

An Experimental Scheme for Verifying that Magnetic Force is Coulomb Force

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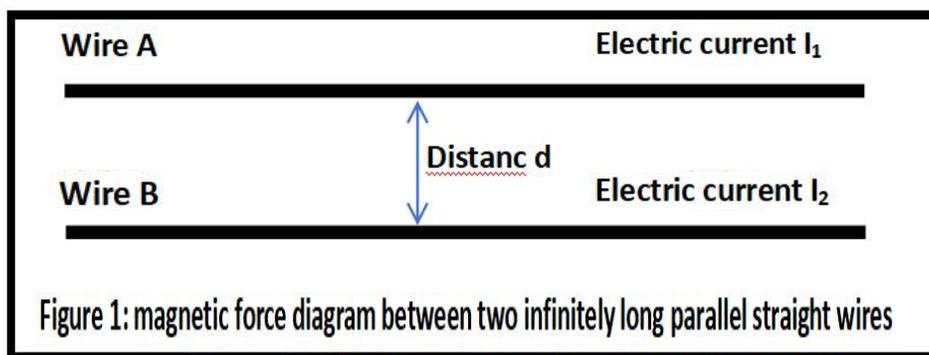
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Abstract

Recently, I have written a number of articles related to magnetism, and clearly pointed out that magnetism is only the vector superposition result of coulomb force of many charges in special combination and motion mode, and cited many evidences to support this conclusion. This paper further proposes to verify that magnetic force is coulomb force's experimental scheme. I hope that qualified experts and friends can refer to the relevant implementation of this experimental scheme in order to confirm the fact that magnetic force is coulomb force and my inference as soon as possible.

1. First, The Theoretical Basis of The Experimental Scheme

1.1. Calculation formula of Magnetic Force Between Parallel Straight Wires



As shown in Figure 1 above, the relationship between the magnetic force F per unit length between two infinite parallel straight wires and the distance D between them and the currents I_1 and I_2 is as follows :

$$F = \frac{\mu_0 I_1 I_2}{2\pi d} \quad \text{(Formula 1)}$$

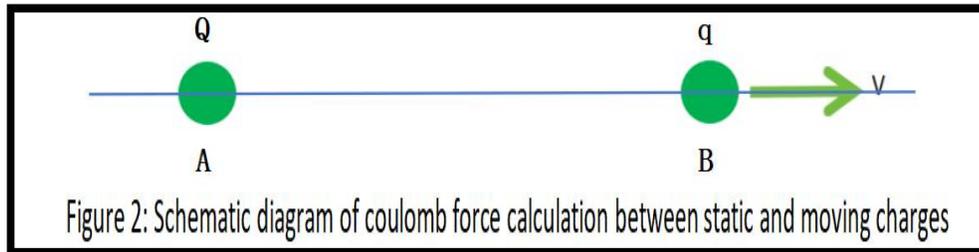
In the above formula, the direction of magnetic force is: when the current direction in two wires is the same, it is attractive, and when it is opposite, it is repulsive.

2. Calculation Formula of Coulomb Force Between Moving Point Charges

In my article “Analysis of the Relationship between coulomb force and Magnetic Force between Dynamic Charges Based on Atoms” (<https://www.toutiao.com/article/7348660275045302824/>), the relevant formulas are given :

A large number of physical phenomena and experimental results show that the speed of coulomb force interaction between charges is not infinite, but limited, which is probably related to the speed C

of light generated by a stationary light source in vacuum. Therefore, this paper intends to discuss the coulomb force between moving charges by taking the velocity C of light generated by a stationary light source in vacuum as the coulomb force interaction velocity that only exists between stationary charges. Coulomb force’s action speed is based on each charge, that is, the interaction speed of coulomb force, which only exists between relatively moving charges, should be superimposed with the relative motion speed of charges. As shown in Figure 2 below, when $t=0$, the charge Q at point A is stationary, while the charge Q at point B, which is apart from R, is moving away in a straight line at a uniform speed V, and the coulomb force between the two charges is :



