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Research on Self-induction Effect of Alternating Vortex Gravitational Field

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Abstract

This paper studies the self-induction effect of alternating vortex gravitational fields through experiments on dynamic vortical gravity fields aenerated during high-speed rail operation. This experiment is a further study of the physical properties of vortex gravity and vortex gravity field.

During high-speed rail operation, there are three states: acceleration, deceleration, and uniform speed. The experiment proves that the alternating vortex gravitational field is produced in the process of the high-speed train accelerating and decelerating, and the alternating vortex gravitational field causes the experimental rod and the experimental car to move perpendicular to the running direction of the high-speed train.

The motion shows that the experimental rod and the experimental car in the carriage are subjected to the force perpendicular to the direction of the high-speed train. This phenomenon can not be explained by the classical mechanics theory, so it is necessary to expand the relevant physical theory. This paper explains this phenomenon as the self-induction effect of the alternating vortex gravitational field, similar to the self-induction effect of the alternating electromagnetic field.Although the high-speed train running at constant speed produces vortex gravitational field, the vortex gravitational field is stable and does not produce vortex gravitational field self-induced effect, so the high-speed train running at constant speed does not produce the vertical motion of the test rod and the test car relative to the direction of the high-speed train.

The essence of the self-induction effect of the alternating vortex gravitational field is that the relative motion between the object in the vortex gravitational field and the gravitational field is the cause of the self-induction effect, which then produces a force on the test rod and the test cart.

Although alternating vortex gravitational fields and alternating electromagnetic fields differ in physical properties, they share symmetry and similarity in related physical characteristics: just as a current

generates a magnetic field and its variation produces an alternating magnetic field, corresponding to a moving object generating a vortex gravitational field, and the change in an object's motion produces an alternating vortex gravitational field; similarly, when an object cuts through magnetic field lines, it generates an electromotive force, corresponding to an object cutting through gravitational lines producing a self-induction effect.

This experiment not only proves the existence of vortex gravitational field of moving object, but also proves the existence of self-induction effect of moving object in alternating vortex gravitational field.

Based on the symmetry of vortex gravitational field and electromagnetic field, Faraday's law, Ampere's law, Biot-Savart's law and Lorentz force are extended to the self-induction effect of vortex gravitational field. The theoretical mechanism of self-induction effect of alternating vortex gravitational field is constructed, and the mutual induction effect constant μ_g *of vortex gravitational field is deduced.*

Keywords

alternating vortex gravitational field, self-induction effect, acceleration, deceleration, motion perpendicular to the direction of high-speed train, extension of physical theory, alternating electromagnetic field, symmetry

Introduction

Although gravitational field and electromagnetic field are two kinds of fields with different physical properties, they have the spatial symmetry of physical properties after this experiment and demonstration. Static charges interact through Coulomb forces, while dynamic charges (currents) interact via Lorentz forces, Ampere forces, and Maxwell's field equations. Static objects interact through universal gravitation, whereas dynamic objects lack corresponding theories. Thus, in terms of theoretical completeness, electromagnetism is considered complete, whereas gravitational theory remains incomplete.

The static gravity of the object is completely different from the physical properties of the charge, but the two have perfect symmetry in the static structure of space and mathematics:

$$\text{Universal gravitation: } F = G\frac{m_1 m_2}{r^2} \tag{1}$$

$$\text{Coulomb law: } F = K\frac{q_1 q_2}{r^2} \tag{2}$$

When electric charges are in motion, they generate electric current, which produces a magnetic field. The movement characteristics of electromagnetic fields are described by Faraday's law, Lorentz force, and Maxwell's equations. Considering the symmetry between static and dynamic states, a complete electromagnetic field theory exists for both static and dynamic (current) charges. From the perspective of symmetry between static and dynamic states of objects and electromagnetic field theory, moving objects should also possess corresponding kinematic physical fields.

The theory of gravity is the theory of the gravity between the static objects, but the theory of the interaction force between the dynamic objects is missing, which makes many physical phenomena such

as the precession of the sun, the precession of Mercury and the movement of Foucault pendulum difficult to be explained.

Since the existence of static and dynamic states of objects, there exists a corresponding static and dynamic gravitational field. This is the case from the perspective of symmetry in logic, space, and physical fields. Based on this, the author has conducted a multi-level and multi-angle exploration of the construction and operation of gravitational field theory for moving objects, drawing on papers on the macroscopic physical phenomena of Earth and celestial bodies, as well as multiple studies on vortex gravity.

