Extra Relativistic Effects ?

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It has just been announced that the OPERA (Oscillation Project with Emulsion Tracking Apparatus) experiment, 1400 meters underground in the Gran Sasso National Laboratory in Italy has detected neutrinos travelling faster than the speed of light, which has been a well acknowledged speed barrier in physics. This limit is $299792, 458$ meters per second, whereas the experiment has detected a speed of $299, 798, 454$ meters per second. In this experiment neutrinos from the CERN Laboratory 730 kilometers away in Geneva were observed. They arrived 60 nano seconds faster than expected, that is faster than the time allowed by the speed of light. The experiment has been measured to 6σ level of confidence, which makes it a certainty [1].Subsequently the experiment has been repeated with smaller bunches of neurtrinos with the same result. However it is such an astounding discovery that the OPERA scientists would like further confirmation from other parts of the world. In 2007 the MINOS experiment near Chicago did find hints of this superluminal effect. Nevertheless scientists wait with bated breath to confirm this earth shattering discovery.

It must be reported that the author had predicted such deviations from Einstein's Theory of Relativity, starting from 2000. This work replaces the usual Einstein energy momentum formula with the modified expression (the so called Snyder-Sidharth Hamiltonian),

$$E^2 = p^2c^2 + m^2c^4 + \alpha l^2 p^4$$

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where l is a minimum length like the Planck length and α is positive for fermions or spin half particles like neutrinos [2, 3, 4, 5, 6]. The above formula is based on considerations of a non differentiable spacetime at ultra high energies. It shows that the energy at very high energies for fermions is greater than that given by the relativity theory so that effectively the speed of the particle is slightly greater than that of light. For example, if in the usual formula, we replace c by $c + c'$, then, comparing with the above we would get:

$$c' = \alpha l^2 p^4 \cdot [4m^2c^3 + 2p^2c]^{-1}$$

The difference is slight, but as can be seen is maximum for the lightest fermions, viz., neutrinos which are in any case already travelling with the velocity c. We could also argue that the extra term in the Snyder-Sidharth Hamiltonian can contribute partly to an oscillating mass of the neutrino oscillations and partly to a fluctuating super luminal velocity.

References

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