

# 物理实验教学中心

*Physics Experiment Center*



# AMPEREMETER MODIFICATION

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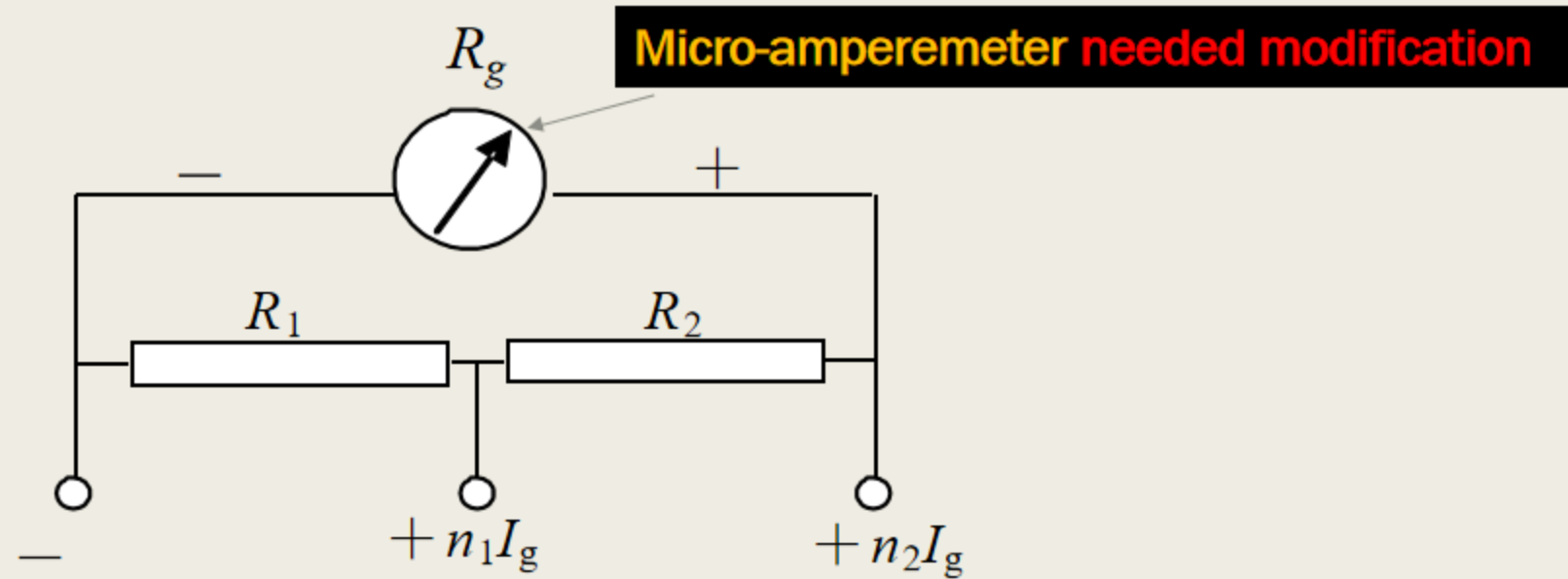
## Purposes:

- (1) Learn to modify a **micro-ammeter** to a double-range **milli-ammeter**.
- (2) Learn the method of correcting a modified ammeter.

# Instruments:

- Two resistance boxes,
- Digital experimental box,
- 8 Cables.

# Principles:



$R_1, R_2$  are shunt resistances,  $R_g$  is the internal resistance of micro-ammeter

$$R_1 + R_2 = \frac{1}{n_2 - 1} R_g$$

$$R_1 = \frac{1}{n_1 - 1} (R_g + R_2)$$

$$\frac{R_1}{R_2} = \frac{n_2}{n_1 - n_2}$$

$$R_1 = \frac{n_2}{(n_2 - 1)n_1} R_g$$

$$R_2 = \frac{n_1 - n_2}{(n_2 - 1)n_1} R_g$$

# Contents and Steps:

- 1. Measure the internal resistance of micro-ammeter,  $R_g$  using 'substitution method'.
- 2. Calculate the ideal value of  $R_1$  and  $R_2$ .
- 3. Modify micro-ammeter to milli-ammeter with range of  $1\text{ mA}$ , determine the value of  $R_1+R_2$ .
- 4. Modify micro-ammeter to milli-ammeter with range of  $10\text{ mA}$ , determine the value of  $R_1$  and  $R_2$ , respectively.

