

INVERTED PENDULUM AND FLOATING LIQUIDS IN THE SUPERFLUID QUANTUM SPACE MODEL

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ABSTRACT

The inverted pendulum on the vertically vibrating device and floating liquids in the box on the vertically vibrating device are well-known phenomena. These phenomena are explained as the result of forces on the pendulum and floating liquids. These forces are produced by the vibrating device. The explanation and the mathematics describing these phenomena are in the frame of technical physics. Besides this explanation, there is also a model of superfluid quantum space where a vertically vibrating device creates waves of superfluid quantum space. These waves are pointing in the opposite direction of gravity and are keeping the inverted pendulum in a vertical position. When gravity force and the net force of the waves are in equilibrium the water in the box under which is air will float.

Keywords: Inverted pendulum, floating liquids, superfluid quantum space.

INTRODUCTION

Superfluid quantum space (SQS) is the physical origin of the universal space. SQS is a 4-dimensional type of energy. All elementary particles are different structures of SQS. 3-dimensional reality starts with the atom. In the interstellar space, its energy density has a value of Planck energy density. In the centre of a given stellar object, the energy density of SQS is diminishing exactly for the amount of its mass m and its correspondent energy E :

$$\rho_{CE} = \rho_{PE} - \frac{mc^2}{V} \quad (1)$$

where ρ_{CE} is the energy density in the centre of the stellar object, ρ_{PE} is the Planck energy density, and V is the volume of the given stellar object (Šorli and Čelan, 2020). When we rearrange equation (1) we get:

$$E = mc^2 = (\rho_{PE} - \rho_{CE})V \quad (2)$$

Equation (2) shows that the energy E of a given physical object is in equilibrium with the energy density of SQS. Energy density of SQS is diminished exactly for the value of E of a given physical object. Gravity force is the result of this equilibrium. That's why gravity force in order to exist, does not need a source. Gravity is the result of the variable energy density of SQS. Gravity force is pointing towards the centre of a given stellar object in the direction from the higher energy density of SQS towards the lower energy density of SQS: $F_g: \rho_{PE} \rightarrow \rho_{CE}$. Gravity force is embedded in a quantum structure of the universal space

which is defined by the presence of a given stellar object (Šorli and Čelan, 2021). Gravity is not emitted or received directly by the stellar object.

SQS and a given stellar object are inextricably linked. A given area of SQS is moving with the stellar object and rotating with it; the result is the dragging effect, planets precession, and shape of the spiral galaxies (Fiscaletti and Šorli, 2021). Matter and SQS are in a continuous active relation: matter is diminishing energy density of SQS which causes gravity force that affects matter.

Inverted pendulum and floating liquids

A vertically vibrating device is interacting with SQS and creates continuous waves of SQS that move in the direction opposite to the gravity force. These waves are 4-dimensional. An inverted pendulum when pushed in a vertical direction will keep this position because it has entered the stream of SQS vertical waves.

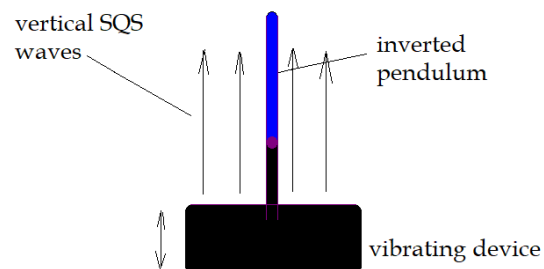


Fig. 1. The inverted pendulum in SQS vertical waves.

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Floating liquids are standing in the air in equilibrium when vertical waves of SQS and gravity force are in equilibrium. For this equilibrium, a precise frequency of vibration is required. If the frequency is excessively high or low, water will fall (Apffel *et al.*, 2020) and (NATURE video, 2 September, 2020, <https://www.youtube.com/watch?v=bodsuTucSxQ>).

Proposal of the experimental verification

We put in the box a Styrofoam plate that has on the down surface a tiny coating of osmium or gold. A tiny layer of osmium or gold will increase the impact of the vertical SQS waves on the Styrofoam plate. These waves are passing every material but can be a shield to a certain extent with surfaces made from heavy elements. We exhaust the air from the box. We switch on the vibrating device, and we slowly increase frequency. When gravity force on the plate will enter the equilibrium with the force of vertical SQS waves, the Styrofoam plate should be lifted and levitating in the air-vacuum of the box.

