The Effect of Light on Gravity: Gravitational Telecommunication by Dynamic Gravity

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This work is based on an extraordinary physical discovery, namely the phenomena of dynamic gravity. A few years ago a Hungarian researcher experimented with a large physical pendulum aimed at gravity research. From the beginning, it became clear that the physical pendulum is not suitable for the measurement of the known Newtonian gravity due to its relatively low sensitivity. In spite of the preliminary estimated low sensitivity, a complete dumbbell-shaped, vertical orientation physical pendulum has been built with a maximum reachable period of about 60-80 seconds. The first realization of the physical pendulum has arms about one meter and both the lower and upper masses were about 8 kg [1].

1. Introduction

The surprising result of the experiment [1] showed that the accelerating masses act toward each other by an, as yet, unknown force (later referred to as "dynamic gravity"). This force is significantly stronger than the traditional Newtonian gravity, and this effect can be clearly demonstrated by the large-period physical pendulum. The summarized result of our theoretical investigations related to this experiment is next:

The Newtonian gravity law is valid (by everyday experience) for closed gravitational systems, when the energy of the system is constant and the systems are in an equilibrium state. This equilibrium starts after a certain time and we can experience it, for example, especially in the Cavendish torsion balance experiment (having very slow movement of the torsion pendulum). The static (equilibrium) state of gravity develops slowly, emerging finally when the gravitational binding energy has been totally dissipated.

The dynamic gravity is a special behavior of Newtonian gravity, during which, the interactive masses, relatively quickly, change their relative positions due to the act of the outer accelerator forces. It means that the masses' interaction happens in an open system and, in addition, there is no time and other necessary conditions for the dissipation of the gravitational binding energy. In the case of gravity measurement of the Cavendish type, the torsion balance, associated with a relatively very slow damping process, leads to the total dissipation of the gravitational binding energy. In other words the torsion balance behaves as a strong low-frequency filter for the (static) gravitational interaction.

From these experimental and theoretical statements it is clear that for the study of dynamic gravity, we must utilize relatively faster instruments and the friction of the instrument must be relatively smaller compared to the torsion balance.

2. Dynamic Gravity Measurement with a Math Pendulum

In physics the math pendulum generally is not applied for the measurement of gravity except that of the local gravitational acceleration measurement. Knowing the newly explored dynamic gravity properties it became evident that the simple math pendulum must be a really good instrument for the study of dynamic gravity. At first glance, it seems that our claim is not supported by everyday experience. But, examine the pendulum movement in more detail. For example, chaotic motion, a few millimeters in amplitude, can be observed, obviously due to outside disturbances, in a pendulum suspended by about one meter of fiber yarn. In this situation, we are not sure whether this small pendulum motion is caused exclusively by the air draft, mechanical noise or, in addition, maybe the unknown dynamic gravitational effect.

The disturbing effect of air movement can be terminated if we put the pendulum into a closed box. The effect of external vibrations can be reduced significantly if there is a narrow resonance curve of the pendulum. This latter condition is not achieved by a single pendulum; a series of weakly coupled pendulums must be used. Finally, we have established a simple instrument for the detection of dynamic gravity which contains only two weakly coupled pendulums:

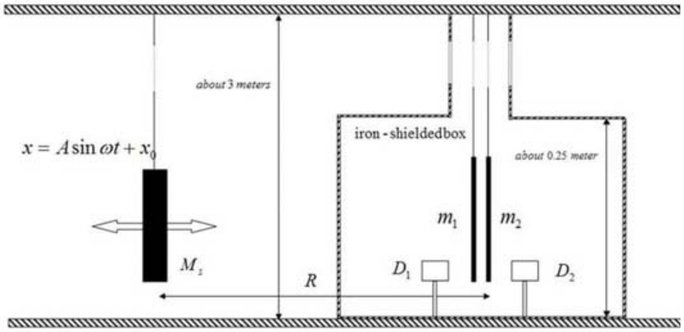

Fig. 2.1. The measurement of dynamic gravity by weakly coupled pendulums (principal scheme).

The dynamic gravity detector (receiver) is realized by two plain parallel ceramic tiles suspended to the ceiling with fishing lines about 3 meter longs ($T \approx 3.5\ s$). The tiles form coupled pendulums, with narrow resonance curves, avoiding any capture of environmental mechanical noise. The mass of the tiles is about 150-150 grams with dimensions 120 x 120 x 5 mm. The gap between the tiles is about 5 mm. The weak mechanical coupling between the tiles is realized by the air gap inside them. D_1 and

D_2 are optical displacement detectors without any mechanical contacts with the tiles. The signals of the detectors are processed by a personal computer working in real-time. The typical amplitude of the ceramic tiles is about 20 microns in the normal ground state.