Through experimental verification and theoretical analysis in this study, we demonstrate that dynamic vortex gravitational fields exhibit self-induction effects, representing a significant advancement in vortex gravitational field theory. The self-induction effects of vortex gravitational fields share symmetry with those of electromagnetic fields. In constructing the theoretical framework for vortex gravitational self-induction effects, we have adopted relevant electromagnetic self-induction theories to establish symmetry-based conceptual foundations.

The self-induction effect of the alternating vortex gravitational field of moving objects is studied in this paper by two kinds of running experiments, high-speed train and metro (Shenzhen metro line 14). The experiments prove that the moving objects have the dynamic vortex gravitational field self-induction effect, which is a further study on the construction of the theory of vortex gravitational field.

1. Experimental Equipment and Methods

The experimental apparatus is designed to consider the vortex gravitational force that will be generated by the high-speed train in operation and exerted on the objects on the train.

1.1 Method One

1.1.1 Measurement of vortex gravitational force on the object in the vehicle: three stainless steel round metal rods with hollow cores and different diameters.

1.1.2 Two rods are used as the experimental track, perpendicular to the direction of the high-speed train's movement and securely fixed. A movable rod (hereafter referred to as the track rod) is placed on the track.

1.1.3 To confirm the directional force on the metal rod, the track is designed with a slope by utilizing the characteristic of the metal rod with a larger end. The metal rod will climb the slope due to the force, which confirms the direction of the force on the track rod.

1.1.4 In the experiment of meeting, the hollow metal rod was used to test the effect of meeting on vortex gravitational field.

1.2 Experimental Method Two

In the subway experiment, a hollow metal rod is assembled into a small cart with four small bearings serving as wheels. The cart's motion is generated through the self-induction effect of a vortex gravitational field. Although there are some variations between the two experimental setups, the driving principles of Experimental Method One and Method Two are consistent, both meeting the experimental requirements of this study.

2. Experimental Observation of the Self-Induction Effect of Vortex Gravitational Field

The self-induction effect of vortex gravitational fields demonstrates the following:

2.1 High-speed trains generate alternating vortex gravitational field self-induction effects during acceleration and deceleration, which do not occur at constant speed.

2.2 Experimental rods in the field exhibit motion due to the alternating vortex gravitational field self-induction effect.

2.3 The vortex gravitational field self-induction effects produced by acceleration and deceleration cause moving objects to generate perpendicular motion relative to the train's direction of travel.

2.4 The vortex gravitational field and electromagnetic field have the symmetry of space physical field in essence. The self-induction effect of vortex gravitational field can be constructed by the symmetry of electromagnetic field theory and vortex gravitational field.

2.5 The self-induction effect of vortex gravitational field is caused by the instantaneous difference between the field and the speed of the test rod. Because of the dynamic nature of this difference, the measurement must correspond to the current of the train accelerating or decelerating. Without this experimental condition, it is difficult to obtain the corresponding deterministic results.

3. Motion Basis of Self-Induction Effect of Vortex Gravitational Field

The study of the forces acting on the experimental rod during high-speed rail acceleration or deceleration, namely the research on the self-induction effect of the vortex gravitational field, is analogous to the study of the electromagnetic self-induced electromotive force experienced by a closed coil in an alternating magnetic field. Below is the theoretical construction of the self-induction effect of the vortex gravitational field.

3.1 The vortex gravitational field generated by the high-speed train in operation varies with the acceleration or deceleration process. The motion of the test rod has the following characteristics:

3.1.1 The dynamic change of vortex gravitational field is produced by the acceleration and deceleration of high-speed train, which induces the self-induction effect of vortex gravitational field on the object in the field.

3.1.2 This effect is equivalent to the experimental rod moving relative to the vortex gravitational field in a high-speed train carriage, thereby cutting the vortex gravitational lines. The resulting motion difference generates a vortex gravitational force on the experimental rod, which is also known as the self-induced effect of the vortex gravitational field.

3.1.3 Since the force perpendicular to the high-speed train's motion direction generated by the experimental rod results from the relative velocity difference between the train's speed and the gravitational field, it is challenging to conduct definitive experiments determining the direction of the self-induced effect in the vortex gravitational field. However, due to the continuous acceleration during the train's acceleration phase and the sustained deceleration upon arrival, it becomes relatively easier to measure the force direction acting on the experimental object. This allows for determining the motion

direction of the moving body and establishing the correlation between the gravitational field and the force direction experienced by the moving object.

