Gravitational Shielding as Viewed in the Planck Vacuum Theory

William C. Daywitt

National Institute for Standards and Technology (retired), Boulder, Colorado. E-mail: wcdaywitt@me.com

This paper argues that gravitational shielding does not exist, because gravitational waves travel within the vacuum state rather than free space.

1 Introduction

The concept of gravitational shielding has been around for a long time and it would incorrectly assert, for example, that when the earth lines up between the moon and the sun, the moon-sun gravitational attraction is reduced. The fact that this shielding (by the earth in this case) does not occur is one of the great mysteries in the history of physics. The theory of the Planck vacuum (PV) state, however, offers an easy explanation for the absence of such shielding.

As a counter example to the gravitational force, consider the free space Coulomb force (e^2/r^2) between two charges e separated by the distance r. If a shield of any type whatsoever is placed between the charges, the resulting force is changed dramatically. Indeed, if a large enough grounded screen were inserted between the charges, the force would vanish entirely.

2 Newton Force

Now consider the gravitational force between two free space masses m in the center-of-mass (CoM) coordinate frame defined by $m\mathbf{r}_1 + m\mathbf{r}_2 = 0$ (with $-\mathbf{r}_1 = \mathbf{r}_2 = \mathbf{r}$):

$$F_{gr}(r) = -\frac{m^2 G}{(2r)^2} = -\frac{m^2 c^4}{4r^2(c^4/G)} = -\frac{(mc^2/2r)^2}{(c^4/G)} \tag{1}$$

$$= -\frac{(mc^2/2r)^2}{(m_* c^2/r_*)} = -n_{2r}^2 \frac{m_* c^2}{r_*} \tag{2}$$

where the n-ratio

$$n_{2r} = \frac{mc^2/2r}{m_* c^2/r_*} < 1 \tag{3}$$

is the normalized force either mass m exerts on the PV at the position of the opposite mass, where the masses are centered at $\pm\mathbf{r}$ from the origin of the CoM coordinates. The normalization force $m_* c^2/r_*$ is the maximum force the PV can sustain before breaking down. This force also normalizes the Einstein field equation [1, eqn.15].

The three ratios in (1) are the force equation expressed in terms of Newton's secondary constant G, an experimental constant that makes (1) agree with the experimental data. As such, however, G hides a significant amount of physics. The substitution $c^4/G = m_* c^2/r_*$ [1, eqn.5] replaces G by a combination of primary (fundamental) constants that lead to (2) and the following nonrelativistic explanation of the gravitational force.

The gravitational field $g(r)$ of either mass can be defined in the usual manner and yields

$$g(r) = \frac{F_{gr}(r)}{m} = -\frac{c^2 n_{2r}}{2r} \tag{4}$$

which is again centered at the radii $\pm r$ from the CoM origin, where r is the coordinate radius common to both free space and its underlying PV state.

From (2) and (4) it is easy to carry these calculations a step further. Newton's second law applied to either mass gives the acceleration

$$\ddot{r} = \frac{d\dot{r}}{dt} = \dot{r}\frac{d\dot{r}}{dr} = -\frac{c^2 n_{2r}}{2r} = -\frac{c^2 \cdot mc^2}{4 \cdot m_* c^2/r_*}\frac{1}{r^2} \tag{5}$$

or

$$\dot{r}d\dot{r} = -\frac{c^2 \cdot mc^2}{4 \cdot m_* c^2/r_*}\frac{dr}{r^2} \tag{6}$$

of the masses. Integrating both sides of (6) from r_0 to r leads to

$$\frac{\dot{r}^2 - \dot{r}_0^2}{2} = \frac{c^2 n_{2r0}}{2}\left(\frac{r_0}{r} - 1\right) \tag{7}$$

where $\dot{r}_0$ is the velocity of either mass at $r = r_0$, and $r \leq r_0$. Without changing the final conclusions, it is convenient to set $\dot{r}_0 = 0$ — i.e., to assume that the masses are released from rest at $\pm r_0$. Then (7) yields their relative velocities toward the origin

$$\frac{\dot{r}}{c} = -\left[n_{2r0}\left(\frac{r_0}{r} - 1\right)\right]^{1/2} \tag{8}$$

where

$$n_{2r0} = \frac{mc^2/2r_0}{m_* c^2/r_*} \tag{9}$$

and $[\cdots]$ in (8) is the normalized force either mass exerts on the PV at the position of the other mass.

3 Conclusions

Three important observations are evident from the previous calculations: equations (2), (4), and (8) are all expressed in terms of PV parameters, implying that the vacuum state mediates the dynamics of the gravitational force between free space masses. A corollary to this conclusion is that gravitational waves, the carrier of the gravitational force, do not propagate in free space — they propagate within the degenerate PV state. Thus free-space gravitational shielding does not change the gravitational force between free space masses.

Finally, the fact that the PV is a degenerate state implies that the Planck particles making up the PV quasi-continuum cannot execute macroscopic (as opposed to microscopic) motions. Thus the gravitational waves that propagate through the PV state must be percussion-like waves, similar to the waves traveling on the surface of a kettle drum.

Submitted on May 26, 2016 / Accepted on June 5, 2016

References

1. Daywitt W.C. The Trouble with the Equations of Modern Fundamental Physics. *American Journal of Modern Physics. Special Issue: Physics Without Higgs and Without Supersymmetry*, 2016, v. 5, no. 1-1, 22. See also www.planckvacuum.com.