

## Further Explanation of the Formula, $E=m.c^2$

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In the paper “Three physical factors: space, time and light velocity” I said that Einstein’s formula:  $E_{re}=m_o.\gamma.c^2$  is not exact because it lacks the shrinkable coefficient:  $\gamma$  of physical factors of space (km) and time (s) in the moving frame.

$$\text{In Einstein's opinion: } E_{re}=m_o.\gamma.c^2=m_o.c^2.\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}=m_o.c^2.\left(1-\frac{v^2}{c^2}\right)^{-\frac{1}{2}}$$

$$\text{In my opinion: } E_r=m_o.\gamma.c_o^2.\gamma^2=m_o.c_o^2.\gamma^3=m_o.c_o^2.\frac{1}{\left(\sqrt{1-\frac{v^2}{c^2}}\right)^3}=m_o.c_o^2.\left(1-\frac{v^2}{c^2}\right)^{-\frac{3}{2}}$$

(of which  $m_o$ =the mass and  $c=c_o$ : the light velocity of a frame when it is motionless;  $v$ : the velocity of a frame when it is motion and  $\gamma$ : the shrinkable coefficient of Lorentz).

$$\text{From } (a+x)^n = a^n + n.a^{n-1}.x + \frac{n(n-1)}{2!}.a^{n-2}.x^2 + \dots$$

$$\text{After calculating: } \left(1-\frac{v^2}{c^2}\right)^{-\frac{1}{2}} = 1 + \frac{v^2}{2.c^2} + \frac{3.v^4}{8.c^4} + \dots$$

$$\left(1-\frac{v^2}{c^2}\right)^{-\frac{3}{2}} = 1 + \frac{3.v^2}{2.c^2} + \frac{15.v^4}{8.c^4} + \dots$$

$$E_{re}=m_o \cdot c^2 \left( 1 + \frac{v^2}{2 \cdot c^2} + \frac{3 \cdot v^4}{8 \cdot c^4} + \dots \right) = m_o \cdot c^2 + \frac{m_o \cdot v^2}{2} + \frac{3 \cdot m_o \cdot v^4}{8 \cdot c^2} + \dots$$

$$E_r=m_o \cdot c_o^2 \cdot \left( 1 + \frac{3 \cdot v^2}{2 \cdot c^2} + \frac{15 \cdot v^4}{8 \cdot c^4} + \dots \right) = m_o \cdot c_o^2 + \frac{3 \cdot m_o \cdot v^2}{2} + \frac{15 \cdot m_o \cdot v^4}{8 \cdot c^2} + \dots$$

The energy of a frame when it is motionless ( $v=0$ ) is  $E_o=m_o \cdot c_o^2$  and  $E_{oe}=m_o \cdot c^2$ . This calculation and Einstein's are same.

In the case where the velocity of the frame is small, from  $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$  we realize that

the coefficient of Lorentz,  $\gamma$  has little effect in changing the physical factors of the frame. It can be ignored. So then, the energy of the moving frame is equal to the energy of a motionless frame ( $v=0$ ). In this case, Einstein's opinion and my opinion are also same.

$$E_{re}= m_o \cdot c^2 + \frac{m_o \cdot v^2}{2} \quad \text{and} \quad E_r=m_o \cdot c_o^2 + \frac{m_o \cdot v^2}{2}$$

We can't say that when the velocity of the moving frame is small and from formula:

$$E_{re}=m_o c^2 + \frac{m_o \cdot v^2}{2} + \frac{3 \cdot m_o \cdot v^4}{8 \cdot c^2} + \dots, \text{ the physical factors, } \frac{3 \cdot m_o \cdot v^4}{8 \cdot c^2} \text{ can be ignored and only}$$

keep  $\frac{m_o \cdot v^2}{2}$  so that Einstein's formula is  $E_{re}=m_o \cdot c^2 + \frac{m_o \cdot v^2}{2}$ . This is because in that

formula, the shrinkable coefficient:  $\gamma$  has already been calculated and the physical

factors,  $\frac{v^2}{c^2}$  can't be ignored. So  $\frac{m_o \cdot v^2}{2} + \frac{3 \cdot m_o \cdot v^4}{8 \cdot c^2} + \dots > \frac{m_o \cdot v^2}{2}$  although the

physical factors calculated as  $\frac{3 \cdot m_o \cdot v^4}{8 \cdot c^2}$  are very small.

In the case the velocity of the moving frame is very large, the shrinkable coefficient:  $\gamma$  can change space and time and every physical factor in that frame. So  $E_r=m_o \cdot \gamma \cdot c^2 \cdot \gamma^2 = m_o \cdot \gamma^3 \cdot c^2$ , rather than  $E_{re}=m_o \cdot \gamma \cdot c^2$ . This is because Einstein's formula:  $E_{re}$  only shows a change of mass ( $m_r$ ) but does not change the space (km) and time (s) in the moving frame.

By the way, I want warning that many countries use nuclear power, i.e. there are many nuclear reactors. In a nuclear reactor, the nuclear particles are accelerated to

high velocity, (high temperature) enough to change its mass. This means that the formula for the energy of a frame moving with extreme velocity ( $E_{re}$  or  $E_r$ ) must be calculated and it is very dangerous to use Einstein's mistaken formula for calculation.

Our concept regarding variable light velocity can be left for future consideration, but the safety of nuclear reactors can't be ignored. I think that the discovery regarding Einstein's mistaken formula should be considered as soon as possible.

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