Weight anomaly in the proximity of nuclear reactors

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Gravity is thought to originate from a peculiar quantum property of matter called tendency of motion. Restlessness is an innate property of mass, as Brownian motion shows. Nucleons are thought to be self-propelled particles changing direction due to gravitational information called G-information.

The observation that stars, black holes and other cosmic structures are emitting huge quantities of neutrinos and that the same structures have the most gravitational effect in the universe make the neutrinos the best candidate as a carrier of G-information.

A simple weighing experiment shows a decrease of the weight of a test object by 0.05% at 350-400 m distance from the core of a CANDU nuclear reactor. This weight anomaly can be explained by the fact that a horizontal flux of anti-neutrinos generated by the nuclear reactor provides G-information to a population of nucleons of the test body which otherwise would receive G-information only from the ground neutrinos.

The observation that stars, black holes and other cosmic structures are emitting huge quantities of neutrinos and that the same structures have the most gravitational effect in the universe make the neutrinos the best candidate as a carrier of G-information. The next logical step was to get as close as possible to a reliable source of antineutrinos, i.e. a fission nuclear reactor, and check whether any gravitational anomaly can be observed.

Two experiments are devised under the assumption that neutrinos and antineutrinos are the carriers of gravitational information [1] and that a horizontal flux of antineutrinos generated through fission reactions can disturb a vertical flux of terrestrial neutrinos in terms of gravitational information giving direction to nucleons which have an inherent tendency of motion.

The experiments were performed in the proximity of the Pickering nuclear power plant in Ontario, Canada. Fig. 1 shows the Pickering power plant (credit to Google

Maps) and the locations L1, L2 and L3 of the experiments providing the most significant results. The Pickering power plant has two groups (Pickering A and Pickering B) of four CANDU-6 reactors each, on the shore of Lake Ontario [2].

L1 is at about 400 m in a median direction between reactor 2 and 3 of Pickering A, L2 is at about 350 m in the axial direction of reactor 1 of Pickering A and L3 is at about 370 m in a lateral direction of all reactors, closest to reactor 4 of Pickering A. L1 and L2 are receiving a horizontal flux of antineutrinos along the nuclear fuel channels and L3 is receiving a horizontal flux of antineutrinos from a lateral direction of the fuel channels. In Fig. 1, the reactors' fuel channels are in a horizontal position, oriented in a perpendicular direction to the Lake Ontario shore.

At the time of the experiments, reactors 2 and 3 of Pickering A were shut down.

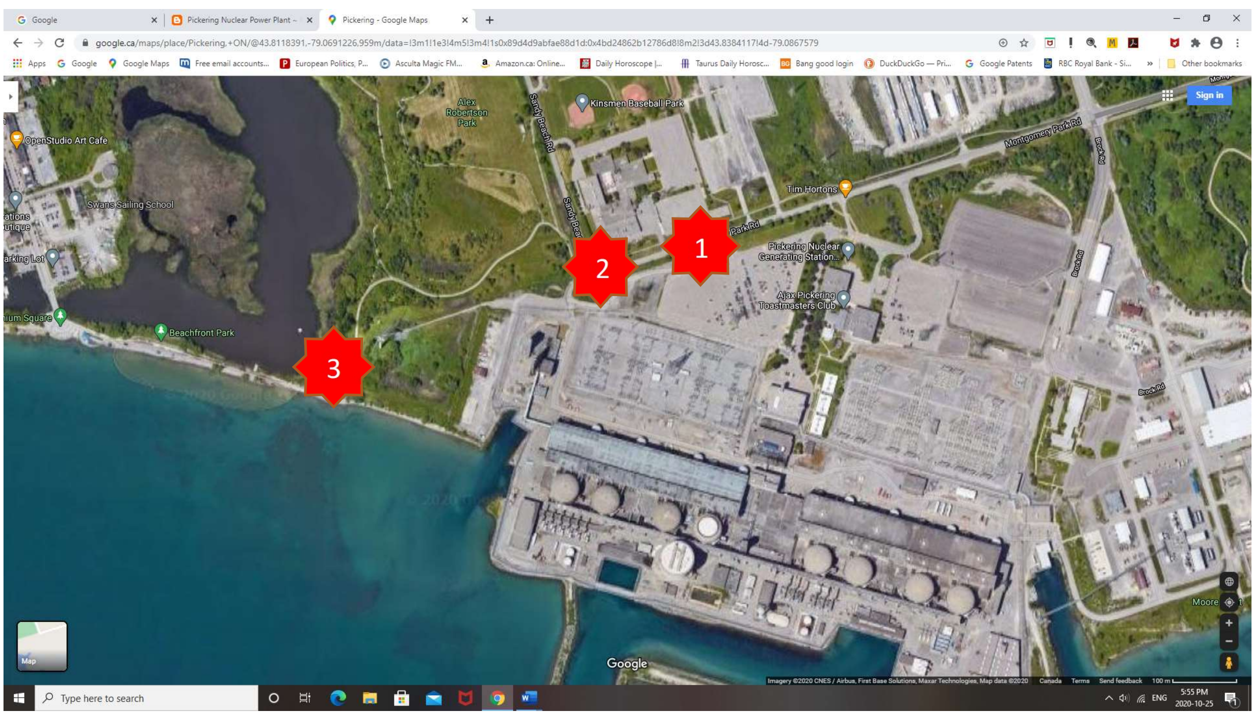

Fig. 1

As seen in Figs. 2-4, a test body (calibration weight of 50.000 g) weight is checked with a digital jewelry scale having an accuracy of +/- 0.003 g. The scale is placed on a horizontally leveled platform in each of the three locations. Before this first experiment, the scale was calibrated with the same test body in Ottawa, Ontario, at about 350 km straight distance from Pickering. Also, air temperature and humidity have been measured for making sure they do not exceed the instrument's range limits. After coming back to Ottawa, the scale reading was again 50.000 g, meaning its calibration stayed steady during the experiment.

