) can explain the phenomenon that the mass-increasing of the charged particles and the velocities of particles are always smaller than the velocity of light when electromagnetic filed speeds up the charged particles. For the motion velocity of the electromagnetic wave's in relation to the working device is velocity of light, $Q = c$, so, $m = m_0 \frac{c}{c - v}$. The reason why mass increases is that particles absorb the photons pushing it forward. No matter how long the time is, because the pushing speed is the velocity of light, the velocity of the being pushed object is always smaller than the velocity of light.

2.4 The open system of entering kinetic energy

Reference 5 introduces a kind of open system having mass and entering kinetic energy. Suppose there is a still object whose mass is m_0, if the outside input object whose kinetic energy density is K along some direction, then the energy added value of that system is

$$\mathrm{d}E_\mathrm{k} = K\,\mathrm{d}m \qquad (4)$$

In the equation, E_k is the kinetic energy of the system and m is the mass of the system.

So, according to the Newtonian mechanics

$$\begin{aligned} \mathrm{d}E_\mathrm{k} &= F\,\mathrm{d}x = Fv\,\mathrm{d}t = v(F\,\mathrm{d}t) \\ &= v\,\mathrm{d}(mv) = v^2\,\mathrm{d}m + vm\,\mathrm{d}v \end{aligned} \qquad (5)$$

Unite (4), there is

$$\frac{dm}{m} = \frac{vdv}{K - v^2} \qquad (6)$$

Integrate (6) and put $m\big|_{v=0} = m_0$ into it, then

$$m = m_0 \sqrt{\frac{K}{K - v^2}} \qquad (7)$$

The form is similar to (1).

It can be verified that the inputting kinetic energy value $K(m - m_0)$ is bigger than the system's total kinetic energy $\frac{1}{2}mv^2$. The premise for the deduction is conservation of kinetic energy, but the result is of non-conservation and contradicts itself. The reason is that the perfectly inelastic collision has the same velocity and it dose not conform to the conservation of kinetic energy.

Newton's theories show the essence that mass has nothing to do with the velocity; theory of inputting-momentum of open system can explain the phenomenon that the mass-increasing of the charged particle and the velocity of particle is always smaller than the velocity of light. Einstein's theories and the inputting kinetic energy of open system have the similar form, but they both disobey the objective fact.

3. The object's translation kinetic energy

The moving object has kinetic energy. Energy is a scalar quantity. For the same object, observations from different coordinate systems, the kinetic energy may be different.

In some coordinate system, a static object whose mass is m_0, affected by the outside force, it starts

moving. When the motion velocity is v, the translation kinetic energy of the object is E_{k}.

3.1 Newton's theories

Newton's theories hold that when the object speeds up by the outside force, its mass is constant, and its translation kinetic energy equals to the work that force makes on the object:

$$E_{\mathrm{kn}} = \Delta E = \int_0^x F \,\mathrm{d}\, x = \int_0^x m_0 \frac{\mathrm{d}\, v}{\mathrm{d}\, t}\mathrm{d}\, x = \int_0^x m_0 \frac{\mathrm{d}\, x}{\mathrm{d}\, t}\mathrm{d}\, v = \int_0^v m_0 v \,\mathrm{d}\, v = \frac{1}{2} m_0 v^2 \qquad (8)$$

In the above equation, E_{kn} is the translation kinetic energy of Newton theories; E is the total energy, F is the force that make on the object and x refers to the distance that force produces.

3.2 Einstein's theories [4]

Einstein supposed that the mass of object is its motion velocity's function:

$$m = \frac{m_0 c}{\sqrt{c^2 - v^2}} \qquad (9)$$

And then

$$E_{\mathrm{kA}} = \Delta E = \int_0^x F \,\mathrm{d}\, x = \int_0^x \frac{\mathrm{d}(mv)}{\mathrm{d}\, t}\mathrm{d}\, x = \int_0^v v \,\mathrm{d}(mv) = \int_0^v v \,\mathrm{d}(\frac{m_0 cv}{\sqrt{c^2 - v^2}}) = \frac{m_0 cc^2}{\sqrt{c^2 - v^2}} - m_0 c^2 = mc^2 - m_0 c^2 \qquad (10)$$

Suppose $E_{\mathrm{v}} = mc^2$ is the energy when an object is moving and $E_0 = m_0 c^2$ is the rest energy. Expand the equation (10) further:

$$E_{\mathrm{kA}} = \frac{1}{2} m_0 v^2 + \frac{3}{8} m_0 \frac{v^4}{c^2} + \ldots \qquad (11)$$

Because of it, Einstein's theories think that Newton's theories translation kinetic energy E_{kn} is a similar value when Einstein's theories translation kinetic energy E_{kA} is at its low speed（$v \langle\langle c$）.