Micro-amperemeter

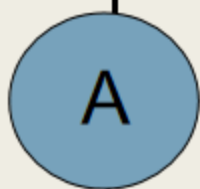
$$I_g = 0.1 \text{ mA}$$



$R_1$



$R_2$



1

$$I_1 = 10 \text{ mA}$$

$$n_1 = 100$$

2

$$I_2 = 1 \text{ mA}$$

$$n_2 = 10$$

E

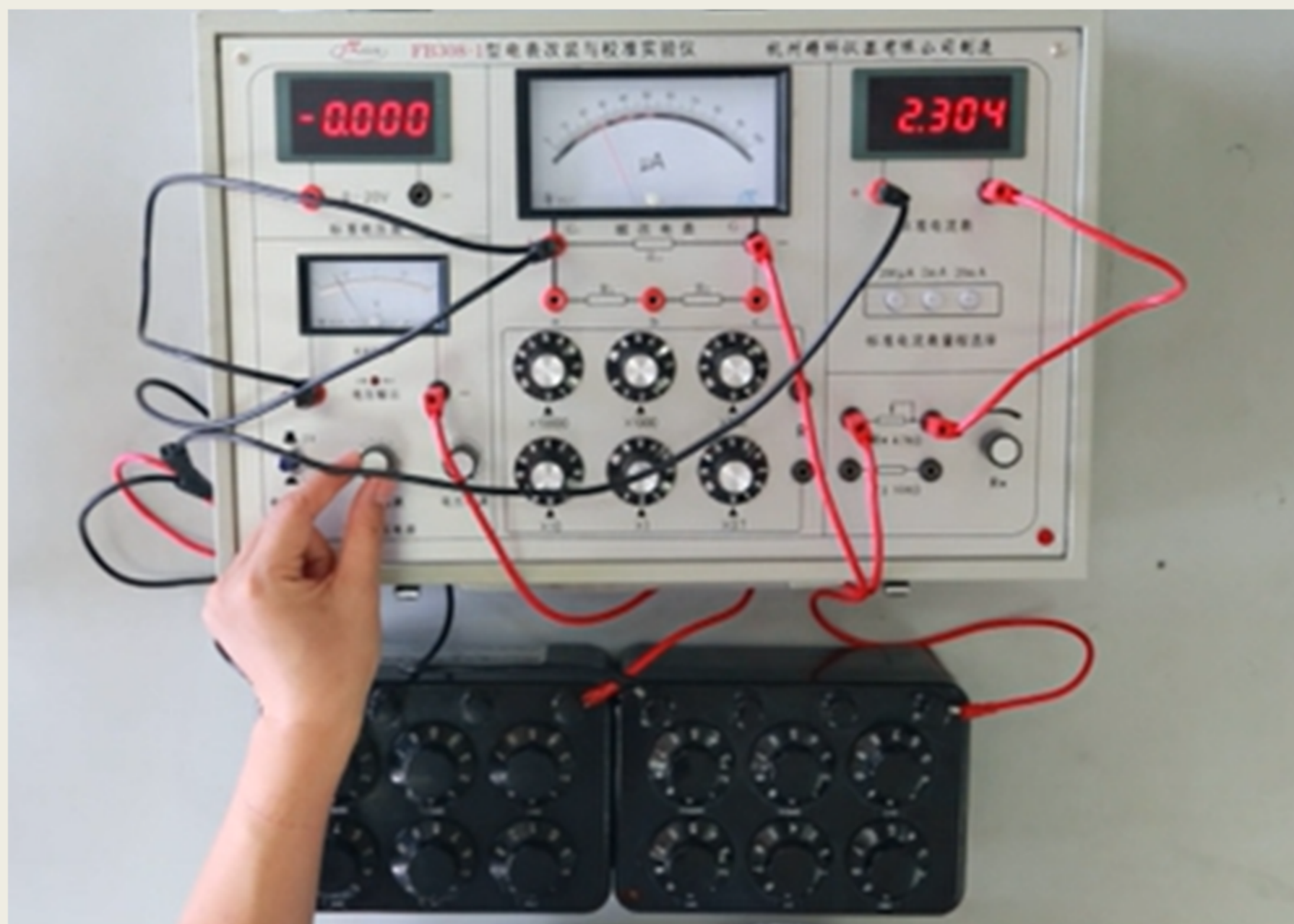


$R_w$

$$R_1 = \frac{1}{90} R_g$$

$$R_2 = \frac{1}{10} R_g$$





**TABLE I** $R_g =$  $\Omega$ 

Resistance	$R_1/\Omega$	$R_2/\Omega$
Ideal		
Exp.	--	--