The gravitational transmitter is a simple pendulum, with the same frequency as the coupled pendulum receiver. The transmitter mass M_s is about 0.25 kg made of lead. The distance between the transmitter and receiver is about $R = 5$ meters. After a little pushing of the transmitter mass, the receiver gives a disturbance signal to the computer. In the case of resonance, the amplitude of the tiles rises up to 100 – 150 microns. The appropriate shielding of the gravitational receiver is very important. The optimal condition, for the successful experiment, is a low vibration and gravity noise environment.

The measurement arrangement (Fig. 2.1.) demonstrates, experimentally, the remarkable possibility of gravitational communication with the help of the newly explored dynamic gravity.

3. Light Causes Dynamic Gravity

It is a big surprise, that the successfully tested new gravity detector is sensitive not only to the moving masses, but also to the variable intensity of light and heat as well. In addition, this dynamic gravity detector is sensitive to a small grinding machine when it is turned on and off, and, it is sensitive especially to GSM telephone calls. This simple instrument can detect a wind storm even from a distance of 50-100 km demonstrated by increased swinging amplitude. This phenomenon is obviously due to the dynamical gravitational effect of the movement of huge air masses.

Fig. 3.1. demonstrates a successfully realized dynamic gravity experiment with a flashing lamp (5 W power in $R = 5$ m distance) which serves as a source of dynamic gravity. The flashing frequency was set to produce the maximum amplitude of the coupled pendulums:

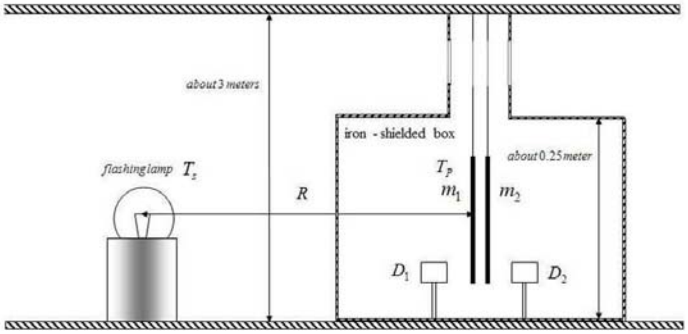

Fig. 3.1. Measuring dynamic gravity caused by flashing lamp (principal scheme).

In summary, the new gravity detector is sensitive to all energy density changes in its surrounding space, which are produced by all kinds of time-dependent energy sources, even those from long distances.

4. Conclusion

The background noise of the new gravity detector is highest by day rather than at night. The simple reason for this fact is the strong dynamic gravity effect of the changing *sunshine intensity* outside of the laboratory.

Unfortunately, in the present work we cannot publish the test results because we have had to stop the investigation because of a serious illness of the author of the present article. In addition, the measurement data acquisition system has broken, some of the measurement records have been lost, and we could not identify the remaining damaged records. That is why we cannot present here the important measured data and graphs.

Because of long-term financial problems, we cannot continue our experiments related to dynamic gravity, and a long theoretical analysis is the only feasible option for us.

It is foreseeable, that further serious research is needed for the deeper investigations of the newly discovered phenomenon of dynamic gravity. That is why we are urgently looking for sponsors and investors to continue, in any framework of cooperation, the promising research which has already begun.

5. Appendix A: The Effect of a Laser Beam on Gravity

Here follows a short summary of an experiment testing the effect of light on the gravitational attraction between two masses [2].

We measured the distance between the mass at one end of a torsion pendulum and a fixed one pound mass. The distance becomes smaller when a laminar light beam is passed between the two masses. We will describe our experiment.

We used a torsion pendulum supported by a 1 mm copper wire at the middle of the pendulum and two 500 g brass masses. The fixed mass was a one pound brass mass. Problems started early; the copper wire stretched and broke. After many trials, we opted for two wires separated by a 1 mm gap and soldered at each end to support the pendulum.

According to the Birmingham Gravitation Group at the University of Birmingham, “Instead of coming from a torsion constant of the wires, the torsion strip has a restoring torque of 96%.”

G. G. Luther of Physics Division, Los Alamos National Laboratory, also used a bifilar pendulum for his research on the gravitational constant.

Later, we had to use three wires separated by a 1 mm gap each because the two wires broke after a certain time. The three wires act as a strip suspension in their physical properties. We attached a small front surface mirror at the suspension point on the beam; a small point laser was used to measure the torsion of the pendulum by reflecting a small point on a *cm* scale on the wall.