3.2 The motion state of the experimental device in the high-speed train car can be observed during the continuous acceleration and deceleration processes:

3.2.1 The moving objects travels to the left of the train's direction of motion.

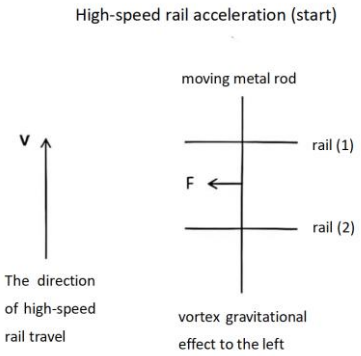

Figure 1

3.2.2 It can be observed that the moving objects inside the train are moving to the right of the direction in which the train is moving.

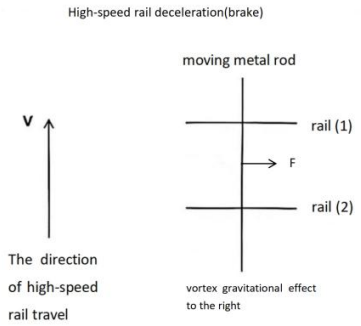

Figure 2

3.3 When the motion train and the stationary train are used to do the meeting experiment, the hanging metal rod in the motion train will tilt to the side of the stationary train. The author thinks that this is because the stationary train, as the space medium of the vortex gravitational field, has the effect of enhancing the vortex gravitational field.

4. Theoretical Mechanism of Vortex Gravity

The self-induction effect of vortex gravitational field is analogized to the self-induction effect of electromagnetic field, and the self-induction mechanism of vortex gravitational theory is constructed.

In order to distinguish the physical concepts of gravitational field and electromagnetic field, the angular

index is added to the physical quantity of gravitational field.

4.1 Derivation of the Self-Induced Potential of Electromagnetic Field on the Self-Induced Potential of Vortex Gravitational Field

Self-induced gravitational potential of vortex gravitational field: $e_g = -\frac{d\phi_g}{dt}$ (3)

In Equation (3), ϕ_g is the flux of the vortex gravitational field: $\phi_g = S_{\phi g} B_{\phi g}$ (4)

In Equation (4), $S_{\phi g}$ is the area of the vortex gravitational field flux, and $B_{\phi g}$ is the induced field strength of the vortex gravitational field.

4.2 Application of the Biot-Savart Law to Vortex Gravitational Fields

The high-speed train is regarded as the source of gravitational field of the infinite long line object in motion. The vortex gravitational field is considered as the basis of the electromagnetic field. The Biot-Savart law of electromagnetic field is used as the basic theory of vortex gravitational field. The angle index is used as the extension of the gravitational formula of Biot-Savart law.

$$dB_{\phi g} = k_g \frac{I_g dl \sin\theta}{r^2} \tag{5}$$

The vortex gravitational field intensity produced by an infinite long linear object at a distance d is given by Equation (5):

$$B_{\phi g} = \frac{\mu_g}{2\pi} \cdot \frac{I_g}{r_0} \tag{6}$$

flow rate of high-speed train operation in the formula: $I_g = \frac{M_c}{t} = \frac{\rho_c s_c l_c}{t} = \rho_c s_c V_c$ (7)

In the above formula, M_c represents the mass of the high-speed rail, ρ_c its average density, s_c its cross-sectional area, l_c its length, and $V_c = \frac{l_c}{t}$ its speed.

Substitute equations (4), (6), and (7) into equation (3):

$$e_g = -\frac{d\phi_g}{dt} = -\frac{\mu_g S_{\phi g} s_c \rho_c}{2\pi r_0} \frac{dV_c}{dt} \tag{8}$$

4.3 Constructing the Theory Mechanism of Vortex Gravity by Lorentz Force

vortex gravity: $F_g = m_b V_b B_{\phi g}$ (9)

In the formula, m_b is the mass of the test rod, V_b is the relative velocity between the test rod and the vortex gravitational field, and B_b is the vortex gravitational field intensity generated by the train in operation.

