

# The Stripe of Electron Diffraction in Magnetic Field— A Counterexample. In Electric Field, the Result Will Be the Same

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## Research Article

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**The stripe of electron diffraction in magnetic field—a counterexample. in electric field, the result will be the same**

**[Short] The Significance to Do Electron Diffraction Experiment in Spark Chamber**

**Runsheng Tu**

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**Abstract**

As long as no one has done diffraction experiment in the spark chamber (DESC) , it makes sense to do this experiment. This experiment has two possible results: (1) Diffraction fringes cannot be obtained; (2) Path information and diffraction patterns can be obtained at the same time. If the result is (1), it provides direct and unambiguous experimental evidence for the existing Copenhagen quantum mechanics interpretation system, which can avoid some unnecessary disputes; If the result is (2), it will cause a scientific revolution in the field of quantum mechanics interpretation (After all, most people now think that "as long as the particle path is observed in the double slit experiment, the interference fringes will disappear"). "The result of the electron diffraction experiment in a magnetic field—diffraction fringes can still be obtained" was discovered. This finding provides an experimental evidence for DESC to be meaningful and predicts that the experimental result of DESC is the result (2).

**Keywords:** Electron diffraction experiment, Spark chamber, Magnetic field interference, Quantum mechanical interpretation, Quantum state superposition, Superposition state collapse.

**1. Introduction**

We are eager to find out whether we can obtain the path information and diffraction fringes at the same time for the double slit diffraction experiment. Can experiments directly prove this? Delayed choice quantum eraser do not directly affect the photons involved in the diffraction, but are validated by affecting the photons that have quantum entanglement with the photons involved in the diffraction [1–14]. Since the particles involved in the diffraction are not directly affected, the reliability of the experimental results is greatly reduced. R. G. Chambers has done an experiment in which a magnetic field interferes with electronic interference fringes [15]. However, this experiment is not an experiment in which the particles involved in the diffraction are interfered all the way, nor an electron diffraction experiment, but an electron microscope Model experiment. Therefore, it is independent of slit diffraction. Because microscopic particles can be instantaneously restored to the superimposed quantum state and the wave-particle binomial state after the interference is eliminated. Therefore, in the diffraction experiment under non-full-range interference conditions,

no matter whether the diffraction fringes are destroyed or not, the problem referred to in the title of this article cannot be proved.

To achieve unambiguous verification of whether path information and diffraction fringes can be obtained at the same time, it is necessary to directly interfere with the particles participating in the diffraction.

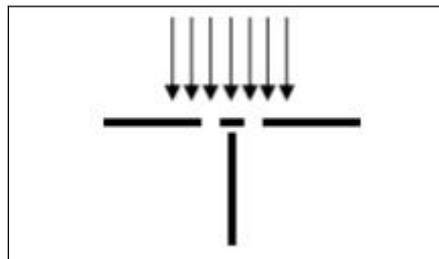
The principle of superposition of states in the existing quantum mechanics theory, the principle of wave-particle duality and the principle of uncertainty jointly determine that “as long as you observe, the superposition state will collapse, the wave-particle duality will be destroyed, and the uncertainty relationship will also be destroyed”, the diffraction fringes of microscopic particles will disappear. If it is said that the diffraction fringes will not disappear in the case of measurement interference, it denies the existing quantum mechanics explanation and threatens the wave-particle duality theory and the uncertainty principle. If the entire electron diffraction process is disturbed by the magnetic field, but the diffraction fringes do not disappear, it is a stronger proof that the existing quantum mechanics theory has serious defects (Found a dark cloud over quantum mechanics).

The author of this paper has done the whole electron diffraction experiment which is disturbed by the magnetic field, and obtained the electron diffraction pattern under the whole disturbance. On the one hand, this experiment proved that the so-called quantum superposition state of free electrons is doubtful, and on the other hand, it shows that electrons passing through different slits in double-slit electron diffraction can be separated to ensure that the diffraction fringes do not disappear. Thus, path information and diffraction fringes can be obtained at the same time.

Several experimental programs are introduced below.

