The Incompatibility of the Planck Acceleration and Modern Physics? and the Solution in Mathematical Atomism

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Planck Acceleration

The Planck acceleration is known to be

$$a_p = \frac{c}{t_p} = \frac{c^2}{l_p} \approx 5.5609210^{51} \tag{1}$$

where l_p is the Planck length and t_p is the Planck second, see [1]. In 1984, Scarpetta had already predicted this as the maximum acceleration possible, [2]. As pointed out by [3], for example, this enormous acceleration means one will reach the speed of light after one Planck second, $a_p t_p = c$. Modern physicists do not really know exactly what the Planck length or the Planck mass, or the Planck second represent. They also do not know precisely how to incorporate it into the framework of modern physics. However, many physicists assume that the Planck second must be the shortest time interval possible. This lead to an interesting paradox. Nothing with rest-mass can undergo Planck acceleration, even for one Planck second. This because no object with rest- mass can travel at the speed of light, since this would require an infinite amount of energy, as first pointed out by Einstein, see [4]. So does this mean the Planck acceleration is meaningless, or merely fiction?

This is where mathematical atomism comes in. Here two indivisible particles, when they are colliding, are the very foundation of mass. When two indivisible particles collide, they become the Planck-mass, see [5, 6]. This mass only lasts for one Planck second before the two colliding particles leave each other and turn into pure energy (light) once again. The indivisible particles have no rest-mass when they are not colliding; then they are massless. However, they have what we can call potential mass – this mass show up as rest-mass in the Planck second of collision, a moment when they are at absolute rest.

The smallest building blocks of the universe have a rest-mass equal to half of the Planck mass. Whenever we are working with rest-mass, we are always working with two indivisible particles. Thus the smallest rest-mass is the Planck mass, which lasts for one Planck second, and as applied to standard particles in modern physics it is more correct to claim that the rest-mass of an indivisible particle is 5.86685×10^{-52} kg (when colliding).

The atomism model is fully consistent with Planck acceleration and holds that we can go from a velocity of zero to the speed of light in one Planck second, as hypothetically measured with Einstein-Poincaré synchronized clocks. In contrast, no particle in the modern particle physics model can ever undergo Planck acceleration, even for one Planck second. So one has three choices: 1) introduce a shorter time interval than the Planck second, 2) claim that the Planck acceleration is not relevant for anything with rest-mass (so it is a purely fictitious acceleration), or 3) come up with yet another mathematical trick (fudge) to save the model. Naturally, one could claim that the Planck mass spontaneously radiates into energy within a Planck second. This is basically correct, but modern physics has no model for what would trigger this event. In fact, we (modern physics) do not even have a clear explanation for what energy actually is, as stated by Richard Feynman:

> *It is important to realize that in physics today, we have no knowledge what energy is.*

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Relativistic Planck Acceleration

Assume a rocket (or particle) is accelerating with acceleration a, as measured from the rocket (the proper acceleration). The well-known relativistic acceleration is given by (see for example [7] and [8])

$$\alpha = \frac{a}{\left(1-\frac{v^2}{c^2}\right)^{\frac{3}{2}}} \tag{2}$$

Assume now that the acceleration as observed from the rest frame is the Planck acceleration, $a = a_p$. If one assumes that $v > 0$, then this will lead to a relativistic acceleration greater than then Planck acceleration. According to atomism, the Planck acceleration can just start to happen from a Planck mass (remember the Planck mass only lasts for one Planck second in this model), and the maximum velocity of any fundamental particle is (as described by Haug in a series of working papers as well as published papers [9, 10])

$$v_{max} = \sqrt{1-\frac{l_p^2}{\bar{\lambda}^2}} \tag{3}$$

for a Planck mass we have $\bar{\lambda} = l_p$, which leads to

$$v_{max} = \sqrt{1-\frac{l_p^2}{l_p^2}} = 0 \tag{4}$$

In other words, the Planck mass is at rest, as observed from any reference frame. The Planck length, the Planck mass, and the Planck time are invariant as observed from any reference frame, in strong contrast to special relativity theory. This also means that the relativistic Planck acceleration is equal to the Planck acceleration

$$\alpha = \frac{a_p}{\left(1-\frac{v_{max}^2}{c^2}\right)^{\frac{3}{2}}} = a_p \tag{5}$$

Actually, all Planck units are invariant across all reference frames. That is to say, Lorentz symmetry is broken at the very moment we reach Planck energy (the Planck scale). This is consistent with what is predicted by several quantum gravity theories, see for example [11]. In other words, we need a modification of Einstein's special relativity theory. All of Einstein's formulas are valid when using Einstein-Poincare synchronized clocks, but atomism leads to the incorporation of key mathematical concepts introduced by Max Planck that are intuitive and very easy to understand.

References

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