五、实验数据处理

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

波峰	V1	V2	V3	V4	V5	V6
电压/V	1.0	2.0	3.0	4.0	5.0	6.0

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 1.0V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.0V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.0V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 1.0V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.0V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.058V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.058$$

最终结果为:

$$V_0 \pm u(V_0) = (1.0 \pm 0.058)V$$

2.灯丝电源电压改变为1v

波峰	V1	V2	V3	V4	V5	V6
电压/V	1.1	1.5	1.7	1.9	2.0	4.0

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 0.4V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 0.266666666667V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 0.166666666667V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 0.766666666667V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.463081466315V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.466699522653V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 1.16674880663$$

最终结果为:

$$V_0 \pm u(V_0) = (0.4 \pm 0.466699522653)V$$

3.V_{G1K} 电压改变为1v

波峰	V1	V2	V3	V4	V5	V6
电压/V	1.0	2.0	3.0	5.0	6.0	7.0

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 1.33333333333V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.33333333333V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.33333333333V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 1.33333333333V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.0V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.058V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.0435$$

最终结果为:

$$V_0 \pm u(V_0) = (1.33333333333 \pm 0.058)V$$

4.V_{G2A} 电压改变为1v

波峰	V1	V2	V3	V4	V5	V6
电压/V	3.0	4.0	5.0	7.0	7.0	6.0

$$\bar{V_0} = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_4}{3 \times 3} = 0.888888888889V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.33333333333V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.0V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 0.333333333333V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum_{i=1}^{3}(\Delta V_i - \bar{V_0})^2}{3 \times 2}} = 0.293972367896V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.299639371723V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.337094293188$$

最终结果为:

$$V_0 \pm u(V_0) = (0.888888888889 \pm 0.299639371723)V$$