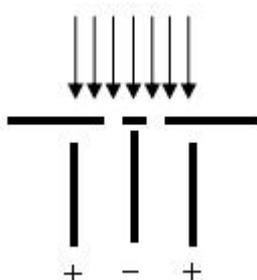
## **2. Experimental scheme to verify whether path information and diffraction pattern can be obtained at the same time**

The easiest way to obtain the path information and the diffraction pattern at the same time is to separate the exit sides of the two slits in the double-slit diffraction experiment (see Figure 1). This is the **experiment 1**. In this case, the two slits are independent of each other. Diffraction fringes will definitely appear, and it is very clear where the particles go. However, the diffraction fringes on the side of the partition will be compressed and deformed. In addition, the diffraction fringes on both sides of the partition are not related. Reducing the height of the partition can improve the correlation degree of the diffraction fringes caused by the two slits. The following is an improved experiment scheme (**Experiment 2**).



**Figure. 1.** Add a partition between the two slits.

One positively charged electrode plate is added to each side of the spacer plate in the device shown in **Figure 1**. Let the middle partition be negatively charged and the electrode plates on both sides positively charged (see **Figure 2**). The height of the three electrode plates is appropriately reduced. This is Experiment 2. As long as the interference of the electric field on the electron rays cannot eliminate the diffraction fringes, we can use experimental scheme 2 to obtain the path information and the diffraction pattern at the same time.



**Figure 2.** Double slit electron diffraction device with electrode separator. The cathode has only one plate, and the anode is two plates connected by wires.

In order to verify the significance of **Experiment 2**, I have done **experiment 3**. As shown in **Figure 3**, moving the permanent magnet with a strong magnetic field makes the electron beams interfere with the magnetic field all the way (In the past, people always considered monitoring and interference in a small area). The result of experiment 3 is that no matter how the electron rays are disturbed, the diffraction pattern will not disappear, but it will be deformed and shifted (see Figure 3). Although the experimental method is simple, the problem explained is unambiguous and the conclusion is very reliable (A large number of facts show: the simpler the experiment, the less controversial the conclusion). Readers can repeat **experiment 3** immediately. The method is to move one or two permanent magnets back and forth on the screen of the diffractometer to observe the changes in the diffraction pattern. As we all know, as long as there is a strong magnetic field close to the receiving screen, according to the existing theoretical judgment, the collapsed electronic wave function has no chance to restore to the state where the volatility plays a leading role. Of course, we can also do the electron diffraction experiment by giving the electron beam a fixed electric or magnetic interference throughout the process. In this way, the interfering magnetic field or electric field is relatively fixed, which facilitates some quantitative research.



**Figure 3.** The influence of the magnetic field on the electron diffraction pattern.

It can be seen from the results of experiment 3 that if an electron diffraction experiment is performed in a spark chamber, the electron path information and diffraction pattern should be obtained at the same time. Because there is only a weak electric field in the spark chamber, and experiment 3 proves that a strong magnetic field cannot destroy the electron diffraction pattern.

The novel result of **experiment 3** makes us very interested in doing **experiment 4**. **Experiment 4** is to do an electron diffraction experiment in a spark chamber (It can also just embed a spark chamber between the receiving screen and the double slit). Because **experiment 3** tells us that the weak electric field in the spark chamber cannot make the electron diffraction fringes disappear. There is no doubt that the movement path of electrons can be observed in the spark chamber. In this way, the purpose of "obtaining path information and diffraction pattern simultaneously" can be achieved by the electron diffraction experiment in the spark chamber. If no one has done an electron diffraction experiment in the spark chamber before, if you have conditions, please rush to do it!