Substituting equation (6) into equation (9) gives:

$$F_g = m_b V_b B_{\phi g} = m_b V_b \frac{\mu_g}{4\pi} \cdot \frac{2I_g}{r_0} \tag{10}$$

Substituting equation (7) into equation (10) gives:

$$F_g = \frac{\mu_g}{2\pi} \cdot \frac{m_b V_b}{r_0} \rho_c s_c V_c \tag{11}$$

5. Isomorphism of Vortex Gravitational Field Energy Derived from Electromagnetic Induction Law and Lorentz Force

5.1 Derivation of the Vortex Gravitational Field Energy from the Law of Electromagnetic Induction

The differential equation of vortex gravitational field energy: $dw_g = e_g i_g dt$ (12)

In the formula, w_b is the induced potential energy generated by the train, e_g is the vortex gravitational potential intensity generated by the train, i_g is the flow rate produced by the experimental object m_b with density ρ_b, area s_b, and length l_b, when there V_b is relative velocity between the object and the train at time t.

$$i_g = \frac{m_b}{t} = \frac{\rho_b s_b l_b}{t} = \rho_b s_b V_b \tag{13}$$

Substitute equations (8) and (13) into equation (12):

$$dw_g = e_g i_g dt = \frac{\mu_g S_{\phi g} s_c \rho_c}{2\pi r_0} \rho_b s_b V_b dV_c \tag{14}$$

The integral of equation (14) yields the vortex gravitational field energy:

$$W = \int dw_g = \int e_g i_g dt = \int_0^{V_c} \frac{\mu_g S_{\phi g} \rho_c s_c}{2\pi r_0} s_b \rho_b V_b dV_c = \frac{\mu_g S_{\phi g} \rho_c s_c \rho_b s_b}{2\pi r_0} V_b V_c \tag{15}$$

It should be noted that in the formula, V_c is the speed of the train, V_b is the relative velocity between the experimental rod and the carriage. When the train is in a uniform state, V_b is zero, and thus the vortex gravitational force acting on the experimental rod is also zero. $\rho_c s_c$ is the surface density of the train's mass, and $\rho_b s_b$ is the surface density of the experimental rod's mass.

5.2 Vortex gravitational field energy derived from Lorentz force

$$\text{energy form; } W = FL \tag{16}$$

In the above formula, W represents energy, F represents the force, and L represents the distance over which the force acts. Substituting equation (11) into equation (16):

$$W = FL = \frac{\mu_g}{2\pi} \cdot \frac{m_b V_b}{r_0} \rho_c s_c V_c L \tag{17}$$

As can be seen from Equation (13), the experimental metal rod m_b is aligned along the direction of the train's movement, and the vortex gravitational force acting on the rod is perpendicular to this direction. Substitute equation (13) $m_b = \rho_b s_b l_b$ into equation (17):

$$W = FL = \frac{\mu_g}{2\pi} \cdot \frac{\rho_b s_b l_b V_b}{r_0} \rho_c s_c V_c L \tag{18}$$

5.3 The induced vortex gravitational field energy derived from the law of electromagnetic induction and the induced vortex gravitational field energy derived from the Lorentz force are isomorphic and equal

The gravitational field energy derived from two physical laws exhibits structural symmetry isomorphism. By applying the electromagnetic induction law to vortex gravity through transformation, we derive Equation (15) for vortex gravitational energy. This is compared with Equation (18) for vortex gravitational energy obtained from the Lorentz force applied to vortex gravity. Both equations demonstrate symmetry isomorphism and equality. Dividing Equation (15) by Equation (18) yields:

$$\frac{S_{\phi g}}{l_b L} = 1 \tag{19}$$

In the above formula, $S_{\phi g}$ is the effective area of the vortex gravitational field flux swept by the object in the motion process, l_b is the length of the experimental object,

L is the travel distance of the experimental object under the force in the vertical direction of its length, which is the effective area of the vortex gravitational field flux swept by the experimental object during its travel. Thus,

$$S_{\phi g} = l_b L \tag{20}$$

The vortex gravitational field energy derived from the electromagnetic induction law (15) is isomorphic and equal to the Lorentz force (18), which is logically consistent. The argument shows that the vortex gravitational field has the self-induction effect.

In the process of acceleration or deceleration, the vortex gravitational field changes, and the experimental suspended rod and experimental track rod in the field are similar to the coil in the changing electromagnetic field, because the vortex gravitational field changes the self-induction effect and mutual induction effect of the vortex gravitational field, and produce the motion.

