Anisotropic Gravity that Gives an Anisotropic Big G inside the CODATA Error Range

Espen Gaarder Haug

March 2, 2019

Abstract

At least one observational study has claimed that Newton's gravitational constant seems to vary with the direction relative to the fixed stars, see [1]. We think this is unlikely, but such experiments should be repeated or at least investigated further. If it is the case that gravity is directionally dependent, then how could this be explained, and how could/should our gravity formulas be modified?

In this paper, we introduce an anisotropic big G that is dependent on the direction relative to the fixed stars, and therefore on a given location on Earth, dependent on the Earth's rotation. A series of experiments claim to have found the anisotropic one-way speed of light when getting around Einstein-Poincaré synchronization, although they have not received a great deal of attention. We do not question that the one-way speed of light is isotropic when measured with Einstein-Poincarè synchronized clocks. We hypothesize here that gravity moves with the speed of light and that the true one-way speed of gravity is anisotropic. Based on this, we get an anisotropic gravitational "constant," which, if calibrated to one-way light experiments, is inside two standard deviations of error as given by CODATA.

Key words: Newton gravity, Newton's gravitational constant, anisotropic one-way speed of light, anisotropic gravity.

1 Introduction

Gershteyn et al. [1] have experimentally shown that the gravity constant seems to vary with direction relative to the fixed stars. While the findings are debatable, the study should be repeated and investigated properly before any firm conclusions are drawn. Here we will look into a possible explanation for why the gravitational constant actually could vary with direction. We think this should be seen in relation to other experiments that claim to have detected an anisotropic directionally–dependent one-way speed of light. A series of experiments claim to have gotten around Einstein-Poincaré synchronization and to have measured the anisotropic one-way speed of light [2–7]. These experiments do not fit the established thinking in physics, but are worthy of further examination for several reasons.

According to mathematical atomism [8] and several "ether" theories, the true one-way speed of light is given by

$$c_\alpha = \frac{c^2}{c + v\cos(\alpha)} \tag{1}$$

where α is the angle of the light signal relative to direction the Earth moves relative to the void, as measured from the Earth and v is the velocity of the Earth against the void, as measured from the void frame. This one-way speed of light takes time dilation and length contraction into account, and a full derivation can be found in [8]. This is the same one-way speed of light one will get from certain ether theories, see [5, 9] and [10]. Experiments indicate that the velocity of the Earth against the void is about 300,000 km/s to 400,000 km/s, that is about 0.1% of the speed of light. This is actually the solar system's velocity against the void and it has been confirmed by experiments not directly related to the one-way speed of light, including studies of muon flux anisotropy, for example, see [11].

2 Anisotropic Gravity

Haug [12–14] has recently suggested that big G is a universal composite constant that can be written in the form

$$G = \frac{l_p^2 c^3}{\hbar}, \tag{2}$$

which is basically identical to a similar composite constant suggested by McCulloch [15]. This leads to an evaluation of the Schwarzschild radius at a deeper level by

$$r_s = \frac{GM}{c^2} = \frac{\frac{l_p^2 c^3}{\hbar} M}{c^2} = 2Nl_p. \tag{3}$$

In 1784, Michell calculated an identical radius to the Schwarzschild radius, based on Newton's theory of gravity, so it is not inconsistent to talk about the Schwarzschild radius (or we could call it the Michell radius) in relation to Newtonian-type gravity theories.

This formula 2 can naturally be found by simply rewriting the Planck length formula with respect to big G. However, Haug [12] has also derived this formula from dimensional analysis and shown that the Planck length can be found totally independent of any knowledge of G, see [16, 17] . In addition, Haug [18] has suggested that the Planck constant likely is a composite transformation constant[1] given by

$$\hbar = \frac{c^2}{8.52247 \times 10^{50}} \approx 1.05457 \times 10^{-34}, \tag{4}$$

where 8.52247×10^{50} is the number of (internal) counterstrikes between indivisible particle on one kg per second. This leads to an understanding that mass in kg actually is simply a fraction of the number of counterstrikes, which means we can rewrite the gravitational constant as

$$G = \frac{l_p^2 c^3}{\hbar} = \frac{l_p^2 c^3}{\frac{c^2}{8.5224710^{50}}} = l_p^2 c \times 8.5224710^{50}. \tag{5}$$

Newton's gravitational constant is a universal composite constant. If we now replace the speed of light c with the anisotropic one-way speed of light, we get

$$G_A = l_p^2 \frac{c^2}{c + v\cos(\alpha)} \times 8.5224710^{50}, \tag{6}$$

and

$$F = G_A \frac{m_1 m_2}{r^2} = \frac{l_p^2 c^2}{c + v\cos(\alpha)} \times 8.5224710^{50} \frac{\frac{\hbar}{\bar{\lambda}_1}\frac{1}{c}\frac{\hbar}{\bar{\lambda}_2}\frac{1}{c}}{r^2} = \frac{\frac{c}{1+\frac{v\cos(\alpha)}{c}} l_p^2 \frac{c}{\bar{\lambda}_1}\frac{c}{\bar{\lambda}_2} \times \frac{1}{8.5224710^{50}}}{r^2}. \tag{7}$$

