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Do Magnetic Monopoles Exist?

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Abstract

In this paper, we continue our previous work by discussing the consequences of curvature in spacetime caused by the presence of mass and the implications of this. We address the question raised by Dirac regarding the impact of a magnetic monopole on the quantum world. We discuss quantization concerning the solid angles observed, which may have a connection with a magnetic monopole.

Keywords

General relativity; quantum thermodynamics; berry phase; magnetic monooles

1. Introduction

We continue Dirac's line of thinking [1] in that a magnetic monopole would cause some kind of quantization in the wave function. As referred to by Dirac, the concept of a magnetic monopole should be more general and would be connected with the principle of choosing a beginning for the axes. In our opinion, it concerns the observer's solid angles, which describe how the observer witnesses the events in spacetime.

Our findings are connected with the Berry phase. According to general relativity, if an observer in a reference frame completes a turn in a closed loop, the reference frame is not the same. This result would be the case for half-integer spin, as is the case for fermions, the carriers of matter. We should also bear in mind that the lift of degeneracy, according to general relativity, happens when an observer accelerates. The findings resolve many paradoxes. Circular movement is an accelerating one. Most probably, the spin describes such a situation and is responsible for gaining orientation in the movement. The centrifugal potential is found from the radial Schrodinger equation and is proportional to the angular momentum squared, but the spin may also enter. Spin is involved in the possible existence of magnetic monopoles if they are said to exist.

In a chronological arrangement, the appearance of a point particle is connected through the solid angle of the observer, who adheres to a reference system with a causal interpretation of other events. The symmetry of physical laws for choosing a zero for time has preserved energy. Choosing a beginning for the axes and for time lifts some degeneracy and is the consequence of a difference in energy as interpreted by lifting the system to a higher energy situation and through the uncertainty principle for energy and time. It is important to remember that in relativity, the time component of momentum is energy. Thus, the system experiences a lifting of degeneracy whenever energy is added, resulting in actual acceleration. This explanation refers to a Rinler horizon for an accelerating observer. For example, the electron in the atom appears to be genuinely accelerating and thus emitting a photon only when a quantum of energy is absorbed or emitted. This is so because time may be considered to be frozen meanwhile in the absence of events occurring.

2. Main Part

We have discovered that because of the curvature of spacetime caused by mass, the photon, once received by the atom, becomes a longitudinal wave of polarization through which the volume vibrates [2]. Magnetic monopoles are associated with the existence of longitudinal photons.

The formula for the curvature (K) of spacetime is derived from the relativistic radius of the electron and is found to be directly inversely proportional to it. Expressed in connection to the fine structure constant, it is as follows:

$$K = \frac{\alpha}{\lambda_c} \tag{1}$$

In equation (1), lambda is the Compton wavelength.

Also associated with the curvature of spacetime is the volume, which is the cover of the particle. Think of it as a spacelike hypersurface in four dimensions, connected with the dielectric susceptibility that alters the speed of light by the following formula:

$$\chi = \frac{N}{V} \tag{2}$$

From the previous work of the author, we reproduce the master equation:

$$\frac{\hbar^2}{2mN}\Delta|\psi|^2 = \frac{VdP}{dV} = \frac{|\psi|^2 V}{N^2}mc^2 = mc^2\frac{d\Omega}{dV} = \frac{dL}{dV} \tag{3}$$

The magnetic monopoles, as is well known, count for the existence of these solid angles.

$$\vec{\alpha} = \frac{\hbar}{m}\nabla|\psi|^2 = \frac{d\vec{F}}{dV} = \frac{\hbar}{mK_B}|\psi|^2\nabla S \tag{4}$$

As a result, we have the following formula:

$$\frac{\hbar}{2Nmc^2}\nabla\cdot\vec{\alpha} = \frac{d\Omega}{dV} \tag{5}$$

The other part of the momentum contains yet another vector. The magnetic current is found to be:

$$\vec{K} = \frac{d\vec{r}}{dt} = \frac{\hbar}{m}\nabla\phi + \frac{e}{mc}\vec{A} \tag{6}$$

The definition of magnetic current agrees with the phenomena of the Berry phase [3].

That way, we are entitled to rewrite the current density as:

$$\vec{J} = \frac{|\psi|^2}{N}\vec{K} \tag{7}$$

We assign the small beta to the magnetic field experienced by the electron, which causes a quantized magnetic flux:

$$\nabla\times\vec{K} = \vec{B} + \vec{\beta} \tag{8}$$

That way, we believe the photon is absorbed by the atom in quanta because the angle phi is not single-valued.

The observer witnesses' slices of spacetime through solid angles. He witnesses all possible causal structures of the past and future. This is so because the spacetime metric describes spacelike events in that case. This is mentioned in literature as a causal diamond [3]. The formula is the following:

$$|\psi|^2 = \chi\frac{d\Omega}{dV} \tag{9}$$

This solid angle is otherwise described in the theory of relativity as a causal cone by other authors [4]. We agree with the results in that the solid angle should be proportional to the spacetime tau multiplied by the spacetime curvature K:

$$\Omega = K\tau \tag{10}$$

Using equation (10) in our work of reference [2], we have found the quantum of action. This is pointed out to exist by other authors as well [5] and may be connected to the Berry phase as well.

The authors discuss the possibility of magnetic monopole-antimonopole pairs forming vortices in the above-cited reference. Our findings for vorticity come to the following formula:

$$\vec{\Omega} = \vec{\alpha} \times \vec{\beta} = \frac{d\vec{r}}{dt} \times \frac{d\vec{F}}{dV} \tag{11}$$

Taking in mind Equation (10), we should put forward the Gauss formula for the sum s of the angles of a geodesic triangle in the surface of a space with curvature K:

$$s = 180 + \frac{180}{\pi} \int K \, dS \tag{12}$$

Equation (12) brings us the information that the solid angle should somehow define the hypersurface spacelike volume. The preservation of solid angles in relativity for the observer is first discussed by Teller [6].

Other authors have also studied the connection of angles in spacetime with the spin of the particle [7].

3. Conclusions

In our previous work, we described a full quantum thermodynamical system emerging from requirements of the general relativity applied in the quantum world. We have discussed some basic facts of quantum mechanics, such as the quantum of action. In this paper, we have given physical insight into the equations and attacked another problem of quantum mechanics: the quantization of magnetic flux in terms of the possible existence of magnetic monopoles.

The problem with the appearance of a magnetic monopole is connected to either having a huge mass or appearing as pairs of monopole-antimonopole. We tend to confirm that they should appear as pairs of infinitesimal volume, thus explaining the appearance of point particles. According to new research [8], the density of mass or probability is the number of events in spacetime. Each time an event takes place, we appear as a point particle. This point particle or the supposedly appearing magnetic monopole should be considered a discontinuity in ordinary spacetime.

The existence of magnetic monopoles should not be taken literally; instead, it is a transformation of the electric charge or mass.

We would like to add that there is a rich literature on the problem of hidden variables in quantum mechanics [9, 10]. We hope we have contributed to this field of research.

Author Contributions

Spiros Koutandos did all the research work of this study.

Competing Interests

The author has declared that no competing interests exist.

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