6. Mutual Induction Effect Constant of Vortex Gravitational Field μ_g

The self-induction effect of vortex gravitational field shows that the alternating vortex gravitational field should also have mutual induction effect.

When a high-speed train remains stationary at a station, its passage generates a dynamic vortex gravitational field around the suspended rod. This phenomenon, known as the mutual induction effect of vortex gravitational fields, causes the rod to shift toward the train's direction. The experimentally determined vortex gravitational constant for this interaction is expressed as: $\mu_g = \mu_{g0}\mu_{gr}$ where is the vacuum vortex gravitational constant μ_{g0}, and μ_{gr} represents the coefficient that increases the constant in the presence of a mediu.

6.1 Data Related to Online and Experimental Equipment

6.1.1 (Online Data) The high-speed rail weighs 455 tons, with a length of 200 meters and a track center-

to-center spacing of 5 meters. Its estimated passing speed is 180 km/h (50 m/s).

6.1.2 Experimental setup: The metal rod weighs 6g, measures 0.178m in length, and has a suspension length of 0.16m.

6.1.3 When high-speed trains pass, the time required for the suspension rod to cover a distance of 0.015 meters is set at 0.05 seconds, as follows: $V_b = \frac{0.15}{0.05} = 3(m/s)$

6.1.4 When the high-speed train passes, the suspension line of the metal rod in the experimental setup deviates from the center by 0.015 meters.

$$\rho_c s_c = \frac{m_c g}{l_c} = \frac{455\times1000}{200} = 2275\left(kg/m^2\right) \tag{21}$$

6.1.5 As stated in (1) above, the surface density of high-speed rail is:

$$\rho_c s_c = \frac{m_c g}{l_c} = \frac{455\times1000}{200} = 2275\left(kg/m^2\right) \tag{21}$$

6.2 Mutual Induction Force of the Experimental Device's Metal Rod During High-Speed Train Passage

From condition (3), when the high-speed train passes, the force acting on the metal rod of the experimental setup is the deflection angle of the suspending line, denoted as. Thus, the force is:

$$F = mg\sin\theta = 0.006\times\frac{0.015}{0.16} = 5.625\times10^{-4}(kg) \tag{22}$$

6.3 Estimation of the Vortex Gravity Constant $\mu_{g0}\mu_{gr}$

As shown in Equation (11), the constant value of the vortex gravitational force in high-speed rail operation is. Substituting Equations (21) and (22) into Equation (11), we obtain:

$$\mu_{g0}\mu_r = F_g\frac{2\pi r_0}{m_b V_b}\frac{1}{\rho_c s_c V_c} = 5.625\times10^{-4}\frac{2\pi\times5}{0.006\times3}\times\frac{1}{2275\times50} = 8.626\times10^{-6} \tag{23}$$

Compare vacuum permeability values:

$$\mu_0 = 4\pi\times10^{-7} = 1.256\times10^{-6}(亨/米) \tag{24}$$

7. Discussion and Conclusion

The experimental results show that the self-induction effect of the alternating vortex gravitational field exists, and the self-induction effect of the alternating vortex gravitational field is symmetrical with the self-induction effect of the alternating electromagnetic field in terms of space and physical properties.

Through the experiment of high-speed train and metro, the self-induction effect of alternating vortex gravitational field is reasonable, which is constructed by the symmetry of electromagnetic field and vortex gravitational field.

The self-induction effect of alternating vortex gravitational field shows that the moving object in the gravitational field will be subjected to a force perpendicular to the gravitational line and the direction of motion when it cuts the gravitational line, and thus the moving object will produce circular motion.

This paper is to prove the self-induction effect μ_g of vortex gravitational field by high-speed train running experiment, and to extend the theory of vortex gravitational field and to construct the theory.

To determine the self-induction effect of the vortex gravitational field in high-speed rail operations, synchronized measurements should be conducted by analyzing current variations during the train's acceleration and deceleration phases. This approach enables directional analysis and quantitative evaluation of the force generated by the vortex gravitational field's self-induction effect. Based on these findings, a gesture analysis model for the vortex gravitational field's self-induction effect should be established, including the helical gesture rule for the vortex gravitational field's self-induction effect and the gesture rule linking motion direction with force direction. The experimental measurement of the vortex gravitational field's self-induction effect in high-speed rail operations requires support and coordination from relevant authorities.

