The Experiment of the Neutron Passing through High-voltage Electrostatic Field

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Abstract More than 10 years ago, the author had proposed a new theory about nuclear structure. He believes the nuclear structure is similar to that of the solar system. Including protons, neutrons and electrons, all particles are made up of other smaller particles. The smallest particle is photon. At this time, the experimental studies were carried out. We let the neutrons pass through the high-voltage electrostatic field to observe what will happen. As the result, we discover the position of image changes. Thus, we can infer that the neutrons deflect in the electric field. In the end, two examples are given about how to re-recognize the common electromagnetic phenomena.

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1. Introduction

Most of us know that there was an ancient contradiction in the history of physics [1,2]. In 1911, scientist Rutherford proposed the nuclear model, but this model had a sharp contradiction with the classical physics theory: the electrons move around the nucleus, they should radiate energy continuously. This can lead nuclear unstable. But that's not the case.

In order to address this problem, in 1913, Bohr proposed the static orbit hypothesis. On this basis, Bohr Theory was established. From then on, most scientists think the old contradiction had been solved [3,4].

But in fact, in the view of the author, the old contradiction has not been solved. According to the electromagnetic theory, the electrons move around the nucleus, they should radiate energy continuously. But according to Bohr Theory, the electrons move around the nucleus on some static orbits, they could NOT radiate energy. So, the two theories contradict each other. Both of them are right, it's impossible [5].

More than ten years ago, the author had proposed a new theory about nuclear structure, which is published on the Journal of Henan Polytechnic University in 2009 [5]. According to the new theory, the nuclear structure is similar to that of the solar system. Including protons, neutrons and electrons, all particles are made up of other smaller particles. The smallest particle is photon. In other word, eventually, all particles are composed of energy particles which similar to photons. When an atomic nucleus attracts more electrons, it will repel other electrons. In electromagnetic theory, we think such nucleus taking negative charges. On the contrary, when an atomic nucleus lost its electrons, it will attract other electrons. In the traditional electromagnetic theory, we think such nucleus taking positive charges.

According to the new theory, between particles, the attraction and repulsion coexists. The resultant force of the attraction and repulsion provides the constraining force in the atomic nucleus [6]. What's more, between two objects, the universal gravitation is the resultant force of the attraction and repulsion between the numberless particles [7]. In the Milky Way, the solar system is similar to an atom [5,6,7].

How to verify this new view? The author had designed an experiment ten years ago [5,6,7]. All the time, he wants to finish it. However, due to the limitation of funds and experimental conditions, he was not able to do so. After a decade of efforts, last month, the situation changed. The experiment was completed. The experimental result is worth noting.

2. The Expeiment

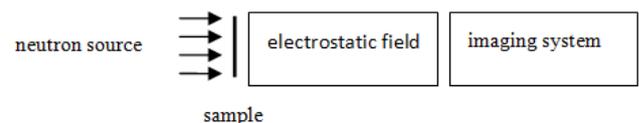The purpose of the experiment is to observe whether the neutron is affected by high-voltage electric field.

Figure 1. The experimental scheme

As shown in Figure 1, it is the experimental scheme, which includes 4 sections: (1) neutron source, (2) sample, (3) electrostatic field, (4) imaging system. When the neutrons pass through the high-voltage electrostatic field, according to the traditional electromagnetic theory, the movements of the neutrons will not be affected by electric field. Then, the image will not change.

But according to the new theory, the positive side of the electric field has lost its electrons, it will attract other electrons. The negative side of the electric field has attracted more electrons, it will repel other electrons. On the other hand, both neutrons and electrons can be regarded as energy particles [5,6,7]. Thus, when the neutrons pass through the electrostatic field, their movements will be affected by electric field. Then, the image will change.

In the experiment, the neutron source is gotten from the thermal research reactor. The thermal neutron flux density is about 5×10^{13}cm^{-2}.s^{-1}. The diameter of the circular neutron channel is ϕ=150mm. Inside the reactor, the graphite is used as neutron moderator, lead is used as reflection layer, and the neutron collimator is installed.