The most accurate results were obtained when the suspension wires were 66 cm long attached to an 8 cm metal hook at the middle of the 83 cm mahogany beam. The screen was placed at a distance of 44.5 cm from the middle of the beam. Since the reflected beam doubles the distance travelled by the 500 g mass at one end, 1.0 cm on the screen is equivalent to a distance of 0.47 cm by the mass.

This apparatus was enclosed in a 1 meter square chamber to minimize air movement. The 1.5 watt red laser sends a 30 degrees laminar light beam between the fixed mass and the 500 g mass. It is air cooled and had to be placed behind a glass pane so the air flow would not influence the pendulum movement. A light source outside the glass pane illuminates the screen on the wall. A small paper screen is fixed in front of the suspension wires to stop the laminar laser light coming from the 1.5 watt laser. Thus the light beam affects only the 500 g mass near the fixed mass and not the 500 g mass used as a counter weight at the far end of the pendulum.

The first apparatus was in the basement, on a solid concrete floor but too close to the road. Passing cars could be recorded on the screen. That was corrected by moving the apparatus in the basement to the other side of the house. The concrete south and north wall were almost equidistant to the pendulum. The counter weight was close to the west wall. The light and the two lasers were activated by relays so the operator could be at 4 meters on the east side in line with the pendulum. At first, it was not realized that when someone approached the pendulum, the movement changed and the results had to be discarded. The pendulum was positioned on an east-west direction and the fixed mass was placed on the north side of the moving mass. Many trials had to be made before this configuration gave good experimental results. Over 1000 hours of recording were done at first by hand and at the end by recording the laser spot movements using a web camera.

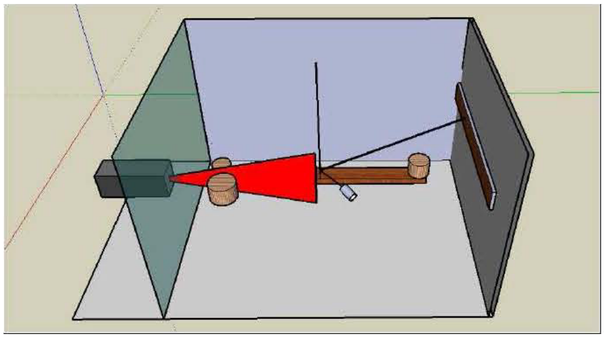

Fig. 5.1. 3D drawing of the apparatus for the study of the laser beam gravity.

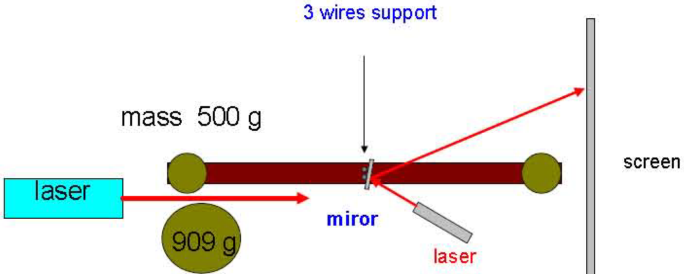

Fig. 5.2. Top view of the apparatus for the study of the laser beam gravity.

From correspondence with experimenter Louis Rancourt [3]:

"I was looking for a shielding effect of light but the results were always the opposite. The moving mass was getting closer when light passed between the two masses. At first, the observations lasted a few hours only. When it was time to make a statistical verification, it was evident that a few hours did not give enough measurements to validate the results. The pendulum period varies depending on how close the two masses are coming together. It varies around 7 minutes; in one hour, the observations are few. I was able to measure for a full day using the web camera. To measure the effect of attraction, we considered the average distance separating the masses. The force varies indirectly with the square of the distance…"

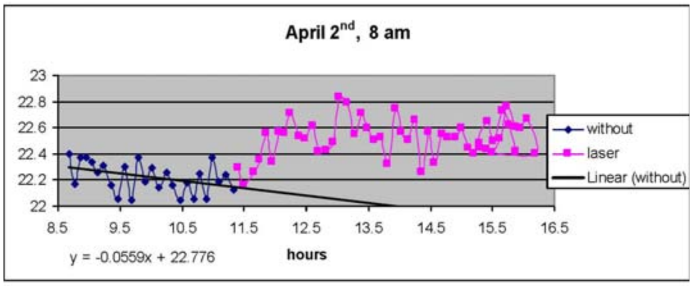

Fig. 5.3. The measured pendulum movement with and without laser beam (The record has obtained in 2/04/2011; the pendulum amplitudes are in cm.)

