Einstein's Special Theory of Relativity from the Law of Conservation of Spin

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Abstract: Here we showed that we can derive the Special-Theory-of-Relativity (SR) energy-momentum relation and the formula for relativistic mass on the basis of the law of conservation of spin on assumption that the SR length contraction is invalid. The SR length contraction follows from the Lorentz Transformation so the Lorentz Transformation violates the law of conservation of spin - the SR needs a reformulation.

Motivation

We assume that the gravitating Einstein spacetime (ES) is grainy - it consists of the ES components moving with the speed of light in "vacuum" c. The ES components can be entangled so there can appear different structures composed of the ES components. In the Quantum Mechanics (QM) very important are loops created in ES. Consider a spinning loop in the rest in ES created from the ES components. Spin of such a loop, S_{Loop}, is defined as follows

$$S_{Loop} = m_o c R = const. = C_1, \quad (1)$$

where m_o is the rest mass of the loop and R is its radius.

Assume that such spinning loop accelerates. To protect its stability, the loop must adopt the orientation for which the spin is parallel or antiparallel to the motion velocity, v, which appears in the Lorentz Transformation. The loop consists of the ES components, which are moving with the resultant velocity equal to c, so there is valid following formula

$$c^2 = v^2 + v_{Spin}^2, \quad (2)$$

where v_{Spin} is the spin speed of the loop. Assume that mean radius of accelerated loop is invariant i.e. $R = const.$. Then, spin of the moving loop is defined by following formula and must be invariant

$$S_{Loop} = m_{Rel} v_{Spin} R = const. = C_1, \quad (3)$$

where m_{Rel} is the relativistic mass of the loop.

From formulae (1), (2) and (3), we obtain the well known SR formula for relativistic mass

$$m_{Rel} = m_o / (1 - v^2 / c^2)^{1/2}. \quad (4)$$

Since resultant energy is defined by $E = m_{Rel} c^2$ whereas momentum by $p = m_{Rel} v$ so we can transform formula (4) into the well known SR energy-momentum relation

$$E^2 = p^2 c^2 + m_o^2 c^4. \quad (5)$$

Summary

Why ES must be grainy and gravitating? Just only then the accelerating loop can increase its relativistic mass by absorbing more and more new ES components to conserve the spin of the loop. It leads to conclusion that the thickness of the accelerating loop must increase, not decrease as it is in SR! For $v = c$, the thickness should be infinite.

We know that in SR, the length contraction follows from the Lorentz Transformation. Here we showed that we can derive the SR formulae on the basis of the law of conservation of spin on the assumption that the SR length contraction is invalid. Since SR starts from the Lorentz Transformation so we proved logical inconsistency of the Lorentz Transformation. It is showed as well in S. Crothers paper [1]. SR needs a reformulation. Notice that there are not direct experimental confirmations of length contraction.

In reality, the Scale-Symmetric Theory (SST) [2], [3], shows stat Nature is even more complicated because there are in existence stable tori/charges with internal helicity which distinguishes fermions from antifermions. When we accelerate the torus/charge of a nucleon then its thickness increases but the two characteristic mean radii of the torus, due to the very strong short-distance quantum entanglement between the ES components, are invariant – it leads to conclusion that the finite volume of the torus/charge of nucleon sets the upper limit for the relativistic mass of it. In SST, the half-integral spin of the tori/charges are the invariants as well.

On the basis of the SST and the partially incoherent SR, we can see that mathematical part of a theory should not be isolated from physical properties of Nature.

References

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[3] Sylwester Kornowski (29 June 2016). “Foundations of the Scale-Symmetric Physics (Main Article No 2: Cosmology)”
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