Empirical research [7, 11] indicates that the velocity of the solar system is about 300,000 km/s to 400,000 km/s of the speed of light. If we use the maximum of this range, then we find a range for big G of

$$G_A = \frac{c^2}{c+v} lp^2 \times 8.5224710^{50} \approx 6.66494 \times 10^{-11},$$

to

$$G_A = \frac{c^2}{c-v} lp^2 \times 8.5224710^{50} \approx 6.68275 \times 10^{-11}.$$

This gives a range for G of about $\pm 0.267\%$, which is well inside two standard deviation as given by CODATA 0.3%. In other words, it is not impossible based on the CODATA variation error in big G that the gravity is anisotropic. To measure whether or not the gravity is anisotropic, one needs to measure big G accurately on different locations on Earth as well as thoroughout the year. The Earth's velocity against the void should vary within a range of up to 60 km/s as the Earth moves around the Sun. Disturbances from the Moon and other objects must be taken into account carefully. Also, if the polar axis is aligned in the same direction as the solar system is moving against the void, then there should be no 24-hour variation in the gravitational force due to rotation of the Earth. On the other hand, if the polar axis is perpendicular to the direction the solar system is moving against the Earth, then there should be a considerable 24-hour cyclical variation in the gravity for a given point on Earth.

3 Conclusion

Some studies claim to have measured both directional and 24-hour cycles in the value of big G. We are skeptical about these findings, but have looked at a possible explanation and believe the work merits further study. By understanding that big G and the Planck constant can probably be better understood as composite constants, we are able to rewrite the gravitational constant to take into account the anisotropic one-way speed of gravity. Based on experiments concerning the one-way speed of light and other studies indicating that the solar system is moving against the void at about 300,000 to 400,000 km/s, we get an anisotropic big G that could vary as much as -0.267% at different locations on the surface of the Earth (further taking into account the orientation of the surface points on Earth. More experiments should be done to confirm or disconfirm this hypothesis.

[1] That is, a constant to transform mass into a arbitrarily chosen weight of kg (or pounds).

References

[1] M. L. Gershteyn, L. I. Gershteyn, A. Gershteyn, and O. V. Karagioz. Experimental evidence that the gravitational constant varies with orientation. *Working paper*, https://arxiv.org/abs/physics/0202058, 2002.

[2] R. T. Cahill. A new light-speed anisotropy experiment: Absolute motion and gravitational waves detected. *Progress in Physics*, 4:73–91, 2006.

[3] R. T. Cahill. The Roland de Witte 1991 experiment (to the memory of Roland de Witte). *Progress in Physics*, 3:60–65, 2006.

[4] R. T. Cahill. One-way speed of light measurements without clock synchronization. *Progress in Physics*, 3:43–45, 2012.

[5] S. Marinov. The velocity of light is direction dependent. *Czechoslovak Journal of Physics*, pages 437–438, 1974.

[6] S. Marinov. Measurement of the laboratory's absolute velocity. *General Relativity and Gravitation*, 12(1):57–65, 1980.

[7] D. G. Torr and P. Kolen. An experiment to measure relative variations in the one-way speed of light. *Precision Measurements and Fundamental Constants II, ed. by Taylor B. N. and Phillips W. D. Nat. Bur. Stand. (U.S.) Spec. Pub.*, 376:675–679, 1984.

[8] E. G. Haug. *Unified Revolution: New Fundamental Physics*. Oslo, E.G.H. Publishing, 2014.

[9] S. Marinov. *The Thorny Way of Truth*. Self Published, 1984.

[10] J. Lévy. *From Galileo to Lorentz and Beyond*. Aperion, 2003.

[11] C. Monstein and J. Wesley. Solar system velocity from muon flux anisotropy. *Apeiron*, 3(2):33–37, 1996.

[12] E. G. Haug. The gravitational constant and the Planck units. A simplification of the quantum realm. *Physics Essays Vol 29, No 4*, 2016.

[13] E. G. Haug. Planck quantization of Newton and Einstein gravitation. *International Journal of Astronomy and Astrophysics*, 6(2), 2016.

[14] E. G. Haug. Planck quantization of Newton and Einstein gravitation for Planck masses and smaller size objects. *International Journal of Astronomy and Astrophysics*, 2018., 2018.

[15] M. E. McCulloch. Gravity from the uncertainty principle. *Astrophysics and Space Science*, 349(2), 2014.

[16] E. G. Haug. Can the Planck length be found independent of big G ? *Applied Physics Research*, 9(6), 2017.

[17] E. G. Haug. Finding the Planck length independent of Newton's gravitational constant and the Planck constant: The Compton clock model of matter. *https://www.preprints.org/manuscript/201809.0396/v1*, 2018.

[18] E. G. Haug. The mass gap, kg, the Planck constant, and the gravity gap. *http://vixra.org*, 2017.