Experimental designs to prove the existence of two types magnetic fields

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Abstract

In a previous paper of the author’s, two types of magnetic fields were proposed and discussed. The two types of magnetic fields should have very different properties with respect to the observer’s motion state. For convenience to discuss, here we name them absolute magnetic field and relative magnetic field. The absolute magnetic field is the magnetic field produced by permanent magnets or by electric currents in neutral wires, which is very familiar to us. Its magnitude is invariable with respect to the motion state of the observer. The relative magnetic field is the magnetic field produced by directional motion of like charges, of which, the magnitude is variable with respect to the motion state of the observer. Here in this article, experimental designs are proposed, by which the existence of the relative magnetic field can be proved.

Keywords: The magnetic field of a moving like charges; relative magnetic field.

1. Introduction

In a previous paper [1] of the author’s, two types of magnetic fields were proposed and discussed. The two types of magnetic fields should have very different properties with respect to the observer’s motion state. For convenience to discuss, here we name them absolute magnetic field and relative magnetic field. The absolute magnetic field is the magnetic field produced by permanent magnets or by electric currents in neutral wires, which is very familiar to us. Its magnitude is invariable with respect to the motion state of the observer. The relative magnetic field is the magnetic field produced by directional motion of like charges, of which, the magnitude is variable with respect to the motion state of the observer. Here in this article, experimental designs are proposed, by which the existence of the relative magnetic field can be proved.

First, let’s see the magnetic fields. One is produced by a current loop wire and the other is by a spinning charged ring, as shown in figure1.

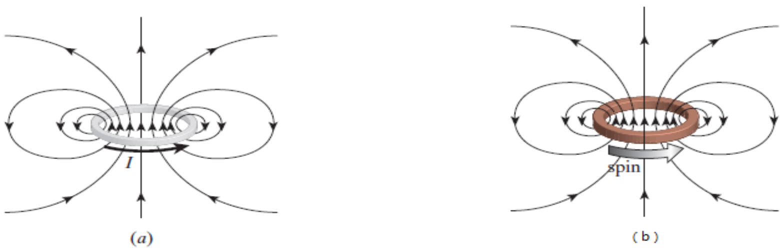

Figure 1. (a) Magnetic field around a current loop. (b) Magnetic field of a charged spinning ring

In (a), it is a magnetic field around a loop of a wire carrying a constant current. In (b), it is a magnetic field around a charged spinning ring. According to electromagnetic theory, the magnetic field of charged spinning ring is identical to that of a current loop [2, 3]. If the current produced by the spinning ring equals to the current of the wire loop, the two magnetic fields are exactly the same. So, from the view of field, if there is a charged particle cutting cross the fields, the particle will experience an exactly same Lorentz force in both magnetic fields. If a conductor rod moves cutting the magnetic field, an electromotive force will appears in the two end of the rod in both fields.

However, from the view of relative motion, if the charged particle or conductor rod synchronous moves with the spinning ring, the particle or the rod will feel no electric current and magnetic field from the charged ring. Their relative motion state is just identical to the state of both motionless. So, from this view, the charged particle will feel no Lorentz force and there will be no electromotive force produced in the two ends of the conductor rod in the magnetic field of the spinning charged ring. If we experimentally prove that no electromotive force produced in the two ends of the conductor rod which moving synchronous with the spinning charged ring, it will be an evidence of the existence of the relative magnetic field. So, we can conclude that there are really two types of magnetic fields in the world and our current definition of magnetic field is not suitable to the relative magnetic field.

2. Experimental designs

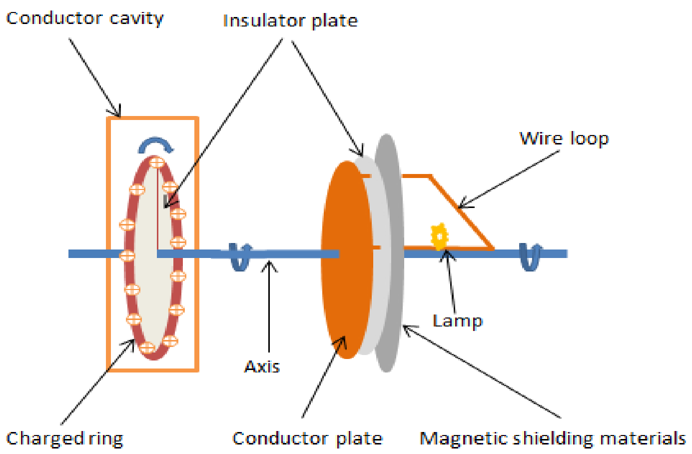

Figure 2. Experimental design

In the experimental design, the spinning charged ring is completely covered with the conductor cavity, so the there is no electric field outside the cavity except a magnetic field. On the left, the sandwich structured plate is composed of three disks. From the left to right is conductor disk, insulator disk and magnetic shielding disk. The use of the magnetic shielding materials will avoid the counteraction of the electromotive forces of the right and left parts of the wire loop if any of that produced. To keep from any electric leakage from the wire loop to the magnetic shielding materials, the wire and the magnetic shielding materials should be separated with insulator materials.

3. Discussion

During the experiment, we rotate the axis in high speed, so the charged ring and the sandwich plate will rotate synchronous. Now, we observe if the indicator lamp lights up. If the magnetic field of the spinning charged ring is identical to that of a current loop of neutral wire, there should be a current flow through the wire loop in the figure 2 and the lamp will light up. If the magnetic field of the spinning charged ring is a relative magnetic field as what we estimated, there should not be a current flow through the wire loop in the figure 2 and the lamp will not light up.

If that the lamp does not light up is due to the fact that the magnetic field of the spinning charged ring is not strong enough, the experimental result will prove nothing valuable. So, we need to perform a parallel experiment with a current loop of neutral wire to replace the spinning charged ring, as shown in figure 3. The importance is that we need to make the current is the same as that produced by the spinning charged ring in figure 2.

During the experiment, the current loop, which produces the magnetic field, does not rotate with the axis. If the lamp light up in this experiment, but not in the experiment of spinning charged ring, the existence of relative magnetic field will be firmly proved. If the lamps do not light up in either of the two experiments, we need to increase the magnetic field to continue the experiment.

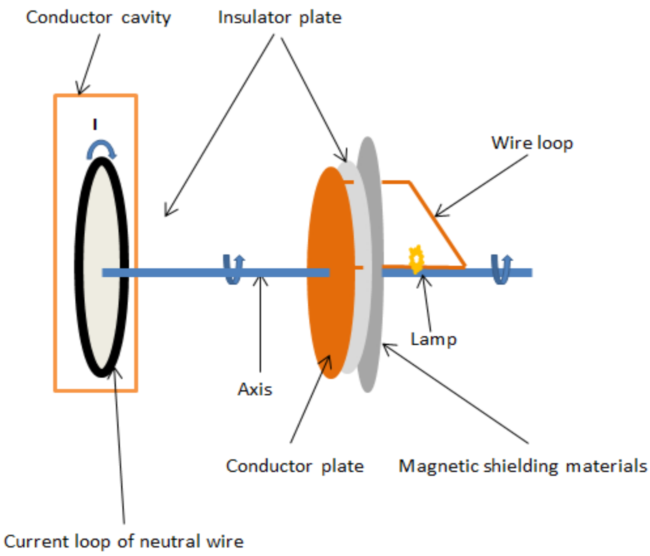

Figure 3. Parallel experimental design

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