南京邮电大学
Nanjing University of Post & Telecom

物理实验教学中心

Physics Expeiment Center

AMPEREMETER MODIFICATION

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Purposes:

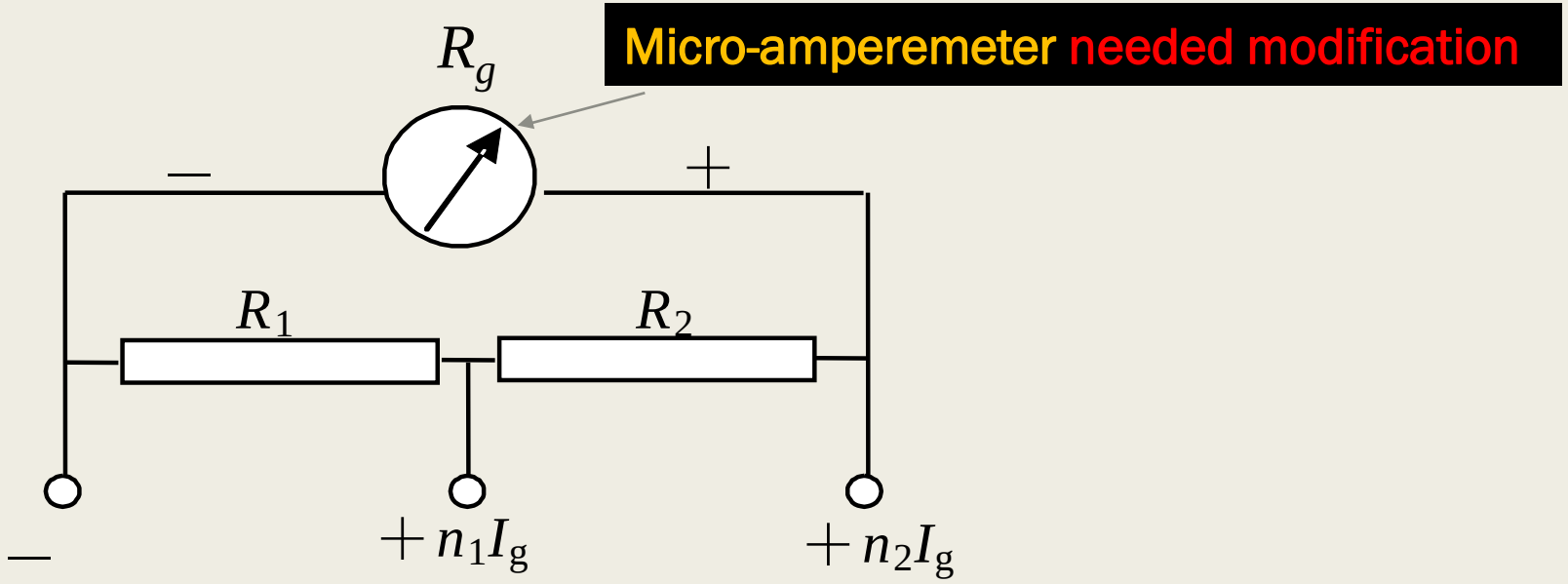
（1）Learn to modify a micro-amperemeter to a double-range milli-amperemeter.

（2）Learn the method of correcting a modified amperemeter.

