五、实验数据处理

1.标准状态:灯丝电源电压3.3v,V_{G1K}电压1.5v,V_{G2A}电压8.0v,V_{G2K}电压82v

波峰	V1	V2	V3	V4	V5	V6
电压/V	21.0	30.5	41.5	52.5	64.5	76.5

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.17V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.50V$$

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

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

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.347V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.35V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.032$$

最终结果为:

$$V_0 \pm u(V_0) = (11.17 \pm 0.35)V$$

2.灯丝电源电压改变为3.4v

波峰	V1	V2	V3	V4	V5	V6
电压/V	22.0	31.0	41.5	52.5	64.5	76.5

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.00V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.17V$$

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

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

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.441V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.44V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.040$$

最终结果为:

$$V_0 \pm u(V_0) = (11.00 \pm 0.44)V$$

3.V_{G1K} 电压改变为1.7v

波峰	V1	V2	V3	V4	V5	V6
电压/V	21.0	30.5	41.5	52.5	64.0	76.5

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 11.11V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.50V$$

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

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

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.338V$$

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:

$$V_0 \pm u(V_0) = (11.11 \pm 0.34)V$$

4.V_{G2A} 电压改变为10v

波峰	V1	V2	V3	V4	V5	V6
电压/V	22.5	32.0	42.5	54.0	65.5	77.5

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_4}{3 \times 3} = 11.11V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 10.50V$$

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

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

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.338V$$

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:

$$V_0 \pm u(V_0) = (11.11 \pm 0.34)V$$