# New approaches to the generation of induced current

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## Abstract

Electromagnetic induction is that an induced current and an induced electromotive force will be generated in the closed circuit coil when a part of the coil cuts the magnetic field line. Magnets are essential in during the process. In this paper, we found that the induced current and induced electromotive force can be still generated in the closed circuit coil without external magnets. In addition, when light, heat and wind energy are applied, the induced current and induced electromotive force generated in the coil will increase. This research result further proves the Collision Electro–Magnetic Theory (CEMT) that we put forward earlier. Air movement will be accelerated by light, heating or wind blowing, and the increase of collision strength and collision frequency will lead to the increase of an electromagnetic field strength, thereby resulting in the increasing of the induced current and induced electromotive force. This is a completely innovative approach to energy harvesting, which opens up new possibilities for non-electromagnetic induction. Just like the invention of electromagnetic induction by Faraday in 1831, the induced current is in the microampere level. But it is a milestone progression.

**Key Words**

Induced current; Non-electromagnetic induction; Light, heat and wind energy; Collision Electro-Magnetic Theory

## 1 Introduction

Electromagnetic induction, sometimes also called magnetic induction, is related to the production of electromotive force (EMF) across an electric conductor when there is a change occurring in the magnetic field. In 1831, Michael Faraday discovered the phenomenon of electromagnetic induction for the first time [1]. When a coil cuts the magnetic force line, an induced current will be generated in the coil. Now non-electromagnetic induction power generation has developed gradually [2], such as solar power generation [3, 4], body temperature power generation [5, 6], and temperature difference power generation [7, 8]. Searching for green new energy and renewable sources has always been a topic and focus [9].

Our recent research found that cutting the electric field line would lead to the generation of the induced current and induced electromotive force in the closed circuit coil. What is more exciting is that the induced current and induced electromotive force can also be generated in the closed circuit coil even without an external magnet. Moreover, by lighting, heating, and wind blowing around the rotating coil, the induced current and induced electromotive force generated in the coil will increase. This work further proves the Collision Electro-Magnetic Theory (CEMT) that we put forward before. It provides a new way for the generation of green new energy and renewable energy.

## 2 Results and discussions

Our previous research proved that an electromagnetic field will be generated when an object collides with one another [10-13]. Then, what about various atmospheric molecules and small particles in the atmospheric air? Is there any electromagnetic field generated by the continuous movement and collision of them? The electromagnetic induction generator is a device that demonstrates electromagnetic induction. When a closed circuit coil cuts the magnetic field line, an induced current and an induced electromotive force will be generated in the coil. Here we remove the two magnets of the

electromagnetic induction generator as the experimental device, as shown in Figure 1a. Rotate the generator exposed in the air. What will happen next? An induced current nearly of 0.73 uA and induced electromotive force nearly of 1.36 V were generated in the closed circuit coil, as shown in Figure 1b and Figure 1c. There is still an induced current and induced electromotive force generated in the coil without external magnets.

Next step, we will investigate the effect of light on the induced current and induced electromotive force. The desk lamp was used to light up the generator as shown in Figure 1d. Turn on the lamp, and go on rotating the coil at the same speed. We found that the induced current and induced electromotive force in the coil increased from 0.73 uA to 2.08 uA, and from 1.36 V to 4.73 V, respectively. (Figure 1e and Figure 1f) Turn off the lamp, and the induced current and induced electromotive force decreased again. (Video S1 in the Supplementary Materials) The induced current and induced electromotive force generated in the coil increase with increased light.

We went on the experiment with a hot plate to heat the surrounding of the coil and investigated the effect of heat on the induced current and induced electromotive force as shown in Figure 1g. Rotate the coil in the same speed. We found that the induced current and induced electromotive force increased with the rising of air temperature around the coil. As shown in Figure 1h and Figure 1i, the induced current increased from 0.76 uA up to 2. 81 uA and the induced electromotive force increased from 1.31 V up to 4.3 V, when the air temperature rose from the indoor temperature up to 40 ℃. (Video S2 in the Supplementary Materials) The induced current and induced electromotive force generated in the coil increase with temperature rising.

We designed another experiment with the wind blowing. (Figure 1j) The wind blew the coil. Rotate the coil in the same speed. We found that the induced current and induced electromotive force in the coil also increased. As shown in Figure 1k and Figure 1l, the greater the wind speed, the greater the magnitude of the induced current. When the wind ceased, the induced current decreased. (Video S3 in the Supplementary Materials) The

induced current and induced electromotive force generated in the coil increase with wind speed increase.