$$F(t) = K \frac{Qq}{(R + Vt')^2} \quad \text{(Formula 2)}$$

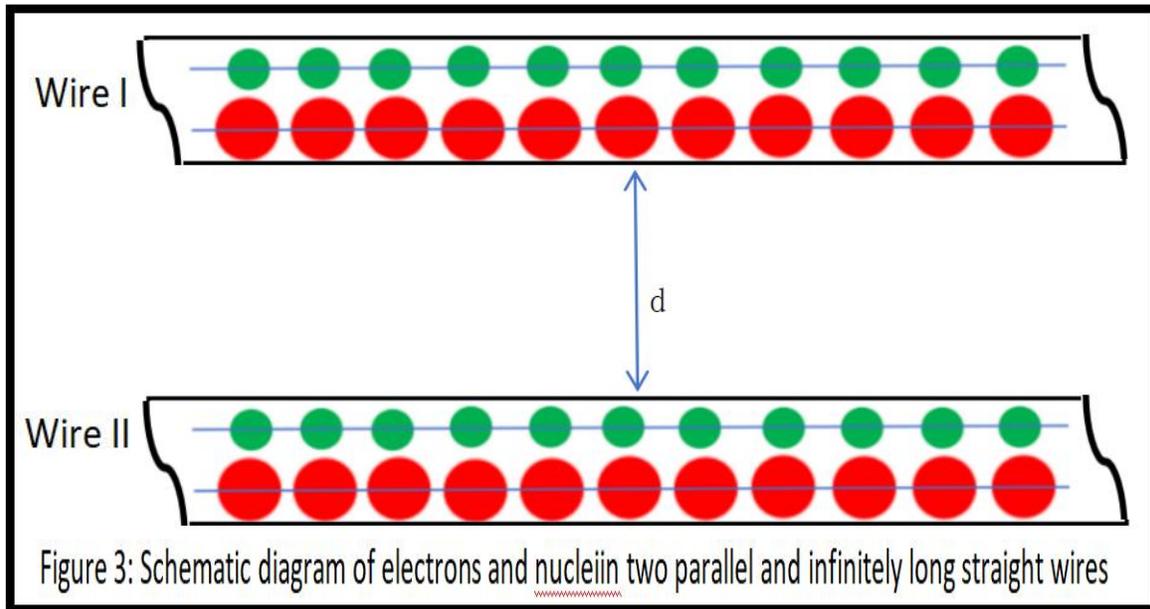
$$F(t) = K \frac{Qq}{\left(\frac{(C - V)(R + Vt)}{C}\right)^2} \quad \text{(Formula 2-1)}$$

From (Formula 2-1), it can be known that the coulomb force between two relatively distant charges will be larger than when they are relatively stationary. This is because the coulomb force of the charge at any time t is the coulomb force at the distance t' earlier.

3. Coulomb Force Calculation Formula Between Two Current-Carrying Parallel Straight Wires

As shown in Figure 3 below, there are two infinitely long straight wires with a distance d. When there is no current in the wires, the nuclei and electrons in their atoms still move around the common center of mass. At the same time, due to thermal motion, atoms will also thermally move at a certain frequency near the center of mass. However, because the number of the outermost electrons in

the atom moving in all directions is basically the same, there is no current in the macro, and there is no directional displacement of the outermost free electrons in the macro. But when a certain voltage is applied across the wire, there will be a current in the wire, that is, the directional displacement of the outermost electrons in the atom. However, its corresponding nucleus (precisely, it should be a positive ion with a unit positive charge that has lost one electron, the same below) is still basically static relative to the conductor in macro. For the convenience of discussion, we assume that when there is no current in the conductor, the free electrons in the conductor and their corresponding nuclei are stationary; However, when there is current, the free electrons in the conductor will move along the direction of the wire at a speed V, while the corresponding nucleus is still stationary relative to the conductor.