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-amperemeter

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

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

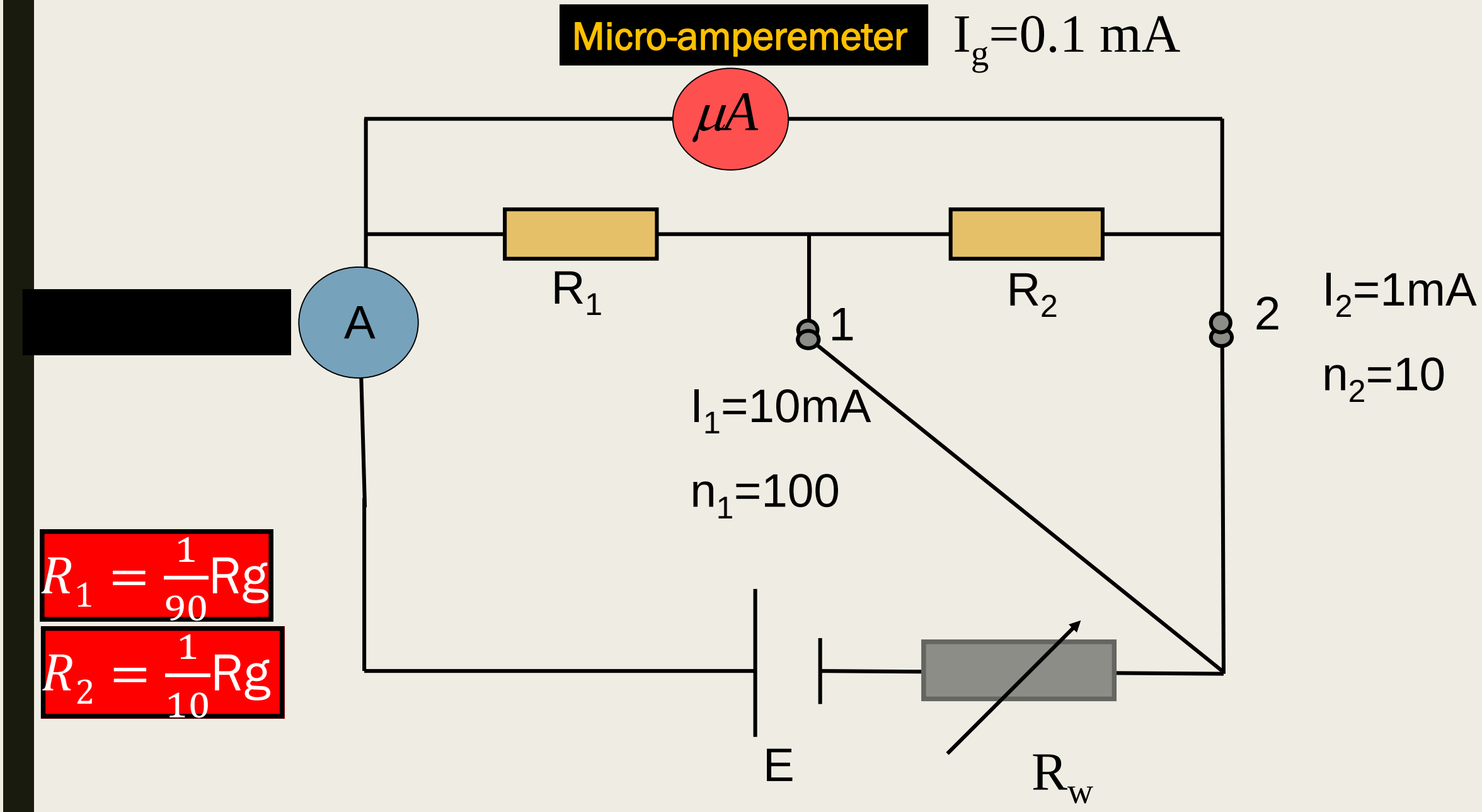
$$\frac{R_1}{R_2} = \frac{n_2}{n_1 - n_2}$$

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

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

Contents and Steps:

- 1. Measure the **internal resistance of micro-amperemeter, R_g, using 'substitution method'.**
- **2. Calculate the ideal value of R1 and R2.**
- **3.** Modify micro-amperemeter to milli-amperemeter with range of 1 mA, determine the value of R1+R2.
- 4. Modify micro-amperemeter to milli-amperemeter with range of 10 mA, determine the value of R1 and R2, respectively.



$$R_1 = \frac{1}{90}\mathrm{Rg}$$

$$R_2 = \frac{1}{10}\mathrm{Rg}$$

Resistance	R_1/Ω	R_2/Ω
Ideal		
Exp.		