The discrepancy between the measured weight and the calibrated weight is up to 10 times larger than the scale error. Therefore, the average 0.05% decrease of the test body weight is considered measurable and significant.

Fig. 2 - measured 49.970 g @ L1

Fig. 3 - measured 49.984 g @ L2

Fig. 4 - measured 49.975 g @ L3

Provided the above experiment is reproduced and confirmed by other researchers, the loss of weight of a test body exposed to a flux of antineutrinos generated by nuclear reactors needs an explanation.

Antineutrinos are produced in the negative beta decay. In a nuclear reactor occurs especially the β^- decay because the common feature of the fission products is an excess of neutrons. An unstable fission fragment with the excess of neutrons undergoes β⁻ decay, where the neutron is converted into a proton, an electron, and an electron antineutrino. Therefore, each nuclear reactor is an immensely powerful source of antineutrinos and researchers around the world investigate the possibilities of using antineutrinos for reactor monitoring [3].

The Pickering nuclear power plant has six operational nuclear reactors rated at 515 MW net electrical power each, generating up to 3100 MW in total. At least 5% of released energy per one fission is radiated away from reactor in the form of antineutrinos. At Pickering power station, about 150 MW is radiated away into space as antineutrino radiation. This amount of energy is forever lost since antineutrinos can penetrate all reactor materials without any interaction.

Along with the weighing experiment, a gravitational acceleration measurement in three axes was performed using the X-Y-Z accelerometer built-in a smartphone through an application interface called “Accelerometer”. During this second experiment, an acceleration of (0.100-0.105) g was displayed in the direction of the reactors, where “g” is the gravitational acceleration.

Fig. 5 – accelerometer data: X=0.07g; Y=0.100g; Z=0.998g

In Fig. 5, the X axis is parallel with the width of the phone, the Y axis is in the direction of the nuclear reactors and parallel with the length of the phone and Z axis is in the direction of the ground. The platform is perfectly leveled and there is no tilt to justify the Y-value of 0.100 g. Away from the reactors, in similar conditions, the Y-value is zero.

This weight anomaly can be explained by the fact that a horizontal flux of anti-neutrinos generated by the nuclear reactor provides G-information to a population of nucleons of the test body which otherwise, away from the reactor, would receive G-information only from the ground neutrinos. The combined G-information coming from the ground neutrinos and from nuclear reactor antineutrinos makes self-propelled nucleons of a test body (kinetic dipoles as explained in [1]) to push themselves less in the direction of the ground. Macroscopically, this complex quantum phenomenon translates in a loss of weight.

The fact that accelerometer's Z-measurement preserves its normal value but a Y-value 10 times smaller yet consistently measurable is present at the same time is unexpected.

Using Newton's definition of force, the above statement translates into a situation in which mass M of the test weight is subject to an expected vertical force 1.00 Mg and to an unexpected horizontal force 0.1Mg. In normal language, the test body is horizontally attracted by the reactor and vertically attracted by Earth at the same time.

However, the weighing experiment suggests the vertical force is 0.95 Mg, not 1.00 Mg. It appears the vector calculus is not applicable, and the mass seems to split into 0.05% of total nucleons self-propelling in the direction of the reactor and 0.95% of the nucleons self-propelling in the ground direction. This is remarkable considering that mass is traditionally thought to be a scalar.

In the new interpretation, mass is seen as the total number of nucleons contained in the test body, each of them acting as a kinetic dipole with a tendency of motion. Nucleons are restless because quarks are pure kinetic energy.

Therefore, mass may not be just a number, but a population of kinetic dipoles. This interpretation is experimentally supported at least by Brownian motion and thermogravity [4]. A new definition of the kilogram was also proposed based on the same interpretation of mass [5].

Gravity is a self-propelling force, not an attraction force. In other words, Newton's apple fell on the ground not because it was attracted by the Earth but because it was self-propelled by its kinetic dipoles oriented to the center of the Earth. Gravity can be thought as the consequence of the tendency of motion of nucleons self-propelling themselves in a direction provided by G-information carried by neutrinos without interacting with them.

Neutrinos and antineutrinos are known to be produced through β^+ and β^- decay. However, since gravity is a property of mass, it follows that any mass is capable to emit neutrinos with various energies, even in what we consider a stable condition of matter. Probably, there are more than three flavors of neutrinos for which we do not have detectors and theoretical description yet.

Neutrinos and antineutrinos are inherently difficult to detect because all matter is transparent to them up to light-years of lead. They may interact with matter only through the weak force.

Provided neutrinos and their antiparticles have such a measurable effect on the gravitational behavior of massive bodies, as described in this paper, this effect deserves further investigation, at least for the practical purpose of building better detectors which can be used for reactor and nuclear proliferation monitoring.

Weighing, ballistic free fall and Cavendish-like experiments could estimate the flux of antineutrinos emitted by fission nuclear reactors. There are already accurate gravimeters based on free fall and laser interferometers that can be used for this purpose. Getting much closer to a reactor than we could this time is also important.

This experiment could benefit neutrino astronomy as well.

LIGO experiment does not seem what was meant to be, i.e. a space-time ripple detector. The new interpretation of gravity leads to the idea that LIGO is probably the most expensive neutrino detector [6].

Also, instead of detecting rare events of neutrino interaction with matter in large volume detectors, compact arrays of sensitive accelerometers directed to regions of interest in the sky can be built. From afar, they could look very much alike with optical telescopes. Acquiring G-information from passing neutrinos without interaction with detectors seems to be more cost effective, yet counterintuitive for the moment.

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