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Verification of Al-Amr Principle and Determination of the Maximal Universal Acceleration

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Abstract:- In this paper, an experiment results verifying Al-Amr principle(*v.r*=*C*) is presented, the constant *C* is determined , by following a method similar to Millikan's in his experiment for determining Planck's constant . In this experiment, general relativity is tested, and the critical curvature of space-time (or the maximal universal acceleration) is obtained.

Keywords: *Quantum Gravity , Maximal Universal Acceleration , Al-Amr Constant ,Experiment.*

I. INTRODUCTION

The concept of the maximal universal acceleration is closely related to quantum gravity, as the effect of this acceleration appears at Planck's time, which is the scale at which the quantum effects of gravitation perform an important function. Einstein replaced gravitation with a geometric concept,"curvature of space", so the curvature is equivalent to acceleration. The maximal universal acceleration is obtained as a critical curvature R_c by using a principle extracted in paper[1]. This principle contains a universal constant *C* to which the curvature is related($R_c = \frac{c^3}{C}$). The maximal universal acceleration is ($5.7 \times 10^{53} cm.s^{-2}$) in paper [1], and its value determined in this experiment is ($5.6 \times 10^{53} cm.s^{-2}$). This agreement with the results of the experiment - within the limits of its accuracy - reinforces al-amr principle and emphasizes the importance of Ibrahim's constant *C*.

The idea of the maximal universal acceleration appeared - first - in string theory, and the mechanism causing this acceleration is attributed to the divergence in the partition function of the string, as this divergence is accompanied by the presence of a smaller length of the strings[2]. This acceleration depends on universal constants, and is of the order ($\sim 10^{54} cm.s^{-2}$).) when Hagedorn [3] temperature is of the Planck's temperature order.

There are other studies on this subject that are based on the effect of Unruh[4] confirming the existence of maximal acceleration at higher temperatures. If the temperature is of the Planck's temperature order, this acceleration is of the order of ($\sim 10^{54} cm.s^{-2}$).

Finsler's spatio-temporal models also contain a maximal universal acceleration[5]. In it, a special length is defined that exists in those models. If this length is of the order of the Planck's distance, we also get an acceleration of the same order, that is ($\sim 10^{54} cm.s^{-2}$).

Other methods such as Caianiello[6] and Castro[7] methods also contain maximal acceleration.

In those methods, the maximal acceleration takes the same formula, which takes the following form: $a_m = \frac{c^2}{L}$, where *c* is the speed of light and *L* has a smaller specific length, When this length is of the order of the Planck's distance L_p , we get $a_m \sim 10^{54} cm.s^{-2}$.[8] The presence of the maximal acceleration on Planck's scale indicates the occurrence of an accelerated expansion of our universe at the beginning of time. This acceleration results in the universal gravitational force [1].

No experiment has been carried out to determine the maximal universal acceleration, but there is a proposal stating that:" the effects of maximal acceleration can be sought in small systems that may be neutrinos" , meaning that the maximal acceleration achieves this important limit of neutrino mass[10]. We have shown through this experiment that these effects lie in certain conditions within atomic systems in the interactions between radiation and matter.

II. METHOD

The principle of al-amr (*v.r = C*) is experimentally verified,Ibrahim's constant *C* is determined, by following a method similar to Millikan's method in his experiment for determining Planck's constant, in the same way , general relativity is "quantum mechanically" tested , the critical curvature R_c, or the maximal universal acceleration a_m - at the beginning of time - is tested.

In this experiment, a monochromatic light is incident on the surface of an alkali metal (sodium) to cause emission of photoelectrons, the collecting electrode is kept at a negative voltage, where the current would be zero.

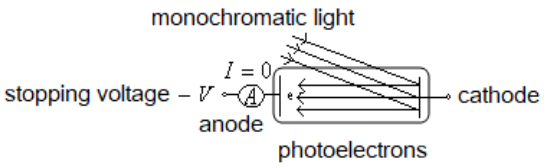

Fig 1 A Photovoltaic Cell Operating at the Visible Spectrum

The emitted photoelectrons "stop moving" without losing the absorbed energy by radiation, that is, their acquired kinetic energies turn into potential energy .Then the electrons with higher potential energy approach rest more than others, that is, their speed approaches to zero.