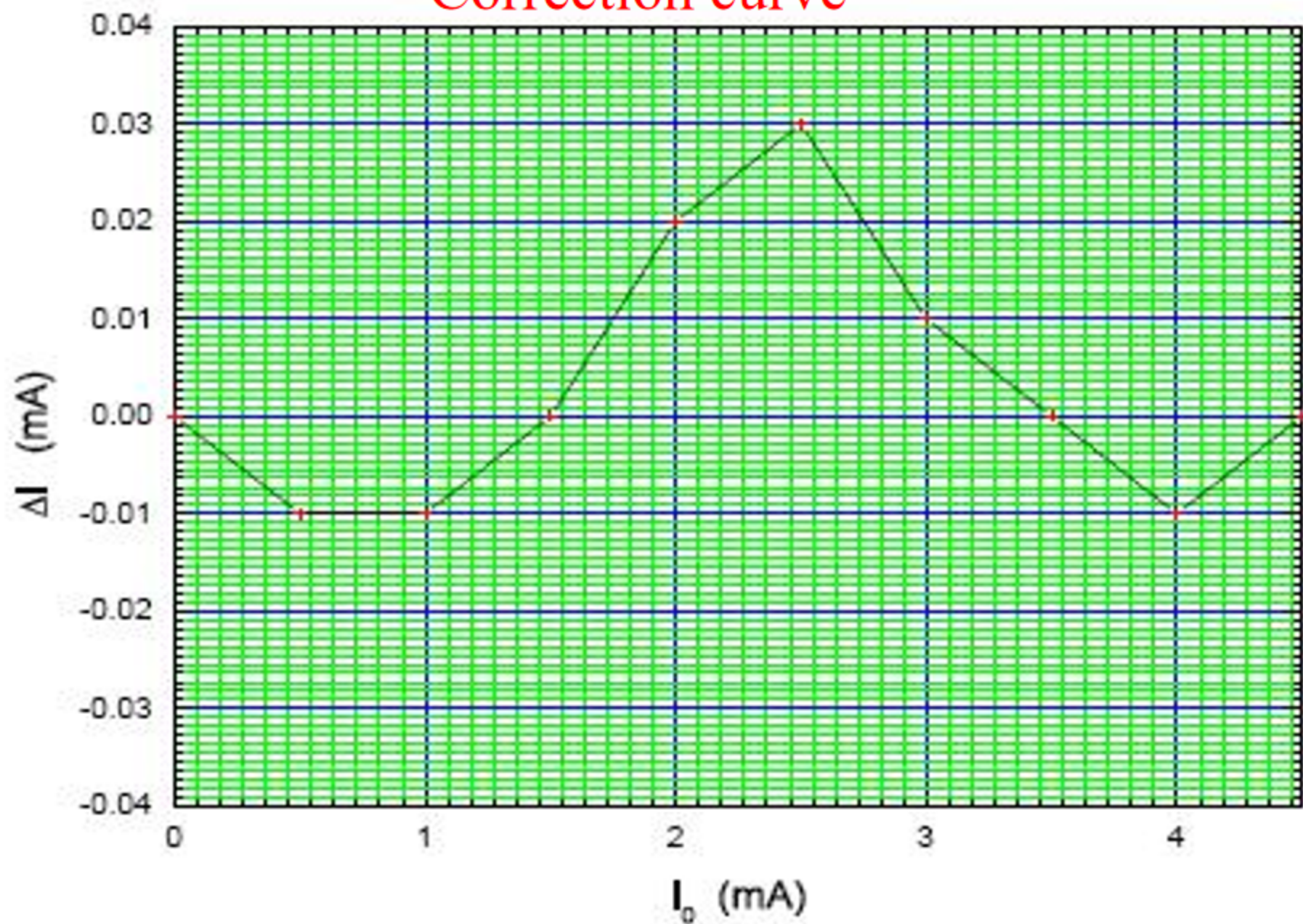


**Modified meter's level:**

$$f = \frac{|\Delta I|_{\max}}{10 \text{ mA}} \times 100$$



## Correction curve



# Homework

- Please complete the report to describe this experiment, complete the table, and plot the correction curve of  $\Delta I - I_0$ .
- DL: November 23, 2023
  
- Useful link(s):
  1. <https://github.com/bliseu/phylab>



END