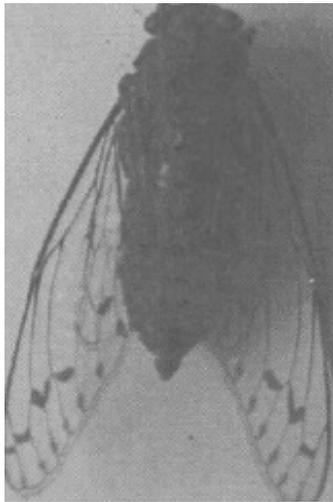For the sample, as shown in Figure 2, it is a cicada.

Figure 2. Picture of the cicada

In the third section, we place two copper plates in a PE pipe. The copper plates connect to a DC power source. Two ends of the pipe are sealed by polyethylene film so as to evacuate. The vacuum degree is about 300 mbar. For the DC power source, we hire a professional company to design and produce it. The maximum output DC voltage is up to 30 KV.

The imaging system adopts neutron radiography technique. As a non-destructive testing technology, neutron radiography has been widely used in many fields [8-12]. The neutron radiography system includes neutron conversion screen, reflector, CCD camera and computer. The neutron conversion screen receives neutrons, turns them into optical signal [13,14]. The reflector reflects the optical signal to the CCD camera. The camera transfers the image to the computer for further processing. The reactor neutron laboratory has this set of equipment, it is open for outer laboratory technicians. In this experiment, the neutron conversion screen is made of ^{6}LiFZnS(Ag). ^{6}Li absorbs neutrons and produces α. ZnS(Ag) absorbs α and produces light. In this way, neutron signals are converted to optical signals [15,16].

After all these apparatuses are prepared well, the experiment began. Firstly, DC power is turned on to generate electrostatic field. The output DC voltage is set to 25 KV. The integral time of the CCD camera is set to 20 seconds. We got a neutron imaging photograph. In the next step, the DC power is turned off. No electrostatic

field is produced. In this situation, we got another neutron imaging photograph. The two photographs are shown in Figure 3.
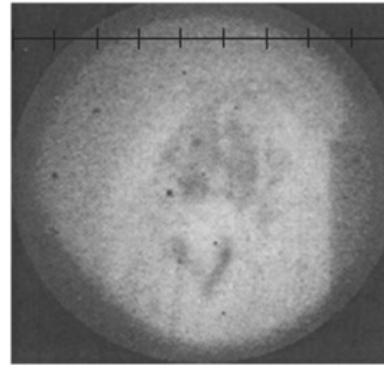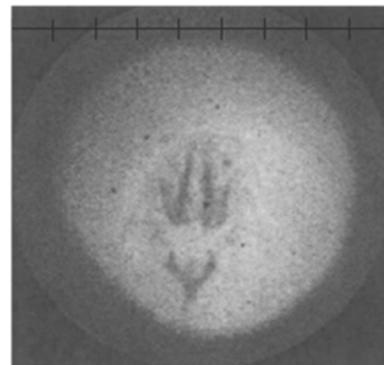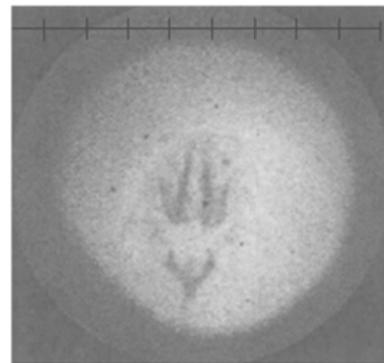

(A)
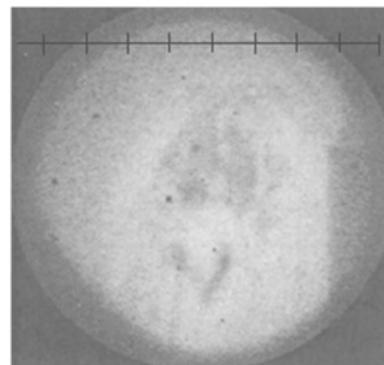
(B)