III. THEORY

We write the principle of al-amr as[1]

$$v.r = C \quad (1)$$

Where Ibrahim's constant is

$$C = 4.84 \times 10^{-23} cm^2.s^{-1}$$

Or we write

$$r\omega.r = C$$

Multiplying by ω we find

$$r^2\omega^2 = C\omega$$

That is

$$v^2 = C\omega$$

Suppose that

$$v^2 = u_a^2 - u^2$$

i.e:

$$u_a^2 - u^2 = C\omega$$

or

$$u^2 = u_a^2 - C\omega \quad (2)$$

Where : u is the effective velocities of the stopping electrons, which are very small velocities, tend to zero, because the current is approaching to zero($I \to 0$).

u_a : is a characteristic constant of the used cathode metal

ω : is the frequency of the incident light, related to the frequency of the electron in its orbit around the nucleus

The potential energy inside the stopped electron would increase its mass by a large amount. This electron must acquire a mass of m_c in order to achieve the principle of energy conservation, which is written in this case in the following form:

The energy of the emitted electron E_e is equal to the excess energy of the absorbed photon E_γ

So we write

$$mu^2 = \hbar\omega$$

The electron mass m_e is of the order of magnitude m_c, and ω is of order $\sim 10^{14} s^{-1}$ .i.e : $u \sim 10^{-4} cm.s^{-1}$

This value ($u \sim 10^{-4} cm.s^{-1}$) is appropriate to express a small speed approaching zero - as in this case - , while if $u = 0$, then $m = \infty$, and this is not possible.

The electron's acquisition of this amount of mass is due to a reason opposite to the phenomenon of redshift by the influence of the gravitational field, where the potential energy of the photon associated with it increases significantly when the electron is exposed as a result of stopping it to a excessive decrease in its speed, that is, when it is subjected to a large decreasing acceleration equivalent to a strong gravitational field, then it turns the energy of a photon is all electromagnetic into mass, as the inertial mass of the photon $\frac{\hbar\omega}{c^2}$ is equivalent to its gravitational mass according to general relativity[12,13].

Compared to Einstein's photoelectric equation [11], it turns out that:

$$u^2 = \frac{e}{m_c} V \quad (3)$$

Where e : is the elementary charge, and V: is the stopping voltage

$m_c = 2.2 \times 10^{-5} g$ is the unit of mass

We have [1]:

$$\frac{e}{m_c} = (\alpha G)^{\frac{1}{2}} \approx 2.2 \times 10^{-5} esu.g \quad (4)$$

α :is the fine structure constant , G : is Newton's constant

Then we write relation(3)as:

$$u^2 = (\alpha G)^{\frac{1}{2}} V \quad (5)$$

The sign of V is negative, so to obtain a positive value for u^2 in relation (5), we choose the negative sign of the root product.

In order to use the Gaussian system of units *CGS* in this relation, the volt unit must be converted to another unit of electric potential in the system *CGS*.

We can simply do this convertion as:

$$1\ volt = \frac{1.6 \times 10^{-12}\ erg}{4.8 \times 10^{-10}\ esu} = 3.3 \times 10^{-3} \frac{erg}{esu}$$

So, there is a new unit of electric potential V in the Gaussian system CGS that we can call the abbreviate name "*gavu*", which is composed of the first letters of the words of the phrase" Gaussian Voltage Unit".

So we write:

$$1\ volt = 3.3 \times 10^{-3}\ gavu \quad (6)$$

By plotting ($u^2 = (\alpha G)^{\frac{1}{2}} V$) graphically against ω - relation (2)- , a straight line can be obtained that cuts the two axes at points $(\omega_a, 0)$ and $(0, u_a^2)$as:

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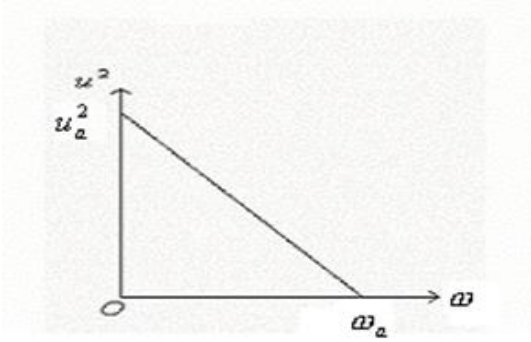

Fig 2 u^2 against ω

We have relation (2) as:

$$u^2 = u_a^2 - C\omega$$

At : $\omega = \omega_a$, then: $u^2 = 0$

Thus:

$$0 = u_a^2 - C\omega_a$$

$$C = \frac{u_a^2}{\omega_a} \qquad (7) \text{ i.e}$$

IV. RESULTS

- *From the Experiment we Obtained the Data in the Following Table:*

Table 1 u^2 – in terms of V - against ω

$V(\times 10^{-3})gavu$	$u^2(\times 10^{-8})cm^2.s^{-2}$	$\omega(\times 10^{14})s^{-1}$
-4.3	9	46
-5.0	11	43
-5.9	13	38
-6.9	15	35
-7.3	16	33
-7.9	17	30

- *A Graph of u^2 Against ω is Plotted as shown in the following figure:*

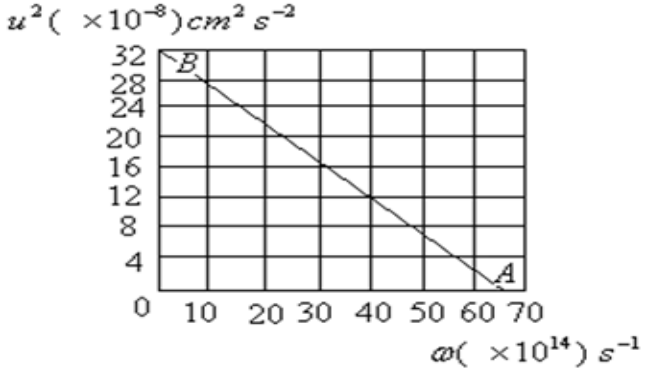

Fig 3 $u^2(\ cm^2.s^{-2})$ Against $\omega(s^{-1})$

We have relation (7) as:

$$C = \frac{u_a^2}{\omega_a}$$

So from the graph we can calculate the constant C as follows:

$$C = \frac{OB}{OA} = \frac{32 \times 10^{-8}}{66 \times 10^{14}} = 4.85 \times 10^{-23} cm^2.s^{-1}$$

This result is consistent with the theoretical value, within the accuracy limits of the experiment, as the relative error did not exceed 0.2%

The critical curvature R_c, or the maximal universal acceleration a_m is calculated:

$$R_c(= a_m) = \frac{c^3}{C} = c^3 \frac{OA}{OB} = 5.6 \times 10^{53} cm.s^{-2}$$

V. CONCLUSION

The principle of al-amr ($v.r = C$) is verified, Ibrahim's constant C is calculated. The results were agree - within the limits of accuracy - with the standard value extracted in paper [1]. The maximal universal acceleration is determined .This result achieves the general theory of relativity and resolves the dilemma of singularities of space-time in our universe.

This experiment showed that the photon's electromagnetic energy turns into mass when the electron is stopped, as the inertial mass of the photon is equivalent to its gravitational mass, meaning that the mass of the electron increases rapidly due to the potential energy inside it when it is stopped, thus the principle of energy conservation is achieved.

The electron's acquisition of this amount of mass is due to a reason opposite to the phenomenon of redshift by the effect of the gravitational field, where the potential energy of the photon associated with it increases rapidly when the electron is subjected to an excessive decrease in its speed, that is, when it is subjected to a large decreasing acceleration equivalent to a strong gravitational force field.

For the purpose of using the Gaussian system of units CGS in the calculations, the volt unit, which is one of the units of the international system MKS, is converted to another new unit in the Gaussian system that is consistent with the theoretical relations, and correct practical results were obtained with it. The method of this experiment and its results agree, in general, with the proposal made in paper [10], which predicts the detection of the effects of the maximal universal acceleration in atomic systems.

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