

How does the shape of a coil affect the generation of electricity

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Back ground

When the Great East Japan Earthquake happened on 03.11.2011, people faced a serious lack of electricity because the Fukushima Daiichi Nuclear Power Station was stopped. So, we thought about an easy way to generate electricity that local people can do and we focused on Electromagnetic induction. Electromagnetic induction generates induced current from the change of magnetic field. Moreover as someone explores we knew that this method to cross-section and number of turns.

Hypothesis

We thought that changing the cross-sectional area equal to the regular circle would cause a change in induced current. In addition, we considered area equal to the regular circle would cause a change in induced current.

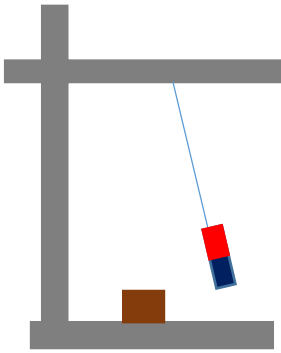


Figure1-Experimental schematic

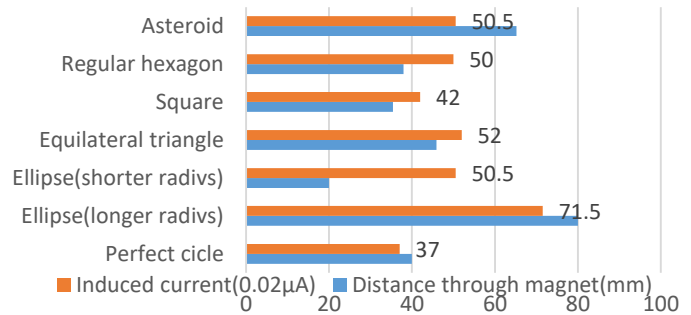
Method

1. Cut out 6 different shapes but with the same cross sectional from styrene foam.
2. Wind the enameled wire around each shape 300 times.
3. Connect both ends of the coil to a galvanometer.
4. Bind a magnet to a thread and make an experimental device like that in Figure1 .
5. Swing the magnet and cause an electromagnetic induction. Then record the number shown on the galvanometer.
6. Do this step ten times and take the average.
After this work, compare the data.

Figure2-A figure of a section and its size

Figure	Radius	Figure	Side
Circle	20	Square	35.449
Ellipse	Longer:40 Shorter:10	Regular hexagon	21.993
Asteroid	32.660	Equilateral triangle	53.870

Result



< Distance >

Ellipse (longer radius)

Asteroid

Equilateral triangle

Perfect circle

Regular hexagon

Square

Ellipse (shorter radius)

< Induced Current >

Ellipse (longer radius)

Equilateral triangle

Ellipse (shorter radius)
· Asteroid

Regular hexagon

Square

Perfect circle

Conclusion

- This result tells that more induced current passes through the longer radius of ellipse of coils than perfect circles ones.
- The perfect circle one and the ellipse (shorter radius) one were different from our hypothesis. This is because how you roll the enameled wires on each coils by hand has differences each time. The results were almost the same as our hypothesis on the other shapes.
- Therefore we think there is a positive correlation between length that a magnet travels above the coils and the amount of induced current.

Reflection and future outlook

- We arranged the number of turns on each coil but we made differences of how tight we wound the enamel wires between each coil, so we couldn't have a perfect experiment to prove our hypothesis is correct or not.
- The real amount of induced current was smaller than we expected so we couldn't use the ammeter to measure the exact number of it. We used the galvanometer, this is one of the reasons why we got the error on the amount of induced current.
- We'd like to reduce work done by hand as much as possible.
- We will make use of our reflection on the next experiment.
- We expect to do it more carefully with plenty of time.