

物理实验教学中心

Physics Experiment Center



Amperemeter modification

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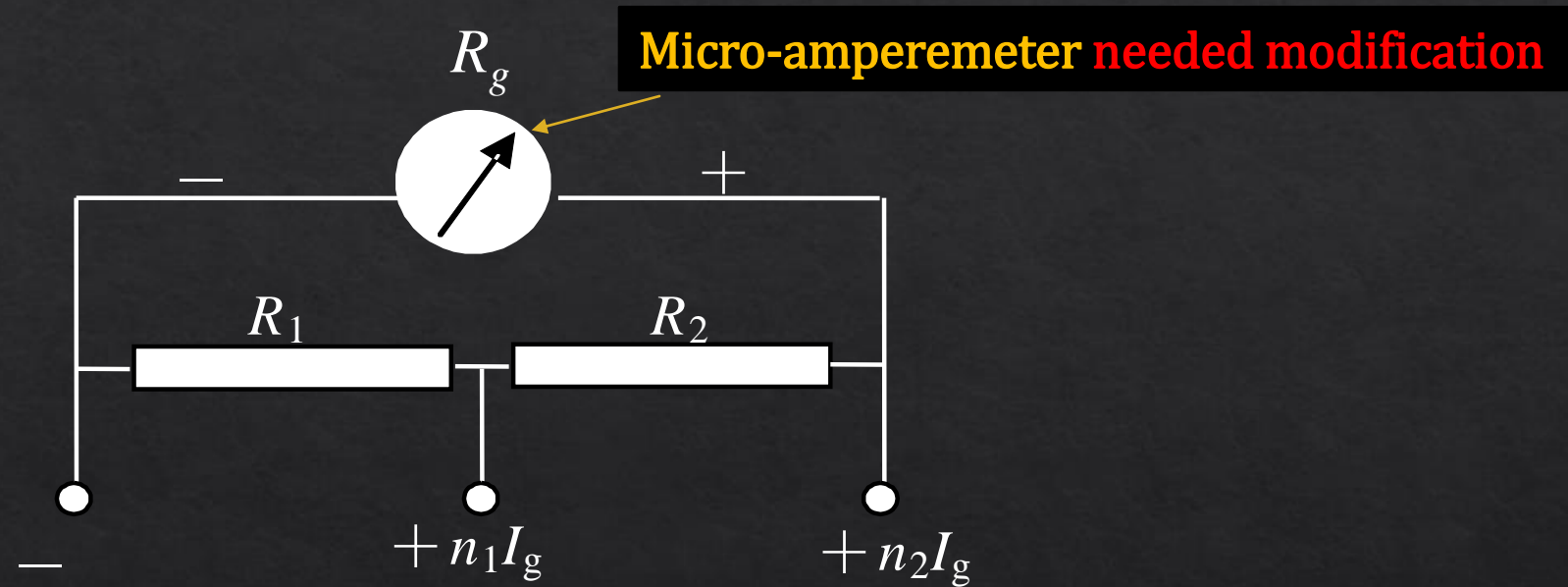
Purposes:

- (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 mA , determine the value of $R_1 + R_2$.
- ◇ 4. Modify micro-ammeter to milli-ammeter with range of 10 mA , determine the value of R_1 and R_2 , respectively.

Micro-amperemeter

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



Standard meter



R_1



R_2

1

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

$$n_1 = 100$$

2

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

$$n_2 = 10$$

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

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

E



R_w

Resistance	R_1/Ω	R_2/Ω
Ideal		
Exp.		

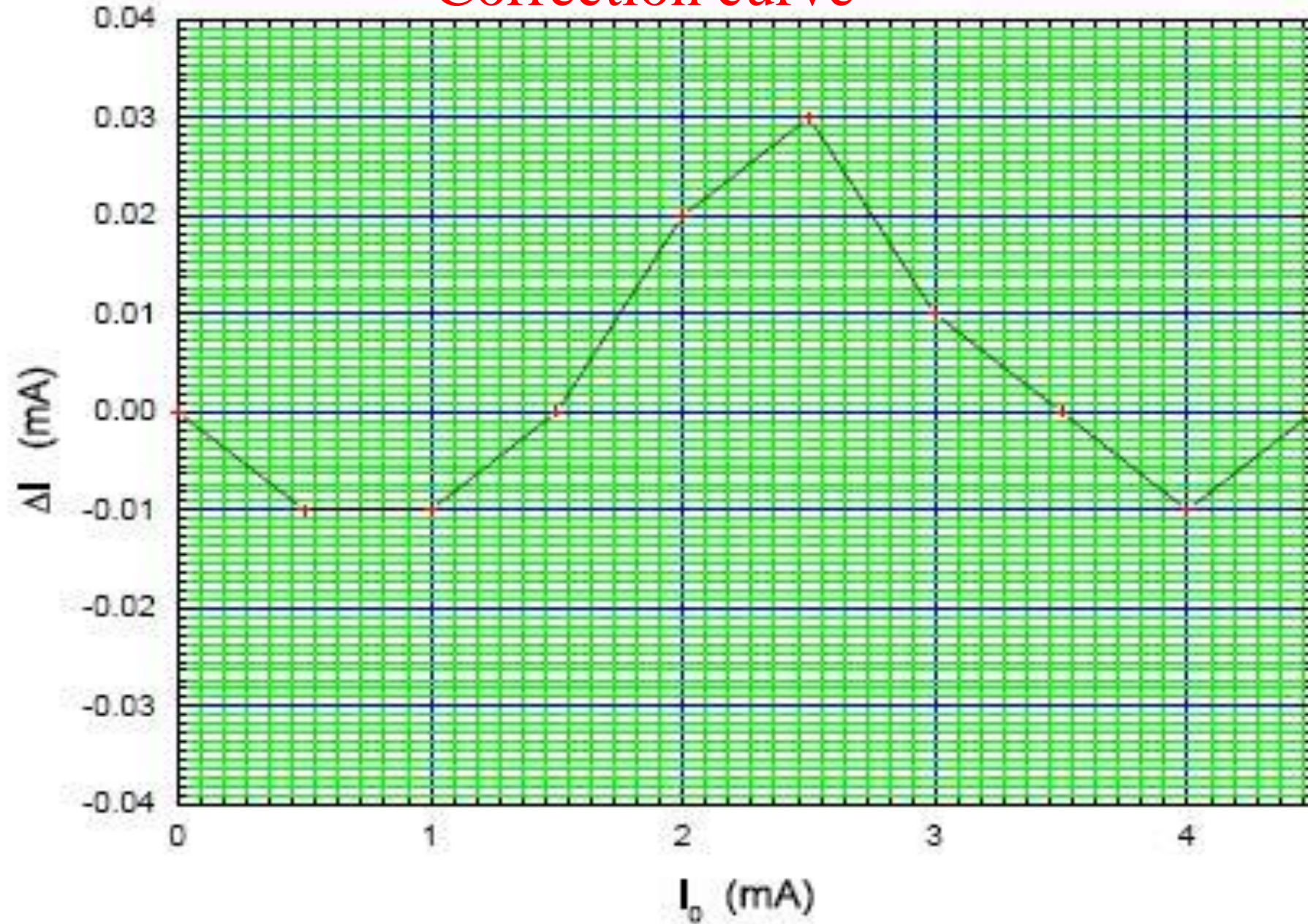
TABLE I: Correction for the meter with range of 10 mA

[illegible]

Modified meter's level:

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

Correction curve



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