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Short Communication

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Vibrator Weight and Pulsations of the Earth's Gravitational Field

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Abstract
This paper shows how the average weight (mass) of a vertical oscillating mechanical vibrator changes. The results of weighing a vertically oscillating electromechanical vibrator in the frequency range of 20-60 Hz are presented. The frequency dependence of the average weight of the vibrator is explained by fluctuations in the intensity of the Earth's gravitational field and the non-relativistic effect of gravitational induction.

Keywords: Mechanical Vibrator, Fluctuations, Gravitational Induction.

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Introduction

Vertical oscillating of massive vibrators is of great importance in engineering and are informative in experimental gravity physics in studies of nonclassical properties of gravity. A type of vertically oscillating vibrator is the rotor of a mechanical gyroscope with a horizontally oriented axis of rotation. The particles of such a rotor move with variable accelerations, while the vertical component of the accelerations of their movement affects the average weight of the rotor. In, a noticeable decrease of up to 10 grams in the average weight of an outgoing brass rotor weighing 1 kg at a rotational frequency of about 30-40 Hz is described [1]. A possible reason for this "levitation" effect is relatively weak fluctuations in the strength of the gravitational field due to geophysical, astronomical or man-made factors. Natural fluctuations in the intensity of the Earth's gravitational field in the audio frequency range also affect the output signal of the LIGO interferometer (Figure.1) [2].

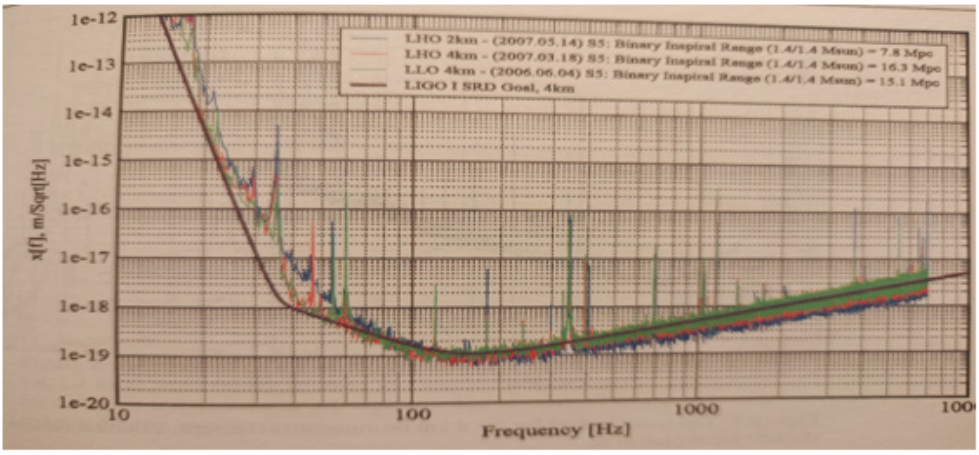

Figure 1: The output signal of the LIGO interferometer [2]. An intense maximum in the frequency band of 30-40 Hz is characteristic.

The phenomenon of gravitational induction consists in a change in the force of gravity acting on a mass moving rapidly under the influence of an external elastic force [3]. An elementary description of the weight change of a mechanical oscillator in an alternating gravitational field,

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taking into account the effect of gravitational induction, is given in [4]. It is noteworthy that very weak periodic changes in the strength of the gravitational field at individual frequencies, with a relative magnitude of about tenths to hundredths of a percent, can cause significant changes in the average weight of the oscillator.

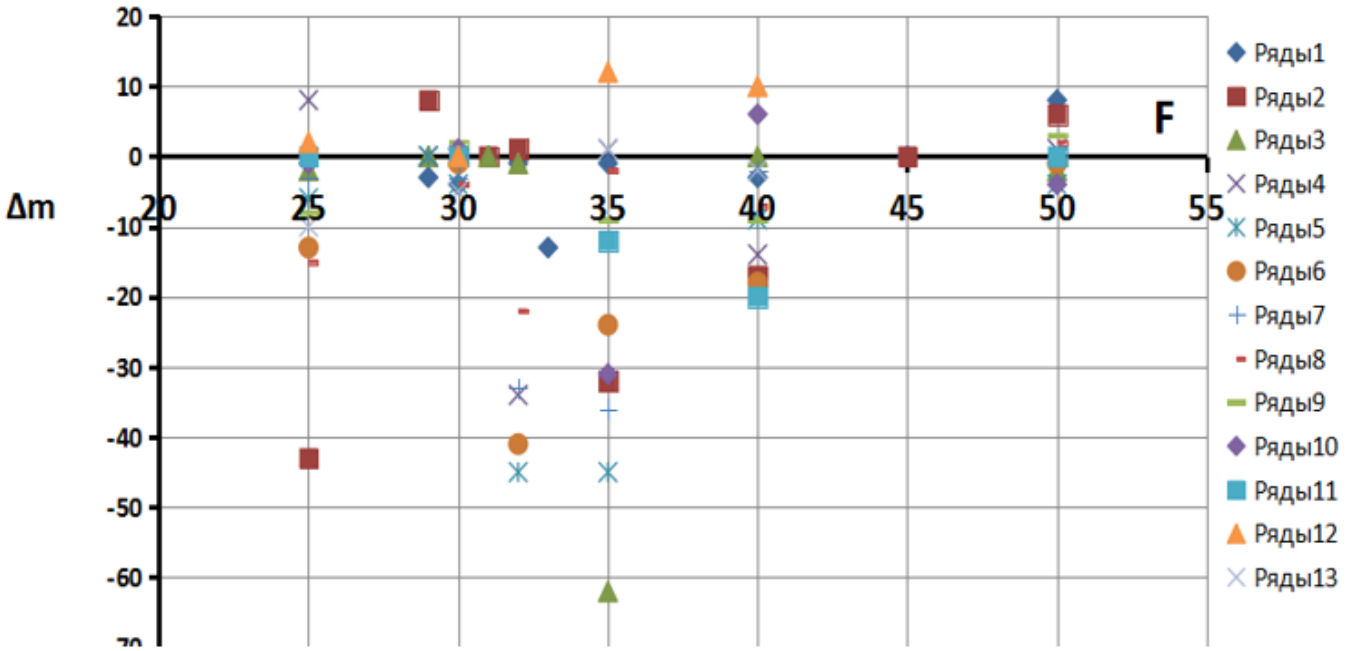

Figure 2: Typical frequency dependence of the change Δm of weight (mass) the container. One large division of the vertical scale corresponds to 0.1 g. The horizontal frequency is F in Hz.

The variation in the measured values of the container weight is apparently due to random fluctuations in the scales and the discreteness of their readings. Negative values of weight changes ("levitation") prevail, although positive weight changes are also observed. There is a noticeable tendency for the average weight of the container to change negatively at frequencies in the range of 30-45 Hz, close to the frequencies of natural fluctuations in the strength of the gravitational field (Figure. 1). It is noteworthy that the relative magnitude of the changes in the mass of the vibrator (about 1/100) is close to the same values of the change in the mass of the brass rotor [1]. This confirms the assumption of a general physical reason for the observed effects, taking into account gravitational induction.

Conclusion

The experiment demonstrates a change in the average weight (mass) a vertically oscillating mechanical vibrator, the sign and magnitude of which are different in the low-frequency range of oscillation frequencies of 20-60 Hz. The probable reason for the frequency dependence of changes in the weight of the vibrator is weak fluctuations in the strength of the gravitational field and the effect of gravitational induction.

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