When there are currents I_1 and I_2 in wire I and wire II respectively, some of the free electrons in them will move directionally. Assuming that the free electrons in wire I and wire II move at speeds of V and U respectively, there are four kinds of coulomb force between the two wires, which are coulomb force between the moving free electrons in wire I and the moving free electrons in wire II and their corresponding static nuclei, and coulomb force between the static nuclei in wire I and the moving free electrons

in wire II and their corresponding static nuclei. Therefore, the resultant force f of coulomb force between the single moving free electron/corresponding nucleus of wire I and the single moving free electron/corresponding nucleus of wire II (see the derivation process in the article Analysis of the Relationship between coulomb force and Magnetic Force between Atom-based Dynamic Charges (<https://www.toutiao.com/article/7348660275045302824/>) for details) is as follows :

$$F = K \frac{e^2}{\left(\frac{(C-V+U)(R+(V-U)t)}{C}\right)^2} + K \frac{e^2}{R^2} + K \frac{-e^2}{\left(\frac{(C-V)(R+Vt)}{C}\right)^2} + K \frac{-e^2}{\left(\frac{(C-U)(R+Ut)}{C}\right)^2} \quad \text{(Formula 3)}$$

4. Magnetic Force Is Likely to Be Relevant Evidence of a Special Form of Coulomb Force

In my book “Magnetic force is only a detailed authentication of coulomb force between multiple charges in different combinations and motion States” (<https://www.toutiao.com/article/7360220640470696487/>), “The internal relationship between permeability of vacuum and Coulomb constant and its physical significance” ([https://www.toutiao.com/Articles such as article/7352413895493190171/](https://www.toutiao.com/Articles%20such%20as%20article/7352413895493190171/)) and “The motion and combination of charged particles are the reasons that determine many physical phenomena and experimental results” (<https://www.toutiao.com/article/7344640357612765715/>) have listed and verified the relevant evidence that magnetism is coulomb force in detail, so they are not detailed here.

4.1. Second, The Experimental Scheme to Verify that Magnetic Force is Coulomb Force

We can consider the following two ways to verify that magnetic

force is Coulomb force :

First, the interaction experiment between two parallel electron beams was carried out in a cloud chamber without magnetic field. Second, the experiment of magnetic interaction between two straight wires is carried out by using an electron beam instead of a straight wire.

5. Experimental Scheme of Interaction Between Two Parallel Electron Beams in a Cloud Chamber Without Magnetic Field (Scheme 1)

This scheme is equivalent to the magnetic experiment of two parallel straight wires with electron beam instead of wire: we can regard a beam of electron beam as a straight wire with the same current. According to the consensus that a straight wire with current will produce a magnetic field (if the current does produce a magnetic field), the electron beam will cause other current straight wires / charged particles nearby to be subjected to magnetic interaction: there should also be a magnetic interaction between

two parallel electron beams. But in fact, there may be no magnetic interaction, but only Coulomb force interaction. That is to say: in this case, only the first interaction force in formula 3 exists.

Because at present, the motion state of electrons and electron beams cannot be observed directly, only indirectly through the cloud chamber. We can carry out more than four kinds of experiments: first, two electron beams with the same speed and intensity are parallel, in the same direction and simultaneously injected into the cloud chamber; Second, two electron beams with the same speed and intensity are parallel, simultaneously and reversely injected into the cloud chamber; Third, two electron beams with different speeds and the same intensity are injected into the cloud chamber in parallel and in the same direction at the same time; Fourth, two electron beams with different speeds and the same intensity are injected into the cloud chamber in parallel, at the same time and in reverse.

