

五、实验数据处理

1.标准状态:灯丝电源电压2.4v, V_{G1K} 电压1.6v, V_{G2A} 电压9.0v, V_{G2K} 电压0.82v

波峰	V1	V2	V3	V4	V5	V6
电压/V	22.25	32.75	43.5	55.0	67.0	78.5

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.33V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.92V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 11.42V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 11.67V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^3 (\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.220V$$

B类不确定度:

$$u_b(V_0) = \frac{0.1V}{\sqrt{3}} = 0.058V$$

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)^2 + u_b(V_0)^2} = 0.23V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.020$$

最终结果为:

$$V_0 \pm u(V_0) = (11.33 \pm 0.23)V$$

2.灯丝电源电压改变为2.5v

波峰	V1	V2	V3	V4	V5	V6
电压/V	22.0	33.0	43.0	55.0	67.0	79.0

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.44V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 11.00V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 11.33V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 12.00V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^3 (\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.294V$$

B类不确定度:

$$u_b(V_0) = \frac{0.1V}{\sqrt{3}} = 0.058V$$

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)^2 + u_b(V_0)^2} = 0.30V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.026$$

最终结果为:

$$V_0 \pm u(V_0) = (11.44 \pm 0.30)V$$

3. V_{G1K} 电压改变为1.8v

波峰	V1	V2	V3	V4	V5	V6
电压/V	22.0	33.0	43.0	55.0	67.0	79.0

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.44V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 11.00V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 11.33V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 12.00V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^3 (\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.294V$$

B类不确定度:

$$u_b(V_0) = \frac{0.1V}{\sqrt{3}} = 0.058V$$

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)^2 + u_b(V_0)^2} = 0.30V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.026$$

最终结果为:

$$V_0 \pm u(V_0) = (11.44 \pm 0.30)V$$

4. V_{G2A} 电压改变为11v

波峰	V1	V2	V3	V4	V5	V6
电压/V	24.25	34.0	44.5	56.0	67.5	79.75

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.17V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.58V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 11.17V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 11.75V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^3 (\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.337V$$

B类不确定度:

$$u_b(V_0) = \frac{0.1V}{\sqrt{3}} = 0.058V$$

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)^2 + u_b(V_0)^2} = 0.34V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.031$$

最终结果为:

$$V_0 \pm u(V_0) = (11.17 \pm 0.34)V$$