The acceleration process of high-speed trains is the energy storage process of vortex gravitational field energy, while the deceleration process is the energy release process of vortex gravitational field energy. When this process repeats, an alternating vortex gravitational field is formed. The changing vortex gravitational field not only generates self-induction effects but also mutual induction effects.

The existence of alternating vortex gravitational field is the basic condition of gravitational wave emission. As long as the alternating vortex gravitational field exists, the vortex gravitational field will emit gravitational waves. Therefore, the study of the self-induction effect of vortex gravitational field has practical and theoretical significance in constructing and perfecting the theory of gravitational wave emission.

The value of $\mu_g \mu_{gr} = 4\pi \times 10^{-7} = 8.626 \times 10^{-6}$ is estimated by the experiment of high-speed train, which is the experimental estimation of the obvious enhancement of vortex field when there is a high-speed train in motion beside a stationary high-speed train, and this constant is $\mu_g \mu_{gr}$.

To determine the vacuum constant μ_{g0} of the vortex gravitational field, more precise physical experiments are required, and the theoretical framework of the vortex gravitational field should be further refined. More accurate high-speed rail experiments should integrate the experimental setup with the current variations during train acceleration or deceleration, as well as the acceleration values of the high-speed rail.

The experiment of high-speed train running in this paper not only demonstrates the vortex gravitational field and vortex gravitational force of moving object, but also shows that the basic theory of gravity is incomplete.

References

Ivanchenko, V. M. (2004). Application of Potential and Vortex Fields to the Description of Gravitation and Electromagnetism. *Ukrainian Mathematical Journal*, *56*(1), 37-61. https://doi.org/10.1023/B:UKMA.0000031702.59017.31

Jia, R. G., & Xue, Q. Z. (2011). *Electromagnetism* (2nd ed.). China Beijing: Higher Education Press

(HEP).

Jing, S. C., Du, Q., & Jin, R. (2008). *Introduction to Physics* (Vol. 2). China Beijing: science press.

Kiselev, A. S., & Krechet, V. G. (2012). Gravitational interaction of a geometric scalar field with a vortex gravitational field in five-dimensional spacetime. *Russian Physics Journal*, *55*(5), 576-579. https://doi.org/10.1007/s11182-012-9850-1

Krechet, V. G., & Yu, E. (2011). Orlova.On the effects of interaction of a spinor field with a vortex gravitational field. *Gravitation and Cosmology*, *17*(4), 324-327. https://doi.org/10.1134/S0202289311040098

Ludwig, G. O. (2024). Extended gravitational vortex without dark matter. *The European Physical Journal C.*, *84*(3). https://doi.org/10.1140/epjc/s10052-024-12585-0

Miftachul Hadi, Malcolm Anderson, & Andri Husein. (2017). The gravitational field equations of a twisted skyrmion string: numerical solution. *Journal of Physics: Conference Series*, *795*(1) 012006-012006. https://doi.org/10.1088/1742-6596/795/1/012006

Orlov, S. (2018). Paradoxes of the theory of gravity. *International Research Journal of Physics*, *1*(1).

Orlov, S. A. (2010). Foundation of vortex gravitation, cosmology and cosmogony. *Kathmandu University Journal of Science, Engineering and Technology*, *6*(2), 142-169. https://doi.org/10.3126/kuset.v6i2.4023

Shen, N. C. (2014). Survey of fundamental physical constants and mea surements of the Newtonian constant of gravitation (National Institute of Metrology, Beijing 100029, China) 2014, *43*(6).

Shu, X. J. (2019). Study on the Deduction of Energy Formula of Gravitation Field. *Jiangxi Science*, *37*(2), 159-184.

Yuan, L. X. (2012). Establishing the vortex gravitational field and the unity of the operating mechanism for the Mercury precession and the earth precession. *Journal of Yunnan University* (NATURALSCIENCE EDITION), *34*(S1), 24-32.

Yuan, L. X. (2015). A Study on current transmitted in conductors as displacement current. *Journal ofJilin Teacher institute of engineering and technology*, *31*(8), 91-96.

Yuan, L. X. (2016). Study on the source of vortex gravitation field. *Journal of Educational Institute of Jilin Province*, *32*(2), 177-180.

Yuan, L. X. (2022). On the Unification of the Precession of the Foucault Pendulum, the Earth's "Precession" and the Mercury Precession by Constructing vortex gravitational Mechanism. *Applied Science and Innovative Research*, *6*(4), 21-34. https://doi.org/10.22158/asir.v6n4p21