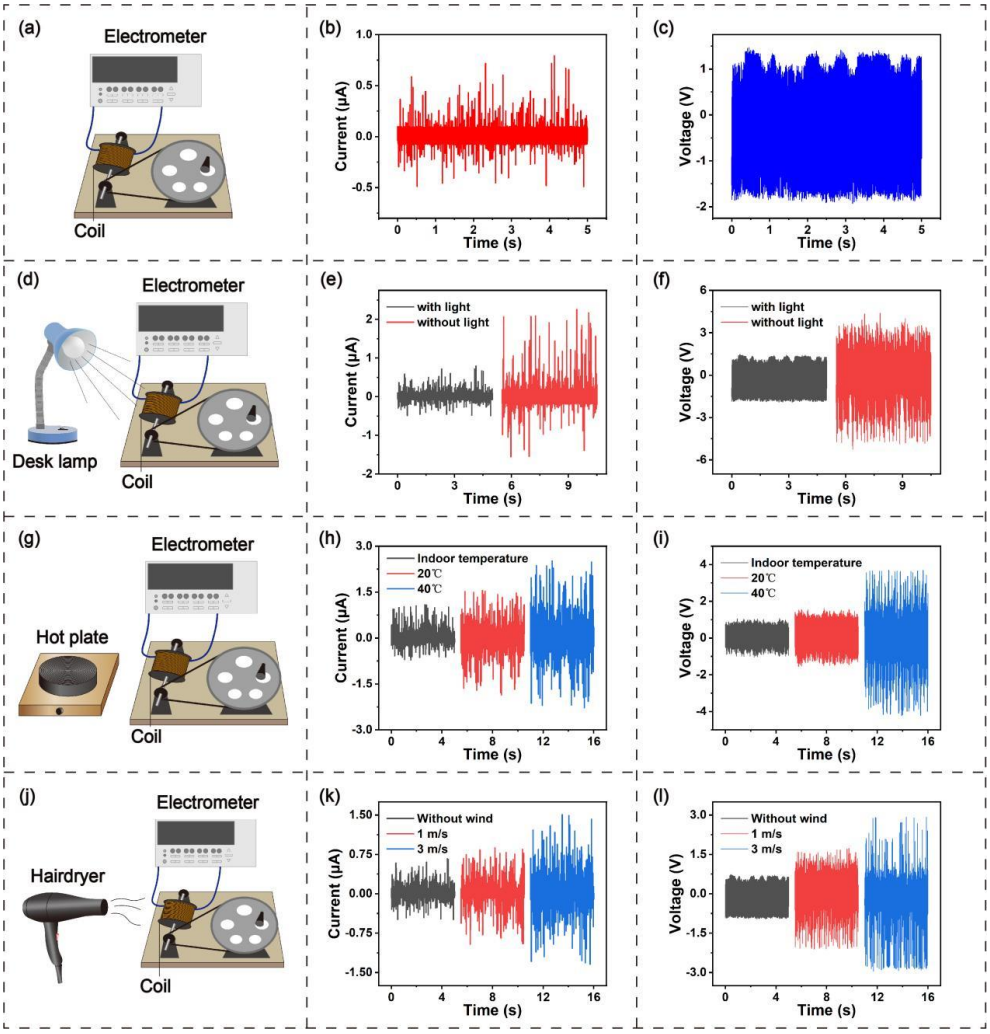


Figure 1 (a) The experimental device of the electromagnetic induction generator without the two magnets; (b, c) The induced current and induced electromotive force when the coil was rotated in the air; (d) The experimental device of the desk lamp for brightening up the generator; (e, f) The induced current and induced electromotive force when the coil was brightened up by the desk lamp; (g) The experimental device of the hot plate for heating the surrounding of the coil; (h, i) The induced current and induced electromotive force when the air temperature around the coil increased from the indoor temperature to 40 ℃; (j) The experimental device of the hairdryer for wind blowing; (k, l) The induced current and induced electromotive force when the coil was blown under different wind

speeds.

My previous research has shown that electromagnetic energy will be generated when matter collides with each other，including macroscopic objects collisions and microscopic particles collisions [14], in which I put forward the Collision Electro–Magnetic Theory (CEMT). When the desk lamp is turned on, two factors cause the increase of the electromagnetic field strength. One is that light can heat the surrounding atmospheric air which leads to an increase in collision frequency and collision strength of the aerosol particles and air molecules. And the strength of electromagnetic field will increase as result. The other is that light itself is an electromagnetic wave, which will also enhance the electromagnetic field strength, thereby increasing the induced current. Both heating and wind blowing intensify the collision of air molecules and the aerosol particles in the surrounding atmospheric air of the coil. The strength of the electromagnetic field increases, so both the induced current and induced electromotive force increase. These experimental results further prove the CEMT that we put forward before.

## 3 Conclusions

In summary, our work indicates that the induced current and the induced electromotive force can be generated by the electromagnetic induction generator without external magnets. In addition, light, heat, and wind blowing will contribute to the increase of the induced current in the closed circuit coil. All this further confirm the Collision Electro–Magnetic Theory (CEMT). Air movement will be accelerated by light, heating or wind blowing. And the increase in collision strength and collision frequency will lead to an increase in the electromagnetic field. This research develops a completely new approach to energy harvesting. Just like the invention of electromagnetic induction by Faraday in 1831, the induced current is at the microampere level. But it is a milestone progression. A new gate is being opened for green energy which makes non-electromagnetic induction possible.

## 4. Experimental methods

**The generation of induced output by rotating the coil in the air**

An electromagnetic induction generator was used to generate the induced current by rotating the coils (Diameter of wire: 0.5 mm, Number of turns: 500) in the air after the two magnets of the generator were removed.

**The generation of induced output by rotating the coil illuminated by a desk lamp**

A desk lamp (9 W LED) was used to provide the light. The electromagnetic induction generator without the magnets was rotated under the light to measure the induced output in the coil.

**The generation of induced output by rotating the coil heated by a hot plate**

A hot plate (Temperature-regulated electric furnace, DRL-1500 W) was used to heat the surrounding of the coil. The electromagnetic induction generator without the magnets was rotated at different air temperatures to measure the induced output in the coil.

**The generation of induced output by rotating the coil blown by a hairdryer**

A hairdryer (XM-3382, 2100 W) was used to blow the coil. The electromagnetic induction generator without the magnets was rotated at different wind speeds to measure the induced output in the coil.

**Electrical measurement**

The current and voltage were measured by an electrometer (Keithley 6514) with computer measurement software written in LabVIEW.

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## Acknowledgments

International and domestic patents have been filed to protect the reported inventions.