3.3 Comment

(1)Newton's theory is right, and there is no falsehood up to now.

(2)There are some problems in Einstein's theory: ① $m = \frac{m_0 c}{\sqrt{c^2 - v^2}}$ which comes from the special relativity disobeys law of indestructibility of matter, and the deducing premise is absurd. ② If equation (9) is right, it also can't go into the equation (10); the reason is that in the deducing process of equation (9), Einstein had supposed that object makes the uniform motion in a straight line, there is no outside force; while calculating the kinetic energy, matter is affected by the outside force and make the accelerated motion; conditions are inconsistent, so shouldn't mix them up. ③The first part of equation (11) being in accordance with (8) is by sheer chance or vamped up.

4. The source and release principle of atomic energy

The discovery and application of atomic energy are one of the science and technological great progress. Some people think it all as Einstein and the special relativity's achievement. In fact, the discovery of atomic energy has nothing to do with the special relativity. Einstein uses false special relativity, and scores a lucky hit on pushing the application of atomic energy.

4.1 F. Hasenohrl's theories

Before 1905 when special relativity published, Thomson and Kaufman etc. made a great contribution to the research on experiment and theory of the relationship between mass and energy. The famous Austrian physicist F. Hasenohrl confirmed that mass-increasing was proportional to radiate energy and deduced the well-known $\Delta E \propto \Delta m c^2$ by experiments.

4.2 Einstein's theories

(1)Special relativity [4]

While explaining atomic energy, Einstein thought that $E_0 = m_0 c^2$ was object rest energy. Energy can convert into mass after disappearing; mass can convert into energy after disappearing; Energy and mass can convert into each other. Suppose, nuclear reaction occurs, the mass loss is Δm_0, the converted energy is ΔE_0, then $\Delta E_0 = \Delta m_0 c^2$.

There are two great problems: one is that the assumption and the deducing process are wrong; the other is it disobeys law of conservation of matter and law of conservation of energy.

(2)Radiation pressure theory [6]

January 1956, Einstein published "Primary exploration on mass and energy" in Technion Journal in New York. The text supposes there is an object B, whose two sides are subjected to the radiation pressure whose momentum is $E/2c$, then according to the law of conservation of momentum, radiate pressure formula and aberration expression, it deduces $E = mc^2$. The quotations are as follows:

"Ⅰ.Before absorption, suppose that M is the mass of B (object), then Mv means the total momentum of B (according to classic mechanics). The radiation energy on each side is $E/2$, therefore, from a famous conclusion of Maxwell theories, it has the momentum $E/2c$.…… So before absorption, the total momentum of this system is $Mv + \frac{E}{c^2}v$.

Ⅱ. After absorbing, suppose that M' is the mass of B (object). The supposed possibility is that: mass

increases along with the absorption of energy E (it is necessary for making the observed result consistent). Momentum after system absorption as a result is $M'v$. Now suppose law of conservation of momentum is right, and uses it on the direction of Z (Z coordinate axis), then there is the equation:

$$Mv + \frac{E}{c^2}v = M'v \quad or \quad M' - M = \frac{E}{c^2}$$

This is the law of mass and energy. The energy increasing amount E connects with the mass increasing amount E/c^2. ……then, $E = mc^2$.”

The false of the theory lies in that when object B's two sides are subjected to the same radiation pressure, the opposite vertex pressure cancel each other, and the total momentum before absorption is Mv, not $Mv + \frac{E}{c^2}v$.

From this, people can get that, the two explanations of Einstein's relationship between mass and energy are invalid and absurd.

4.3 Newton's theories

The atomic energy comes from the energy in the atom.

The release of the atomic energy is that photon along with its mass and energy transfers together; the mass of the object that releases energy reduces, so does the energy; the energy of the object that receives energy increases, so does the mass. The process object lets out its atomic energy just as to use gun blasting-off bullet, and the bullet taking along mass and energy transfer together. The relationship between energy and mass transferred is $\Delta E = \frac{1}{2}\Delta mc^2$.

5. Verification of the relationship between mass and energy

5.1 Newtonian mechanics

The relationship between mass and energy of Newtonian mechanics has already got a widespread application, and has not been found out faults up until now.

5.2 Einstein's theories

There are obvious mistakes in the mass-energy relation of Einstein's special relativity and radiation pressure theory in the course of deducing. They disobey law of conservation of mass and law of conservation of energy. Although many people declare that experiment has already proved the special relativity and mass-energy transforming formula, if observe carefully, it is easy to find that these experiments are all invalid or forged [7-8].

6. Conclusions

Mass is mass, energy is energy. The two can't convert into each other. There are mass conservation and energy conservation.

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