Demonstrating Gravitational Repulsion

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In previous papers we showed that a classical model of gravitation explains present gravitational phenomena. This paper deals with gravitational repulsion and it shows how it manifests in black holes and particle pair production. We also suggest a laboratory experiment to demonstrate gravitational repulsion.

1 Introduction

In previous papers [1–5] we showed that a Lagrangian

$$L = -m_0(c^2 + v^2)\exp R/r, \tag{1}$$

where

m_0 = *gravitational rest mass* of a test body moving at velocity $\mathbf{v}$ in the vicinity of a massive, central body of mass M,
γ = $1/\sqrt{1 - v^2/c^2}$,
R = $2GM/c^2$ is the Schwarzschild radius of the central body.

gives rise to the following conservation equations:

$$\begin{aligned} E &= mc^2 e^{R/r} = \text{total energy} = \text{constant}\,, && (2)\\ \mathbf{L} &= e^{R/r}\mathbf{M}, && (3)\\ L &= \text{magnitude of } \mathbf{L} = \text{constant}, && (4)\\ L_z &= M_z e^{R/r} = e^{R/r} m_0 r^2 \sin^2\theta\dot{\phi}, && (5)\\ &= z \text{ component of } \mathbf{L} = \text{constant}, \end{aligned}$$

where

$$m = m_0/\gamma^2, \tag{6}$$

is a *variable gravitational mass* and

$$\mathbf{M} = (\mathbf{r} \times m_0\mathbf{v}), \tag{7}$$

is the total angular momentum of the test body. Eqs. (3) and (4) are amendments to the equations in the previous articles.

The above equations give rise to equations of motion that satisfy all tests for present gravitational phenomena.

2 Gravitational repulsion

Eq. (2) shows that gravitational repulsion occurs between bodies when their masses m are increased by converting radiation energy into mass. This conversion occurs according to the photoelectric effect,

$$h\nu \rightarrow mc^2. \tag{8}$$

This is the reverse of what occurs during nuclear fission.

In a previous paper [4, §3] we proposed that this accounts for the start of the Big Bang as well as the accelerating expansion of the universe. We now consider other effects.

2.1 Black holes

With black holes the reverse of repulsion occurs. According to (2) and (6) matter is converted into radiation energy ($v \rightarrow c$) as $r \rightarrow 0$. Conversely, as radiation is converted into mass, matter should be expelled from a black hole. This phenomenon has been observed [6].

In this regard our model of a black hole differs from that of general relativity (GR) in that our model does not approach a mathematical singularity as $r \rightarrow 0$, whereas GR does approach one as $r \rightarrow R$.

2.2 Pair production

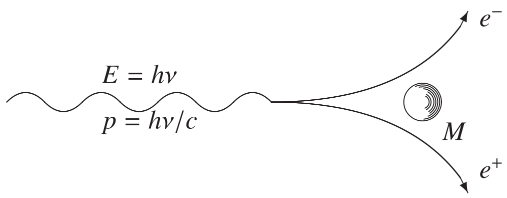

Fig. 1: A high-energy gamma ray passing near matter can create an electron-positron pair.

In pair production a gamma ray converts into a positron and an electron, with both particles moving away from one another. Pair production only occurs in the presence of a heavy mass. The explanation for the required presence of the mass is generally given in texts as:

> The process as we have assumed it to occur is impossible. This is because energy and momentum cannot simultaneously be conserved in free space in this process. . . .
>
> However, if the high-energy gamma ray passes near a very heavy particle, then the heavy particle can soak up all the momentum without carrying away a significant amount of energy [7, §5.6].

We aver that the explanation is contrived. The last sentence is too inexact for a rigorous mathematical formulation. Although we do not submit a formulation at this stage, we suggest that repulsion occurs between the particles and the heavy mass.

2.3 Laboratory demonstration

It should be possible to demonstrate gravitational repulsion in a laboratory. A suggestion on how to do this is provided by Jennison and Drinkwater [8]. Their experiment was not designed to demonstrate gravitational repulsion, but to demonstrate how the properties of mass, or inertia, are simulated by phase-locked standing waves in a microwave transmitter/receiver system mounted on a frictionless air track. It should be possible to modify their experiment to show that gravitational repulsion would occur if the frequencies of the standing waves were increased. As a prototype we propose a modification of their experimental setup as depicted in Fig. 2. Two microwave transmitters/receivers lock a standing wave of frequency ν near a large mass M. Increasing the frequency of the standing wave should push it away from M.

From (2) and (8) an increase of $\Delta\nu$ will cause a separation of the microwave system from M equal to

$$\Delta r = A/(B - \ln h\Delta\nu), \tag{9}$$

where A, B are constants.

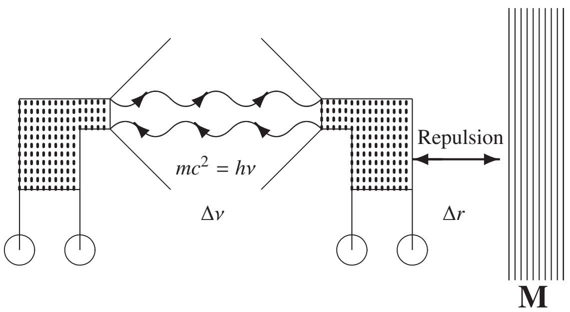

Fig. 2: Repulsion of a trapped wave. Repulsion $\Delta r = A/(B - \ln \Delta mc^2)$ where A, B = constant and $\Delta m = h\Delta\nu/c^2$.

The repulsive effect can also be measured by a sensitive gravimeter placed between M and the standing wave system.

Setting up the above experiment could be cumbersome on a macro scale. The author is investigating demonstrating the repulsive effect at nano scales.

3 Conclusion

The success of the proposed theory to explain present gravitational phenomena supports the above proposal to demonstrate gravitational repulsion.

Submitted on April 28, 2010 / Accepted on May 17, 2010

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