### **3. Discussion on the Significance of the Experiment 3 and Experiment 4**

The existing quantum mechanics interpretation system believes that in the spark chamber, the high-speed electrons are in the collapsed state of quantum superposition, and can only show complete particle properties without electron diffraction. If experiments can directly prove that electron diffraction patterns can be obtained in the spark chamber, the existing quantum mechanics interpretation system will be seriously threatened. There are only three reasons for denying the significance of electron diffraction experiments in spark chambers: First, the theory predicts that electron diffraction patterns cannot be obtained in the spark chamber; Second, there are many experiments that indirectly show that electron diffraction patterns cannot be obtained in the spark chamber: Third, **Experiment 3** is too simple. There are several reasons why it is definitely meaningful to do electron diffraction experiments in the spark chamber: First, **experiment 3** has proved that the magnetic field cannot make the electron diffraction pattern disappear (A thousand indirect indirect proofs are not

worth the last direct experimental proof); Second, The existing interpretation system of quantum mechanics has been questioned by many people [16-20]; Third, for qualitative experiments, the simpler the experiment, the more reliable the qualitative conclusion will be; Fourth, in theory, it is entirely possible to establish local-realism quantum mechanics [21-23]. The literature [21-23] shows that the theory of quantum state superposition and wave function collapse theory means that do not support electrons does not support the existing quantum mechanics interpretation system. But one can not deny the mathematical formal system of quantum mechanics.

If, in a magnetic field, the wave function of the electron beam collapses and only exhibits particle properties, there will be no diffraction fringes in the electron diffraction experiment that is disturbed by the magnetic field. Once the experimental facts show that the volatility can be maintained in an electric or magnetic field and diffraction fringes appear, the existing quantum mechanics explanation is denied.

People say that Schrödinger's cat will collapse just by looking at it. However, I found through experiment (Exp. 3) that even with a whip, the Schrödinger cat does not collapse. The experiment is to use a magnetic field to interfere with the electron beam all the way to do an electron diffraction experiment. This is an exception to verify the interpretation system of quantum mechanics. The exception is a dark cloud above quantum mechanics. This dark cloud is also the fuse and guide for the quantum mechanics revolution. **Experiment 3** is an exception in quantum mechanics experiments. To find an experimental exception is to find the fuse of the scientific revolution.

If the experiment proves that the existing quantum mechanics interpretation system is wrong, this error must originate from the initial misinterpretation of the diffraction phenomenon of microscopic particles. This article advocates this kind of experimental verification. It is always meaningful to explore the essence of the diffraction phenomenon of physical particles and many other secrets of microscopic particles. Both electron diffraction experiments in the spark chamber and direct magnetic field interference electron diffraction experiments are good ways to explore the essence of electron diffraction. It can be proved that the electron does not interfere with itself when passing through the slit, and there is no need to explain the collapse of the superposition state.

In short, even the most profound theoretical predictions are no match for simple, direct and unambiguous experimental conclusions. Also consider that the cost of doing electron diffraction experiments in the spark chamber is not high. The experiments suggested in this article are meaningful and necessary.

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**Statement:** I declare that the authors have no competing interests as defined by Nature Research, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

# Figures

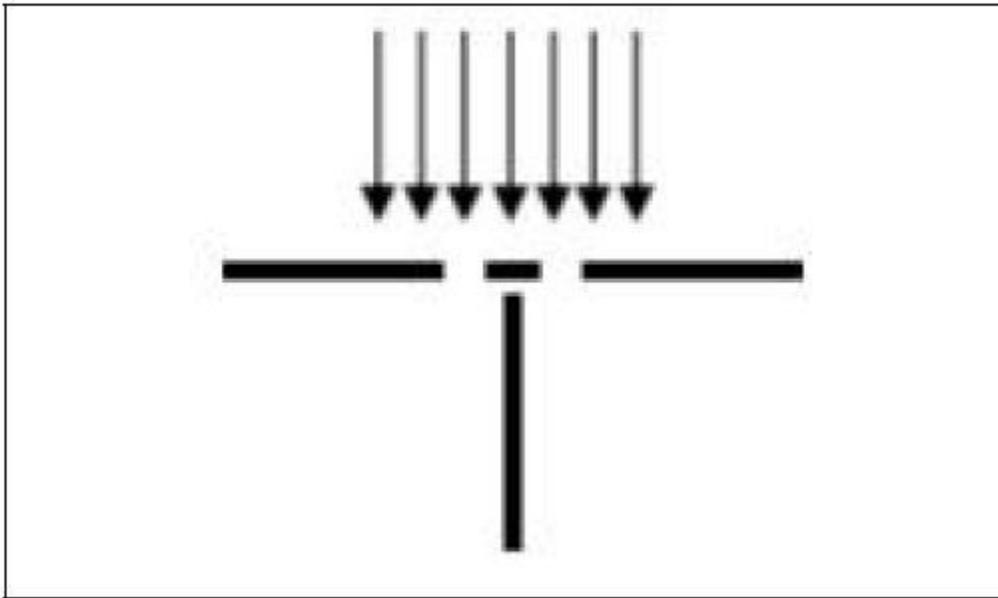


Figure 1

Add a partition between the two slits.

