A Simple Spin Experiment

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Abstract

'Could we not reject the concept of matter and build a pure field physics? We could regard matter as the regions in space where the field is extremely strong. A thrown stone is, from this point of view, a changing field in which the states of the greatest field intensity travel through space with the velocity of the stone.' [1] *Albert Einstein*

The real experiment proposal

A source emits a right-handed photon, the photon impinges almost perpendicularly a mirror being reflected to a detector set up to measure the spin of particle.

The simplicity of the result of experiment (only two possible outcomes: spin is the opposite or the same), and the fact that the experiment produces result that is direct evidence of the laws of physics makes it a very attractive and easy task even for students. The result seems to be so obvious that no one has ever tried to do that!

The real experiment

A source emits a right-handed photon, the photon impinges almost perpendicularly a mirror being reflected to a detector set up to measure the spin of particle. The photon shall be a low-energy photon to avoid a photoelectric effect, Compton scattering or pair production.

According to Standard Model the reflected photon's **spin is the opposite** to that of the photon emitted at the source.

According to our thought experiment carried out below the 'reflected' photon's **spin is the same** as that of the photon emitted.

That is the reason that our thought experiment should be very easy to falsify.

And what if the result confirmed our thought experiment prediction? Than the time would come to work out a new metric describing the new principle. We could propose **the strongest equivalence principle** (or say even the new correspondence principle) claiming that any interaction is entirely geometrical by nature (that is the metric alone determines the effect of any interaction) and the behavior of systems do not depend on a distance scale.

Finally we should be able to decide if physics is anything more than the pure geometry.

The thought experiment

Einstein has asked: could we not reject the concept of matter and build a pure field physics? Following him let us assume that what impresses our senses as matter is really a great concentration of energy into comparatively small space. Let us regard matter as a region in space where the field is extremely strong. How strong?

Let us start out with our simple thought experiment: we observe a small region in spacetime (the size of an elementary particle radius) deformed to the grade that the actually detected wave is not emitted nor reflected by the observed object but it comes back to us along the geodesic (the notion of a "straight line" in general relativity). In fact we observe only a strongly deformed spacetime region, "empty" inside and redirecting our wave but apparently… we perceive a particle. We perceive means that our measuring instruments and our language out of the force of habit say so. The fact that deformations of spacetime exist is generally recognized as a part of general relativity theory. In contrast to GR the metric under consideration is different.

Before we proceed (in future, depending on the outcome of our real experiment) to construct the proper metric we need to take some assumptions regarding the spacetime properties to decide what could possibly emerge out of our reasoning:

a) the spacetime is continuous, i.e. not perforated, not torn and has a homeomorphism property

b) the spacetime has elastic properties (possible to assess),

c) the elastic properties of spacetime are isotropic

d) any spacetime deformation is unlimited (i.e. to some extent it deforms the entire spacetime due to its elastic and homeomorphism properties).

The spacetime here is not the infamous ether which was rightly rejected because it was to be a frame of reference and a background for all events. The spacetime is not the background, but the material of matter and energy itself and then it is quite natural that energy and matter can be transmitted as waves.

The Conclusion

Looking for the metric first we need to get experimentally verified assumptions. The assumptions we have and the proposal of simple experiment also. We are waiting for a team willing to carry out the experiment to prove that the physics is or is not only a pure mathematics.

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[1] Einstein A., Infeld L. The Evolution of Physics (Redwood Burn Ltd., 1938), p. 242-3