Faster than light?

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Abstract

The hypothesis formulated by Smarandache on the possibility that no barriers exist in the Universe for an object to travel at any speed is here shortly analyzed.

In 1980, contrarily to what previously postulated by Einstein, Smarandache, according to the EPR paradox, formulated the hypothesis that no barriers exist in the Universe for an object (or particle or information or energy) to travel at any speed.

Recently, EPR-type experiments (entanglement and tunneling) have been carried out which prove that quantum mechanics is "non-local" and that the speed of light can be overcome. In fact, these experiments have highlighted that "space-time" separated systems, which previously had mutually interacted, are anyhow connected and such a connection is instantaneous, discriminating and not attenuated.

Instantaneousness is not new in Physics. It suffices mentioning the Newtonian Physics where the instantaneousness of the force of gravity is hypothesized. However, gravity decreases with the square of distance and such an interaction acts on all of the masses in the Universe, contrarily to what "non-local" mechanics seems to do.

If it is possible to travel at speeds greater than that of light, is it possible to exchange information faster than the speed of light? The answer is no. It has been demonstrated that even if it was possible to transmit information into the space at speeds greater than that of light the receiver is not capable to correctly reconstruct the sent information. Therefore, the Einstein principle of causality is not violated; consequently, it is not possible to detect an effect earlier than its cause.

To exchange information at speeds greater than that of light, the Schroedinger's equation must be admitted slightly non-linear. So far, all of the dedicated experiments have proved exactly the contrary. However, the Physics of Chaos has highlighted that nature, which until a few years ago was thought to

be linear, prefers instead showing itself through highly non-linear phenomena and that the linear ones constitute a rare exception. So, why shall we believe that, on an atomic scale where quantum mechanics applies, nature should follow linear relationships ?

Moreover, is it actually true that relativity prevents from any possibility that objects exist which travel at a speed greater than that of light ? Actually, relativity states that it is not possible to accelerate an object up to a speed greater than that of light since this would need to rely on all of the energy of the Universe; in fact, as the speed of the object increases its mass gets greater and greater. On the other hand, relativity does not prevent the possibility that objects exist with a speed greater than that of light, such as in specific reactions where tardions ($v<c$) can originate tachions ($v>c$). In such a case, a particle does not need to be accelerated to a speed greater than that of light since it already exists with a speed greater than "c". The only problem with tachions is that these hypothetical particles should posses an imaginary mass that is too strong of an assumption from a physical point of view. Several unsuccessful experiments have been carried out so far with the aim to find tachions (i.e., through the attempt to detect Cerenkov's radiation that should be emitted by the ones that travel at a speed greater than that of light)

This might mean that:

1) tachions do not exist
2) tachions interact only rather weakly with matter (capture rate less than that of neutrinos) and therefore it is complicated to detect them.
3) Necessary energies to generate tachions are too high for the performances of present accelerators.

In summary, the emerging "non-local" quantum mechanics seems to con-validate the Smarandache Hypothesis, without violating Einstein's "causality" principle. The relativity theory will need to be completely re-written if proofs are brought that Schroedinger's equation is weakly "non-linear"; in which case, information could be transmitted faster than light.

Unfortunately, it is not possible to resolve this dispute for the moment; all of the hypothesis remain still valid.

References:

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