Figure 3. The first group of photos (the integral time of the CCD camera is set to 20 seconds), (A): DC power is turn off; (B): DC power is turn on

(A)

(B)

Figure 4. The second group of photos (the integral time of the CCD camera is set to 30 seconds), (A): DC power is turn off; (B): DC power is turn on

From Figure 3, we can see two photographs are different. The scale line is set above the picture, it is fixed. The position of image on scale line shows the shift appears. Based on the shift, we can infer that the neutrons deflect in the electric field.

In order to verify this result, we do this experiment once more. At this time, the integral time of the CCD camera is set to 30 seconds. The second group of photos is shown in Figure 4. Again, it shows the positions of sample image on scale line are different, then, we can infer that the neutrons deflect in the electric field indeed. In addition, compared with Figure 3, Figure 4 is slightly clearer.

3. Two Examples of Re-recognition of Electromagnetic Phenomena

3.1. The Movement Rules of Electrons in Picture Tube

Picture tubes are widely used in TV sets, displays, oscilloscopes and other equipments [17,18]. The fowlloing analysis will show the movements of the electrons have little to do with their electric charges.
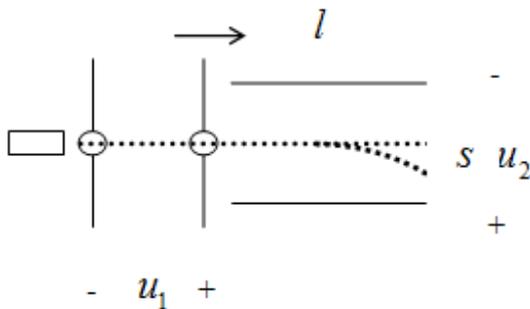

Figure 5. The structure of the picture tube

As shown in Figure 5, after the electrons are emitted from the electron-tube heater, they are accelerated in accelerating electric field, then, deflected in the deflecting electric field.

To suppose the accelerating electric field voltage is u_1, the deflection electric field voltage is u_2, the length of the deflection tube is l, distance between positive and negative poles of the tube is d. Then, how to calculate deflection distance s?

In order to calculate s, let us assume the mass of the electron is m, the charge is e, the initial velocity is zero. Then, when the electron is accelerated in the accelerating electric field, it meets the following equation.

$$eu_1 = \frac{1}{2}mv^2$$

Where v is the velocity of the electron.

The formula can be rewritten to

$$v^2 = \frac{2eu_1}{m}$$

When the electron enters the deflection electric field, it meets the following equation.

$$l = vt,$$

Where t is the flying time of the electron in the deflection electric field. The formula can be rewritten to

$$t = \frac{l}{v}.$$

In the deflection electric field, electric field strength equals to

$$E = \frac{u_2}{d}.$$

The force given to the electrons equals to

$$F = e \times E = \frac{eu_2}{d}.$$

Then, the acceleration of the electron equals to

$$a = \frac{F}{m} = \frac{eu_2}{md}.$$

Thus, we can calculate deflection distance S.

$$S = \frac{1}{2}at^2 = \frac{1}{2} \times \frac{eu_2}{md} \times \left(\frac{l}{v}\right)^2.$$

Because of $v^2 = \frac{2eu_1}{m}$, we can gain the following equation.

$$S = \frac{1}{2}at^2 = \frac{1}{2} \times \frac{eu_2}{md} \times \left(\frac{l}{v}\right)^2 = \frac{1}{2} \times \frac{eu_2}{md} \times \frac{l^2}{\frac{2eu_1}{m}}.$$

We rewrite above formula to gain deflection distance s.

$$s = \frac{u_2 l^2}{4du_1}.$$

In above formula, there are neither parameter m, nor e, it shows the deflection distance S has little to do with the mass of the electron m, and as well, has little to do with the electric charge e. In practice, the designers use other prameters such as u_1, u_2, l and d to calculate deflection distance s.

