Experiment P-44
Static Electricity

Physics

Objectives

- To learn about static electricity and how it is created.
- To produce static electricity by rubbing different materials against each other, in order to measure it.

Modules and Sensors

- PC + NeuLog application
- USB-200 module
- NUL-246 Charge logger sensor

Equipment and Accessories

▪ Metal can
▪ Metal container (larger than the can)
▪ Plastic insulator (a plastic plate or cover)
▪ Felt
▪ Plastic ruler
▪ Other small materials

Introduction

Static electricity is the result of an imbalance between negative and positive charges in an object. Charges build up on the object's surface until they find a way to discharge. By rubbing certain materials against each other, negative charges can transfer from one object to the other.

For example, when rubbing a balloon against a woolen fabric or your hair, the balloon becomes negatively charged and the hair/fabric becomes positively charged.

In this experiment we will rub together different objects and measure their charge with a charge logger sensor. A Faraday cage will be used to protect the objects from external electric fields.

Procedure

Experiment setup

1.   Set up the experiment as shown in the picture below.
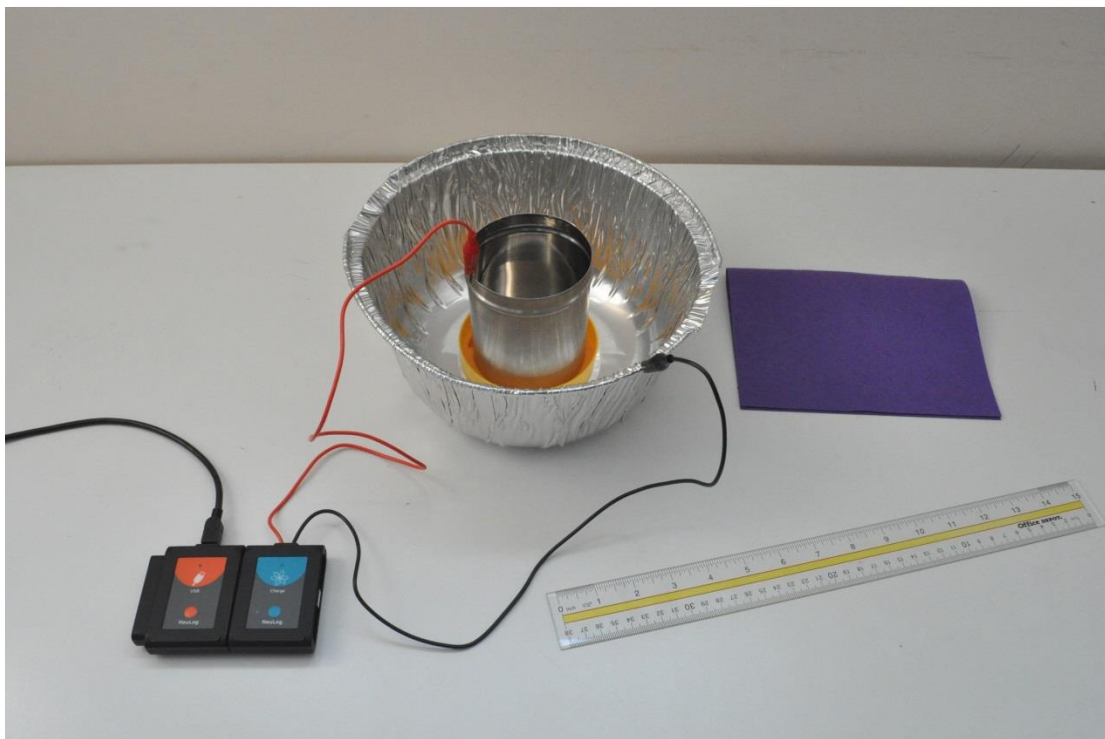
2.   Insert the plastic insulator into the large metal container.

3.   Put the metal can on top of the insulator.

4.   Attach the charge sensor's red cable to the can.

5.   Attach the charge sensor's black cable to the large container. The container will protect the can from external electric fields.

Sensor setup

6.   Connect the USB-200 module to the PC.

7.   Check that the charge sensor is connected to the USB-200 module.

Note:

The following application functions are explained in short. It is recommended to practice the NeuLog application functions (as described in the user manual) beforehand.

