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Electromagnetic induction in zero magnetic field. Is it ssible?

Question by D.D. Stoinov, D.D. Stoynov: What is magnetism?
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It has been reported that experiments have been conducted and electromagnetic induction has been performed in a zero magnetic field that contradict Faraday's law.

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1. Introduction

Magnetism is one of the most mysterious electromagnetic phenomena. That is why it should be explained on the basis of the known laws for these phenomena. Turns out that's not always the case. Experiments have been conducted that seem to contradict some of these laws. So what is magnetism? Is this question relevant now?

2. Emergence of electromotive force in a zero magnetic field

There is a rule that if inside a closed loop that does not carry an electric current, no magnetic field can occur and it will always be zero. Therefore, if an electric current flows along the hollow wire (Fig.1), then inside, in the closed loop with radius *r*, the magnetic field must be zero

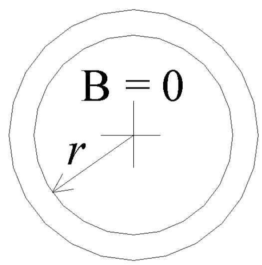

Fig.1. The magnetic field inside a hollow wire along which electric current flows is zero (B=0)

Let another wire be placed in a hollow wire (Fig.2). The question is, if an alternating electric current flows through the hollow wire 1, will an electromotive force be induced in the inner wire 2, even though the magnetic field inside will always be zero?

It turns out that the answer must be yes. This is confirmed by our experiments. When an alternating current flows along the hollow wire 1, an electromotive force is excited in the central wire 2 and an alternating voltage is measured on the voltmeter.

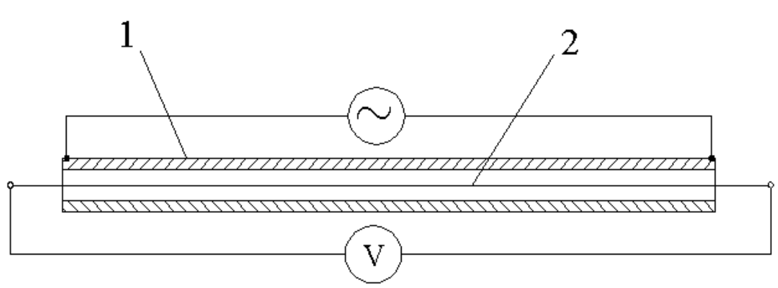

Fig. 2. Hollow conductor with central conductor

The general appearance of the experimental setup is shown in Fig.3. In this particular case, a coaxial cable type RG174 with a length of about 1.8 meters is used for the hollow wire. The copper braid of the same cable serves as a hollow conductor, and the inner conductor serves as a central conductor. In order to avoid external interference, the coaxial cable was placed in a steel tube with a diameter of 6 mm. For convenience, the steel pipe is bent in the shape of a circle.

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For this experiment to be successful, a steel pipe must be used. Thus, the measured signal is amplified many times over.

Fig.3. General view of the experimental setup.

3. Mutual induction in zero magnetic field

If an electric current flows through a bent wire (Fig. 4), it does not produce a magnetic effect, i.e. its magnetic field will always be zero.

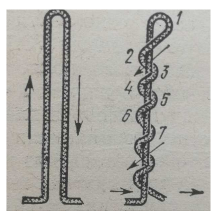

Fig.4. The magnetic field of a bent wire is zero

Let's make two solenoids (coils) with a bent wire (Fig.5). If an electric current were to flow through each of them, they would produce no magnetic action because their magnetic field would always be zero.

Fig. 5. Two solenoids with zero magnetic field

In the particular case, in our experiment, the first coil has 280 turns of bent insulated wire with a diameter of 0.5 and an active resistance of 6.3 Ω, and the second has 50 turns and an active resistance of 1 Ω

Let's put the two solenoids in the most convenient position for mutual induction between them (Fig.6). The question is, is it possible to have a mutual induction between these two solenoids, that is, if an alternating electric current flows in the primary coil, an electromotive force is also excited in the secondary coil?

According to Faraday's law, in order to induce an electromotive force in a closed electric loop, the magnetic flux passing through it must change.

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$$E = \frac{d\Phi}{dt}$$

where E is the induced electromotive force in the secondary winding, and Φ is the magnetic flux.

In this case, although the electric current flowing in the first coil is variable, the magnetic flux will always be zero $(\Phi = 0)$. Therefore $d\Phi = 0$, and also $E = 0$, i.e. the result must be zero, because in order for an electromotive force to occur, according to Faraday's law, a change in the magnetic field is required.

Here is a way around this law, ie. to carry out a successful energy exchange experiment between the two solenoids. For now, we refrain from showing how Faraday's law is circumvented. This is a question for electrodynamics scientists. Actually, this is the easier question. The task of how to theoretically explain the obtained result is more difficult. This is to answer the question posed here. What is magnetism?

Fig. 6. Electromagnetic induction between two solenoids with zero magnetic field.
1. Primary coils, 2 place of bending, 3 secondary coils, 4 place of bending, 5 voltmeter

4. Conclusion

Experiments have been conducted and electromagnetic induction has been carried out in a zero magnetic field, which contradict Faraday's law. That is why asking the question what is magnetism is justified. So what is magnetism, how do you theoretically explain the results so obtained? That is our question.

We put this question to the electrodynamics scientists. We hope it will arouse interest among a wider audience.

We are ready to show our experiments. Also, if we are asked the question what is magnetism, our answer will be positive. Yes, perhaps we know what is physical cause of the magnetism.