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*

We propose a real experiment to falsify a geometrization of matter concept [2],[3].

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. However the result seems to be so obvious that no one has ever tried to do that!

The thought experiment

Einstein has asked: could we not reject the concept of matter and build a pure field physics? Paraphrasing him let us assume that what impresses our senses as matter is really a strong deformation of spacetime.

Let us start out with our simple thought experiment: we emit a wave to observe that small region in spacetime (the size of an elementary particle radius). That region is deformed to the grade that the wave actually detected (observed) comes back to us along a geodesic ("straight line" in differential geometry). In fact *we observe* only a strongly **deformed spacetime region** 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 deformation of spacetime exist is generally recognized as a part of general relativity theory (e.g. gravitational lensing). In contrast to GR's distance scale the metric under consideration refers to the quantum scale [3].

Before we proceed (in future, depending on the outcome of our real experiment) to calculate the proper scale invariant 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 calculate)

c) the elastic properties of spacetime are isotropic

d) any spacetime deformation is unlimited (to some extent, it deforms the entire spacetime in Gaussian distribution mode, due to its elastic and homeomorphism properties). *Quantum nonlocality becomes GR type locality by the emergence out of Gaussian distribution*

e) the spacetime is a dissipative coupled system that exhibits self-organized criticality. *That assumption is necessary to use the general law of survival of the stable for the evolution of spacetime deformations)[3]*

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 (fabric) of matter and energy itself and then it is quite natural that energy and matter can be transmitted as waves/wavepackets.

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

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

According to Standard Model the photon does not go “around” along a geodesic but it is simply reflected and as a cause of that reflection the spin is changed.

We try to prove that the photon is not a point particle (like in Standard Model) that is reflected from another point particle (one of the many creating our mirror) but instead it travels around a “particle” being a part of the mirror and comes back along a geodesic. The way it goes is a geodesic because the mirror’s “particle” is the spacetime deformation only. If our photon goes along the geodesic (straight line) it does not change its spin.

So it is a realization of the thought experiment.

The Conclusion

What if the result of the real experiment confirmed our thought experiment prediction? Than the time would come to work out the one, scale invariant metric. We could propose a **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 fundamental behavior of systems does not depend on a distance scale.

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

The outcome of the real experiment contradictory to Standard Model of QM would let us forget the wave-particle duality, wave function collapse and so on….

However looking for this scale invariant metric, firstly 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 geometry.

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

[2] Safuta J., Spacetime Deformations Evolution Concept, vixra.org/abs/1102.0026

[3] Safuta J., Spacetime Deformations Theory, vixra.org/abs/1006.0005