This example shows although traditional electromagnetic theory has achieved many successful applications, but it does not mean the theory of nuclear structure is correct.

3.2. The Experiment of Electricity Produced by Friction
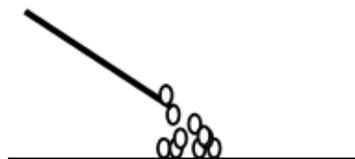

Figure 6. Charged glass rod attracts small objects

We all know that when glass rod rubs some other materials, the electricity is produced. Charged glass rod could attract small objects.

Now, the problem is: the small objects themselves are not charged, how could they be attracted by the electric force?

Maybe, it can be interpreted in many ways. Anyway, the traditional answer is not convincing.

However, according to new theory, the explanation is more reasonable. Both electrons and small objects can be regarded as energy particles. After the glass rod lost its electrons, it would attract other particles including the electrons, neutrons and some small objects [5,6,7].

4. The Conclusion

In this paper, the author introduces the an ancient contradiction in the history of physics. He points out the contradiction between the electromagnetic theory and Bohr theory: according to the electromagnetic theory, moving extranuclear electrons will radiate energy. However, according to Bohr theory, on some orbits, moving extranuclear electrons will NOT radiate energy. In order to solve this contradiction, the author proposes a new theory about nuclear structure. The nuclear structure is similar to that of the solar system. Including protons, neutrons and electrons, all particles are made up of other smaller particles. The smallest particle is photon. In the next step, the experimental studies were carried out. The experimental arrangement includes 4 sections: (1) neutron source, (2) sample, (3) electrostatic field, (4) imaging system. We let the neutrons pass through the electrostatic field to observe whether their routes change. In the experiment, the position of image on scale line shows the shift appears. Thus, we can infer that the neutrons deflect in the electric field. In the end, two examples are given to re-recognize the common electromagnetic phenomena. First example is about the movement rules of electrons in picture tube, the analysis shows the movements of the electrons have little to do with the mass of the electron m, and as well, has little to do with the electric charge e. Second example is the charged glass rod attracts small objects. The small objects themselves are not charged, why can they be attracted by the electric force? For this question, the author proposes new interpretation according to new theory.

Although the conclusion of this paper contradicts to the traditional view, it is really worth paying attention to.

Acknowledgments

References

[1]   Craft, Aaron E.; Hilton, Bruce A.; Papaioannou, Glen C. Characterization of a Neutron Beam Following Reconfiguration of the Neutron Radiography Reactor (NRAD) Core and Addition of New Fuel Elements. NUCLEAR ENGINEERING AND TECHNOLOGY. Volume: 48   Issue: 1 Pages: 200-210 Published: FEB 2016.

[2]   Abedi, Ali; Maitra, Neepa T.; Gross, E. K. U. Exact Factorization of the Time-Dependent Electron-Nuclear Wave Function. PHYSICAL REVIEW LETTERS. Volume: 105 Issue: 12 Article Number: 123002   Published: SEP 15 2010.

[3]   Agostini, Federica; Abedi, Ali; Suzuki, Yasumitsu; et al. The exact forces on classical nuclei in non-adiabatic charge transfer. JOURNAL OF CHEMICAL PHYSICS. Volume: 142, Issue: 8, Article Number: 084303, Published: FEB 28 2015.

[4]   Alexander, MH; Manolopoulos, DE; Werner, HJ.An investigation of the F+H-2 reaction based on a full ab initio description of the open-shell character of the F(P-2) atom. JOURNAL OF CHEMICAL PHYSICS. Volume: 113, Issue: 24, Pages: 11084-11100 Article Number: PII [S0021-9606(00)01648-2], Published: DEC 22 2000.