It can be predicted that when two electron beams are close together, there is a static coulomb force between electrons in the same direction and at the same speed, which will repel each other. That is, the distance between two electron beams in the cloud chamber will increase with the distance of injection, but the mutual attraction/distance will decrease when there is no current in the same direction when two parallel straight wires are in parallel; The interaction law in other cases can be calculated by using the formula of coulomb force existing between moving charges, which is not detailed here.

6. Experimental Scheme of Interaction Between Two Straight Wires with One Electron Beam Instead of One Straight Wire (Scheme 2)

This scheme is equivalent to treating an electron beam as a straight wire with the same current, and it should generate a corresponding magnetic field around it (if the current can really generate a magnetic field), and there is a magnetic interaction between it and the nearby straight wire with current. In fact, however, only the first and third coulomb force terms in Equation 3 may exist, while the second and fourth terms (the coulomb force between the nuclei in two straight wires that are stationary relative to one wire and the coulomb force between the nuclei and the moving electrons in the other straight wire) are absent because there is no nucleus in the electron beam. That is to say, there are only two coulomb force terms between the other straight wire and the electron beam: the coulomb force between the electrons in the electron beam and the stationary nucleus in the other wire, and the coulomb force between the moving electrons in the other wire and the electrons in the electron beam.

In the experimental device for measuring the magnetic force between straight wires with constant current, after replacing a part of one straight wire with an electron beam with the same intensity current, the stress of the other straight wire without replacement is measured. With other experimental conditions unchanged, according to the current magnetic theory, the magnetic force on the

other straight wire should not change. But according to my point of view, the magnetic force on another straight wire will change obviously (from the original four coulomb force components to the vector superposition of two coulomb force components).

6.1. Third, The Prediction and Physical Significance of Experimental Results

7. Scheme 1 Possible Experimental Results

- **Regardless of the speed and direction of the two electron beams entering the cloud chamber, the distance between the electron beams will continue to increase.**
- The distance between the electron beams shooting into the cloud chamber varies with the entry speed and direction of the electron beam, and the distance becomes smaller in the same direction and larger in the opposite direction.
- The distance between two electron beams will not change with the injection speed and direction.

8. Possible Experimental Results of Scheme 2

- The magnetic force on another straight wire will change when it is replaced by an electron beam.
- The magnetic force on the other straight wire will not change when it is replaced by an electron beam.

9. Physical Significance of Experimental Results

- If the first situation in scheme 1 occurs, it is proved that there is only coulomb force between electron beams and there is no magnetic force.
- If the second situation in the first scheme occurs, it is proved that there is only magnetic force between electron beams, and there is no coulomb force.
- If the third case in option 1 occurs, it may be proved that the distance between the electron beams is not close enough or the total mileage of the interaction is not enough.
- If the first situation in the second scheme occurs, it is proved that the magnetic force is probably only the vector superposition result of coulomb force under special circumstances.
- If the second situation in the second scheme occurs, it is proved that there is a magnetic force between the electron beam and the straight wire, and there is no coulomb force. Can't prove that magnetism is coulomb force.

References

1. The author of classic field theory [America] C.S Herrick (2018) published by World Book Publishing Company.
2. The author of the classic field theory (Russia) L.D. Landau, (Russia) E.M. Lifushitz,(2021) Beijing Branch of World Book Publishing Co., Ltd.
3. Electromagnetics by Chen Bingqian, (2014) Peking University Press
4. The author of Optics (3rd Edition) Guo Yongkang (2017) published Higher Education Press.
5. Astronomy Tutorial By:Hu Zhongwei Sun Yang October 2019 Shanghai Jiaotong University Press

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6. "A new study on the phenomena of" diffraction "and" interference ", Hao Ji
 7. "New Discovery in Optical experiment", Facheng Yang
 8. Zou Wanquan (2011),32(11):20-55 Analysis on the formula of blackbody radiation energy density and Wien's displacement law [J]. Neijiang Science and Technology
 9. Huang Zhixun (2013),7(03):59-85Eight Problems Affecting the Development of Physics [J]. Frontier Science.

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