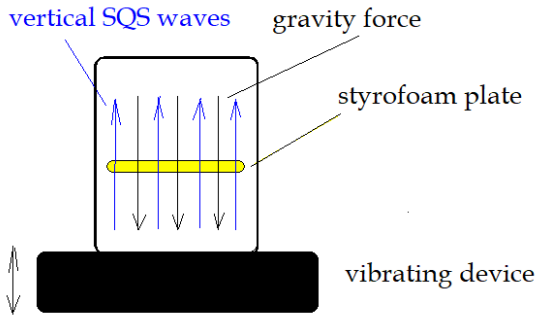


Fig. 2. The levitating Styrofoam plate.

The vibrating device also has on the upper surface a thin layer of osmium or gold. Every moving object is acting on the SQS. Sun is rotating SQS and so pushing planets, the vibrating device is creating waves of SQS that are continuously moving upwards. We suspect that the thin layer of osmium or gold on the surface of the vibrating device will increase the strength of the SQS waves. The energy of SQS is 4-dimensional. However, it can be pushed by the 3-dimensional object. When the surface density of the vibrating object is higher, the pushing effect will be bigger.

The proposal of the SQS model is that in the floating water experiment (Apffel *et al.*, 2020) vertical waves of SQS are acting in the opposite direction of gravity. The result is that water is floating. This can be experimentally verified by the following experiment: the vibrating device is situated on the massive table. Above the vibrating device is a stand on which is situated a precise balance (100 grams can be measured precisely on the 10 micrograms). We put on the balance an object with a mass of 90 grams. The vibrating device is off. After

switching the vibrating device on, the weight of the object on the balance will diminish with the increase of the frequency of the vibrating device (see in Figure 3).

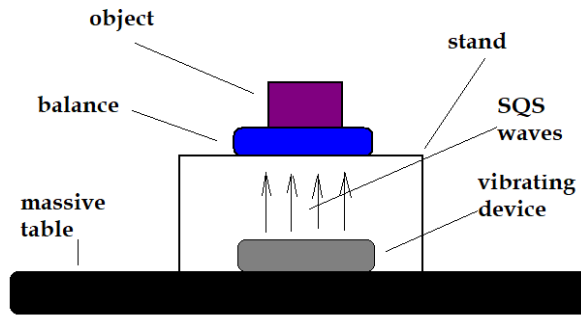


Fig. 3. The SQS vertical waves are diminishing the weight of the object.

Theoretical basis of changes in gravity

In the SQS model gravity force is the result of the variable energy density of SQS. Gravity force points from higher to lower energy density of SQS. Some changes in gravity theoretically is possible when we will be able to build a technical device that will increase the energy density of SQS. Such a device will move towards the higher energy density of SQS that is in the intergalactic areas. A given physical object is diminishing the energy density of SQS accordingly to equation (1). The area of SQS in which this object tends to move towards the area of SQS where energy density is lower. A given physical object on the Earth tends to move towards the centre of the Earth. In the same way, devices for changes in gravity will tend to move towards the higher energy density of SQS.

In the SQS model, the curvature of space in General Relativity (GR) is replaced with the variable energy density. More space is curved, less space is dense. Inertial mass and gravitational mass have both origins in the diminished energy density of SQS:

$$m_i = m_g = \frac{(\rho_{PE} - \rho_{cE})V}{c^2} \tag{3}$$

The rest mass m_R is not inertial mass m_i , the rest mass is the energy E that is incorporated in a giving physical object:

$$m_R = \frac{E}{c^2} \tag{4}$$

Thinking that the rest mass is the inertial mass has created numerous theoretical problems. The inertial mass is the result of the rest mass interaction with the energy of SQS. The rest mass of a given physical object (from the proton

to the Active Galactic Nuclei) is diminishing the density of SQS exactly for the amount of its energy (Šorli and Čelan, 2021). In this sense the average energy density of the given volume of the universe is constant. Interpreting gravity as the result of space curvature is here implemented by the model of the variable energy density of SQS. NASA has measured that universal space has an Euclidean shape (NASA, 2014. https://map.gsfc.nasa.gov/universe/uni_shape.html). The curvature of space in GR is a geometrical model of gravity, indicating that the universal space is curved seems wrong. Therefore, the statement by Whittaker (1958) who said that it is not the space that has curvature but the geometry of the space has curvature, cannot be true. Since the variable energy density of space seems a more appropriate physical explanation of gravity. There is no need to search for the hypothetical graviton as the transporter of gravity because matter does not emit and does not receive gravity. Gravity is the result of matter interaction with the SQS. How to increase the energy density of SQS is the challenge of 21-century physics. What today seems impossible in the next few decades can be our daily reality.

CONCLUSION

Physics has the potential to describe all physical phenomena including changes in gravity. In the superfluid quantum space model floating liquids can be interpreted as an example of the effect of changes in gravity caused by SQS waves.

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