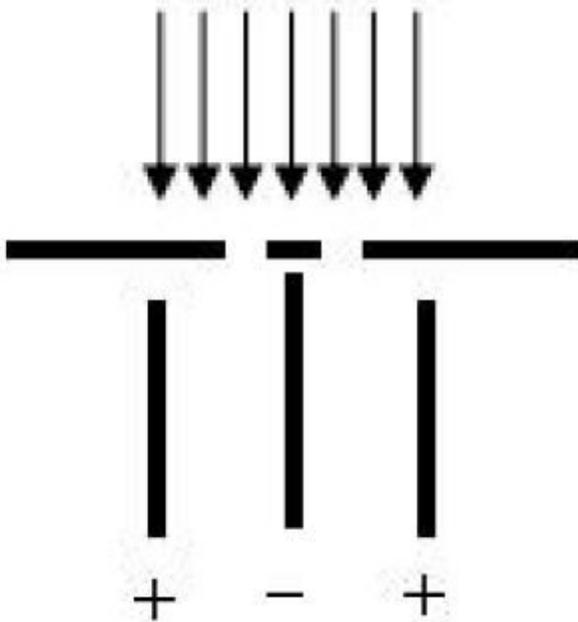
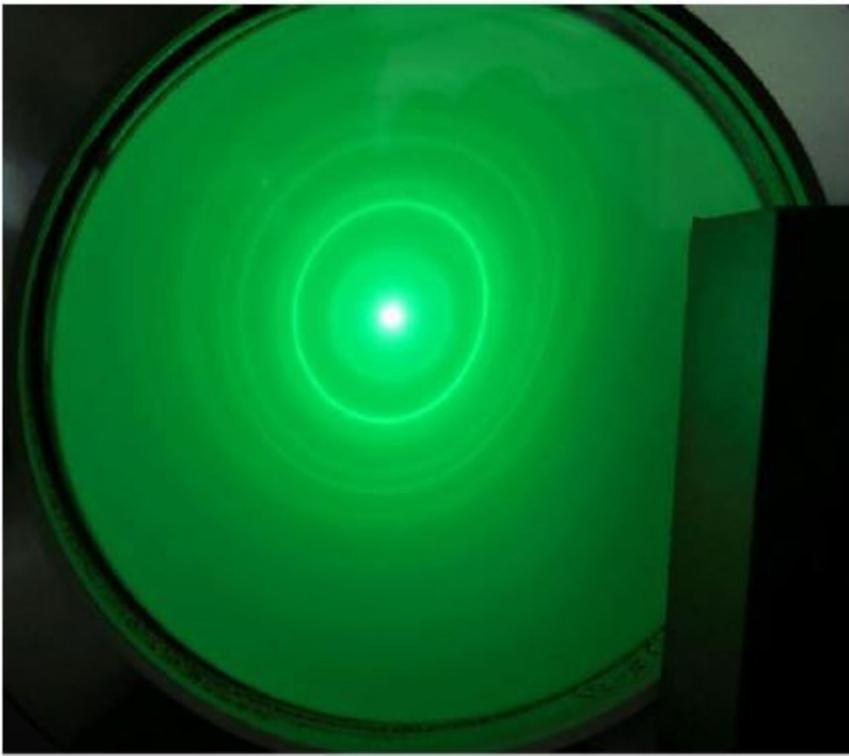


Figure 2

Double slit electron diffraction device with electrode separator. The cathode has only one plate, and the anode is two plates connected by wires.



**Figure 3**

The influence of the magnetic field on the electron diffraction pattern.