6. Appendix B: Bifilar Pendulum

This realization of the torsion pendulum is less well known (Fig. 6.1.):

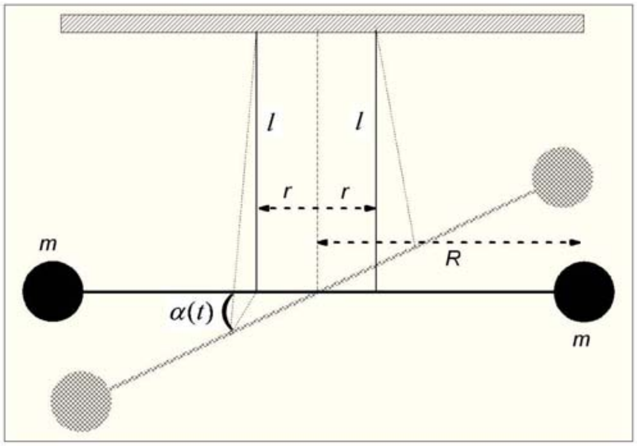

Fig. 6.1. The principal drawing of the bifilar pendulum

In case of rotation of $\alpha(t)$ angle the total mass of the pendulum lifts to z-height. By the drawing we get a right-angled triangle and the Pythagoras theorem gives:

$$l^2 = z^2 + (ar)^2 \ . \tag{6.1}$$

From this we get:

$$z(\alpha) \cong l\left(1-\frac{1}{2}\frac{r^2}{l^2}\alpha^2\right) \quad \Rightarrow \quad z(\alpha)-z(0) \cong \frac{1}{2}\frac{r^2}{l}\alpha^2 \ . \tag{6.2}$$

Therefore the potential energy of the torsion pendulum will be the next:

$$U(\alpha) \cong -2mg\left(-\frac{1}{2}\frac{r^2}{l}\alpha^2\right) = mg\frac{r^2}{l}\alpha^2 \ . \tag{6.3}$$

According to the theory of torsion harmonic oscillators we can determine the torsion coefficient κ:

$$U(\alpha) \cong \kappa\alpha^2 = mg\frac{r^2}{l}\alpha^2$$
$$\kappa = mg\frac{r^2}{l} = \text{torsion coefficient} \tag{6.4}$$

First, we can neglect the friction of our torsion pendulum, the typical equation of the torsion harmonic oscillator without damping is widely known:

$$I_R\ddot{\alpha}(t) + \kappa\alpha(t) = 0\ . \tag{6.5}$$

The solution of this differential equation is:

$$\alpha(t) = \alpha_0 \sin\omega_0 t + \varphi_0\ , \tag{6.6}$$

where

$$\omega_0{}^2 = \frac{\kappa}{I_R} = \frac{smgr^2/l}{2mR^2} = \frac{r^2}{R^2}\cdot\frac{g}{l}\ . \tag{6.7}$$

Compared to the ordinary math pendulum, the period of the bifilar torsion pendulum is principally easily adjustable by the ratio of R/r :

$$T_0 = \frac{2\pi}{\omega_0} = 2\pi\frac{r}{R}\sqrt{\frac{g}{l}}\ . \tag{6.8}$$

In practice, the torsion pendulum friction is not negligible. This means that the pendulum period is greater than the calculated value (6.8). In this case the motion equation will be:

$$I_R\ddot{\alpha}(t) + C\dot{\alpha}(t) + \kappa\alpha(t) = 0\ . \tag{6.9}$$

The general solution of the damped torsion pendulum equation is:

$$\alpha(t) = \alpha_0 e^{-\lambda t}\sin\omega t + \varphi_0\ , \quad \lambda = \frac{C}{2I_R}\ . \tag{6.10}$$

The damping factor can be calculated with the next relation:

$$\lambda^2 = \omega_0{}^2 - \omega^2 = \frac{r^2}{R^2}\cdot\frac{g}{l} - \omega^2\ , \tag{6.11}$$

where the ω is the measured frequency of the realized bifilar (torsion) pendulum.

Louis Rancourt and his colleagues finally used the “trifilar” pendulum in their gravitational experiment with a laser beam [3]. The equation of motion of the trifilar torsion pendulum can be derived similarly to the above shown math method.

References

[1] http://www.scribd.com/doc/15939620/Gravity-Experiment-with-Physical-Pendulum.

[2] Louis Rancourt, Antii Saari, “Effect of Light on Gravitational Attraction”, *Physics Essays* **24** (4): 557-561 (Dec 2011), http://physicsessays.org/doi/pdf/10.4006/1.3653936, e-mail Louis.Rancourt@collegeboreal.ca.

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