DEVELOPMENT OF THE EVANS WAVE EQUATION IN THE WEAK-FIELD LIMIT: THE ELECTROGRAVITIC EQUATION

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The Evans wave equation [1-3] is developed in the weak-field limit to give the Poisson equation and an electrogravitic equation expressing the electric field strength $\mathbf{E}$ in terms of the acceleration $\mathbf{g}$ due to gravity and a fundamental scalar potential $\phi^{(0)}$ with the units of volts (joules per coulomb). The electrogravitic equation shows that an electric field strength can be obtained from the acceleration due to gravity, which in general relativity is non-Euclidean spacetime. Therefore an electric field strength can be obtained, in theory, from scalar curvature R. This inference is supported by recent experimental data from the patented motionless electromagnetic generator [5].

Key words: Evans wave equation, unified field theory, generally covariant electrodynamics, weak field limit, electrogravitic equation.

1. INTRODUCTION

Recently, field and wave equations [1-3] for grand unified field theory (GUFT) have been inferred on the basis that the electromagnetic sector must be generally covariant and that the electromagnetic potential is a tetrad. The tetrad is the one form that is the eigenfunction of the generally covariant Evans wave equation [2], which describes all four fields in GUFT. The gauge invariant electromagnetic field is the torsion form, a wedge product of two tetrads, and is defined by the first Maurer-Cartan structure relation [4]. The homogeneous and inhomogeneous

field equations of generally covariant electrodynamics are identities of differential geometry [3,4] that follow from the fact that the generally covariant potential is a tetrad one form. These inferences follow from the identification of the tangent space of general relativity with the fiber bundle space of gauge theory.

In this Letter, the Evans wave equation is developed in the weak-field limit (Sec. 2) to give the Poisson equations of Newtonian dynamics and of electrostatics. The two Poisson equations are then compared to derive a simple but fundamental electrogravitic equation which shows that electric field strength $\mathbf{E}$ between two charged particles originates in the acceleration due to gravity $\mathbf{g}$ generated by the masses of the two particles. The field strength $\mathbf{E}$ is proportional to the acceleration $\mathbf{g}$ through the fundamental scalar potential $\phi^{(0)}$ with the units of volts (joules per coulomb). Therefore, it may be inferred from the electrogravitic equation that the electric field strength $\mathbf{E}$ originates in non-Euclidean spacetime in the weak-field limit [1-4] and therefore from scalar curvature R. This theoretical result is supported qualitatively by reproducible and repeatable results from devices such as the motionless electromagnetic generator (MEG) [5]. Quantitative experimental tests of the electrogravitic equation will require measurements of the effect of changing mass on electric field strength, in the simplest case the electric field strength generated between two charged particles.

2. DERIVATION OF THE ELECTROGRAVITIC EQUATION

The derivation starts from the Evans wave equation for gravitation [2]

$$(\Box + kT)q_\mu^a = 0, \tag{1}$$

where q_μ^a is the tetrad one-form that describes the gravitational potential, k is Einstein's constant, T is the contracted energy momentum tensor [6] of Einstein, and $\Box$ is the d'Alembertian operator for flat, or Euclidean, spacetime. The Evans wave equation for electromagnetism is then

$$(\Box + kT)A_\mu^a = 0, \tag{2}$$

where the electromagnetic potential is the tetrad one-form

$$A_\mu^a = A^{(0)}q_\mu^a = \frac{\phi^{(0)}}{c}q_\mu^a. \tag{3}$$

Here $\phi^{(0)}$ is a fundamental scalar potential and c is the speed of light in vacuum. The gauge-invariant gravitational field is then the anti-commutator of tetrad one-forms, the Riemann form

$$R^{ab} = R\left\{q^a, q^b\right\}, \tag{4}$$

and the gauge-invariant electromagnetic field is the commutator of tetrads, the torsion form

$$G^c = G^{(0)}[q^a, q^b].\tag{5}$$

In the weak-field limit [2-4], Eq. (1) reduces to the Poisson equation for Newtonian gravitation:

$$\nabla^2\Phi = 4\pi G\rho,\tag{6}$$

where Φ is the gravitational potential in units of $(ms^{-1})^2$ and ρ is the mass density in units of kgm^{-3}. Here G is the Newton gravitational constant. In the same weak-field limit, Eq. (2) becomes the Poisson equation for electrostatics [3]:

$$\nabla^2(\phi^{(0)}\Phi) = 4\pi G(\phi^{(0)}\rho);\tag{7}$$

so, in order to unify the theory of electrostatics with that of Newtonian gravitation, replace Φ in the equations of gravitation by $\phi^{(0)}\Phi$ to generate the equations of electrostatics.

For example, the acceleration due to gravity is

$$\mathbf{g} = -\boldsymbol{\nabla}\Phi,\tag{8}$$

and thus the electric field strength is

$$\mathbf{E} = -\frac{1}{c^2}\nabla(\Phi^{(0)}\Phi)\tag{9}$$

in S. I. units. Comparison of Eqs. (8) and (9) gives the electrogravitic equation

$$\mathbf{E} = \frac{\phi^{(0)}}{c^2}\mathbf{g},\tag{10}$$

which shows that the electric field strength between two charged particles originates in the acceleration due to gravity between the two particles. The electric field strength and the acceleration due to gravity therefore become two parts of one field, the electrogravitic field.

3. DISCUSSION

The motionless electromagnetic generator [5] (MEG) may provide qualitative evidence for the fact that electric field strength in a circuit can be obtained from non-Euclidean spacetime, and the electrogravitic equation is a simple example of how this process occurs. The electric field in a circuit is generated from the product of the fundamental potential $\phi^{(0)}$

and the acceleration due to gravity, which in general relativity is non-Euclidean spacetime. The fundamental potential in volts is the scaling factor that links the electromagnetic potential to the scalar curvature [3]. The MEG has been precisely replicated [5] and thus is an example of how electric field strength and electromagnetic energy can be obtained from spacetime. However, the MEG is a complicated device; and, in order to test the electrogravitic equation quantitatively, experiments are needed on the simplest level, the interaction of two charged particles. For a given potential $\phi^{(0)}$, the equation shows that changing the mass of one particle, keeping the other mass and two charges constant, should result in a change in the electric field generated between the two particles. If the fundamental potential is known, this effect can be predicted quantitatively. Similarly changing the charge on one particle, keeping the other charge and both masses constant, should result in a small change in the acceleration due to gravity between the two particles. Again, if we know the fundamental potential precisely, this effect can be calculated quantitatively for comparison with experimental data.

Therefore these are proposed experimental tests of the hypothesis leading to the Evans equation [1-3]. A considerable amount of data in optics and other effects are available which prove beyond reasonable doubt the existence of the Evans-Vigier field $\mathbf{B}^{(3)}$ [7], the fundamental field of generally covariant electrodynamics.

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