8.   Run the NeuLog application and check that the charge sensor is identified.

Settings

9.   Click on the **Sensor's Module** box.

10.   Select the +/- 100 nC button to change the sensor's mode.
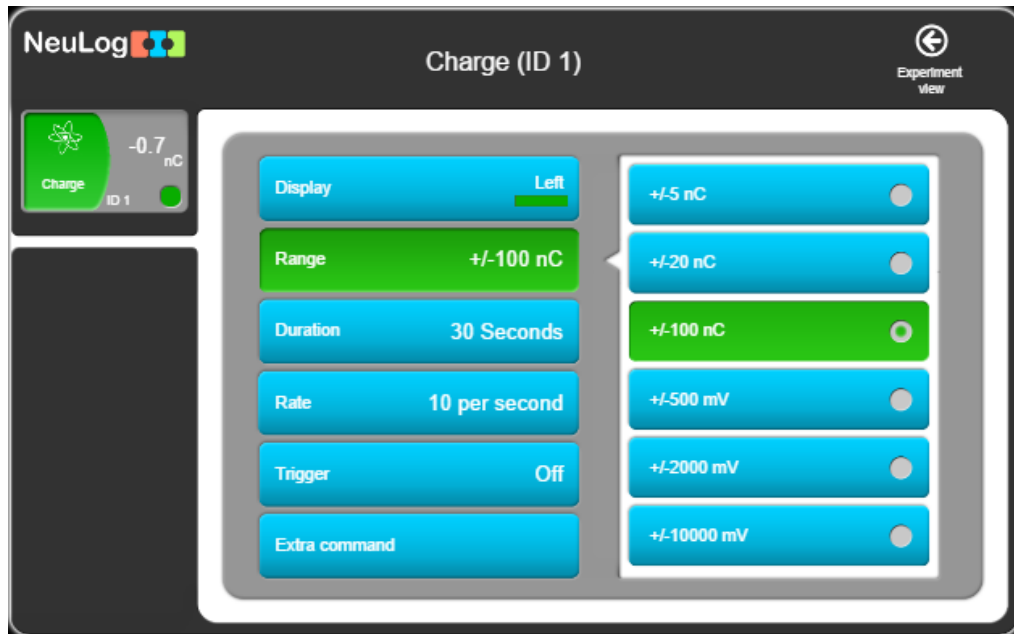
11.   Click on the **Run experiment** icon and set the:

Experiment duration to 30 seconds
Sampling rate to 10 per second

Testing and measurements

12.   Click on the **Record** icon [●] to start the measurement.

13.   Rub the plastic ruler on the felt for about ten seconds and then put it inside the can without touching its surface.

14.   After a few seconds, take out the ruler (without touching the can's surface).

15.   Your graph should be similar to the following:
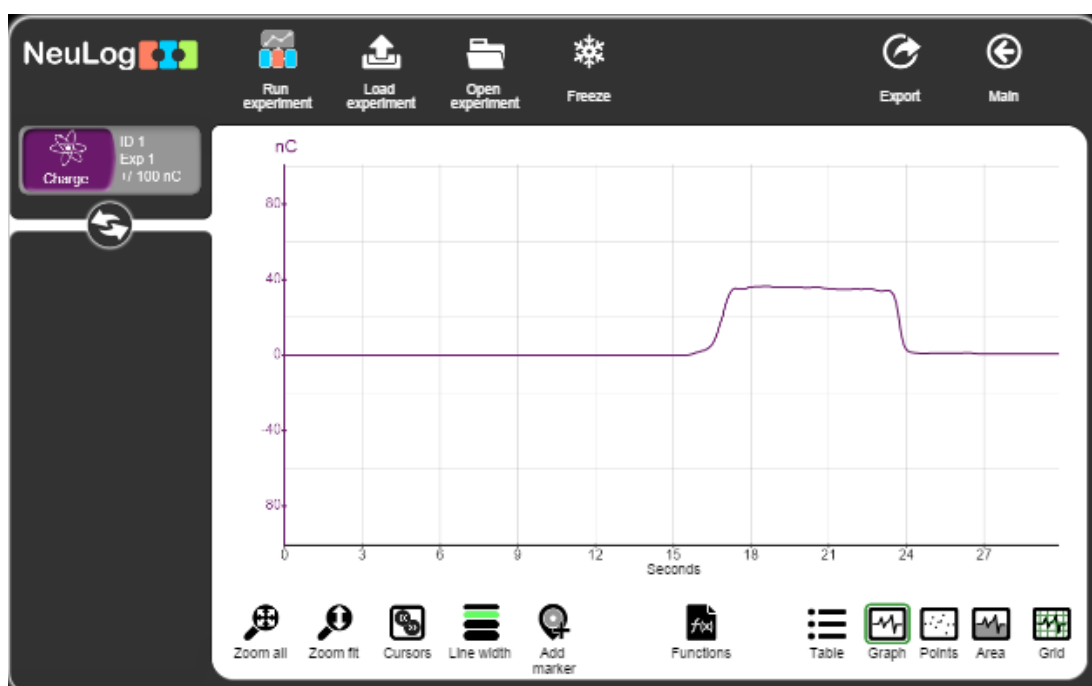
16.   Click on the **Export** Icon [↗] and then on the **Save value table (.CSV)** button to save your graph.

17.   Click on the [←] icon to go back to the graph.

When you rubbed the ruler on the felt, electrons moved from the ruler to the felt, leaving the ruler positively charged.

Challenge research

18.   Repeat the experiment, but after putting the ruler in the can, rub it against the can. Then take the ruler out of the can.

19.   Try repeating the experiment with other materials.

Summary questions

1.   What was the measured charge after taking the ruler out of the can in the first experiment? What was the charge after taking the ruler out of the can in the second experiment? Why is there a difference?

2.   What other materials did you use? Compare the obtained charge to the first experiment.

3.   What happens if you rub two inflated balloons on your hair and then get the balloons close together?