[5]   HU Qing-gui. Project of the unified field hypothesis and its experiment test. JOURNAL OF HENAN POLYTECHNIC UNIVERSITY (NATURAL SCIENCE), Volume: 28, Issue: 2, Pages:252-255 , Published: 2009, (in chinese).

[6]   HU Qing-gui. Only Essence of All Phenomena of Universe and Natural. Journal of Jishou University (Natural Science Edition), Volume:33, Issue: 4, Pages: 60-65, Published: 2012, (in chinese).

[7]   HU Qing-gui. New experimental scheme to measure the gravitational constant G among big objects. Journal of Hebei University of Science and Technology, Volume:29, Issue: 2, Pages: 115-118, Published: 2008, (in chinese).

[8]   Chen, GY; Lanza, RC. Fast neutron resonance radiography for elemental imaging: Theory and applications. IEEE TRANSACTIONS ON NUCLEAR SCIENCE Volume: 49 Issue: 4 Pages: 1919-1924 Part: 1 Published: AUG 2002.

[9]   Mor, Ilan; Dangendorf, Volker; Reginatto, Marcel; et al. Reconstruction of Material Elemental Composition Using Fast Neutron Resonance Radiography. PROCEEDINGS OF THE 10TH WORLD CONFERENCE ON NEUTRON RADIOGRAPHY (WCNR-10) Book Series: Physics Procedia Volume: 69 Pages: 304-313 Published: 2015.

[10] Nattress, J.; Ogren, K.; Foster, A.; et al. Discriminating Uranium Isotopes Using the Time-Emission Profiles of Long-Lived Delayed Neutrons. PHYSICAL REVIEW APPLIED Volume: 10 Issue: 2 Article Number: 024049   Published: AUG 30 2018.

[11] Feizi, H.; Ranjbar, A. H. Developing an Accelerator Driven System (ADS) based on electron accelerators and heavy water. JOURNAL OF INSTRUMENTATION   Volume: 11. Article Number: P02004   Published: FEB 2016

[12] MARSHALEK, ER; WENESER, J. Nuclear rotation and boson expansions. PHYSICAL REVIEW C Volume: 2 Issue: 5 Pages: 1682-+ Published: 1970.

[13] Lim, IC; Sim, CM; Cha, JE; et al. Measurement of the void fraction in a channel simulating the HANARO fuel assembly using neutron radiography. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT. Volume: 542. Issue: 1-3. Pages: 181-186. Published: APR 21 2005.

[14] Chadwick, M. B.; Herman, M.; Oblozinsky, P.; et al. Nuclear Data for Science and Technology: Cross Sections, Covariances, Fission Product Yields and Decay Data. NUCLEAR DATA SHEETS Volume: 112 Issue: 12 Special Issue: SI Pages: 2887-2996 Published: DEC 2011.

[15] Wu, Huarui; Khaykovich, Boris; Wang, Xuewu; et al. Wolter mirrors for neutron imaging. NEUTRON IMAGING FOR APPLICATIONS IN INDUSTRY AND SCIENCE Book Series: Physics Procedia Volume: 88. Pages: 184-189. Published: 2017.

[16] Bes, Daniel R. The BCS-BRST Solution to the Nuclear Pairing Problem: A Case of Broken Symmetries. FIFTY YEARS OF NUCLEAR BCS: PAIRING IN FINITE SYSTEMS Pages: 10-25 Published: 2013.

[17] MAGLIONE, E; POLLAROLO, G; VITTURI, A; et al. Absolute cross-sections of 2-nucleon transfer-reactions induced by heavy-ions. PHYSICS LETTERS B. Volume: 162. Issue: 1-3. Pages: 59-65. Published: 1985.

[18] Hilaire, S; Berger, JF; Girod, M; et al. Mass number dependence of nuclear pairing. PHYSICS LETTERS B. Volume: 531. Issue: 1-2. Pages: 61-66. Article Number: PII S0370-2693(02)01371-0 Published: APR 4 200.