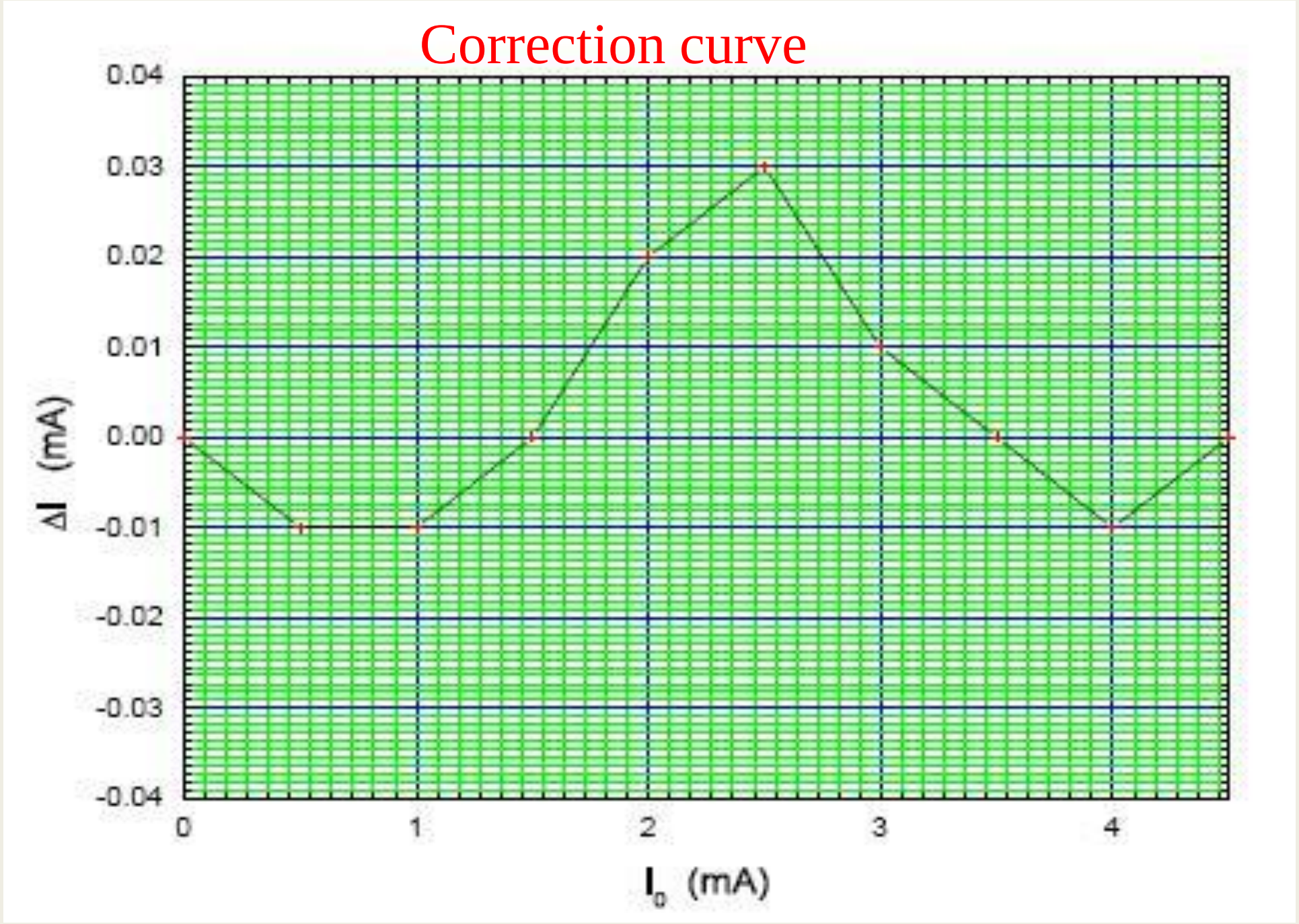
TABLE I: Correction for the meter with range of 10 mA

Pointer position of micro-amperemeter	10	20	30	40	50	60	70	80	90	100
Reading of micro-amperemeter: I_0(mA)	1	2	3	4	5	6	7	8	9	10
Reading of standard meter: I(mA)										
$\Delta I = I_0 - I$(mA)										

Modified meter's level:

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

Correction curve



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