五、实验数据处理

1.标准状态:灯丝电源电压0v,V_{G1K}电压0v,V_{G2A}电压0v,V_{G2K}电压0v

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

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 1.00V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.00V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.00V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 1.00V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum\limits_{i=1}^{3}(\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.000V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.06V$$

相对不确定度:

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

最终结果为:

$$V_0 \pm u(V_0) = (1.00 \pm 0.06)V$$

2.灯丝电源电压改变为0v

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

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 0.40V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 0.27V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 0.17V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 0.77V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum\limits_{i=1}^{3}(\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.463V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.47V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 1.167$$

最终结果为:

$$V_0 \pm u(V_0) = (0.40 \pm 0.47)V$$

3.V_{G1K} 电压改变为0v

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

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_1}{3 \times 3} = 1.33V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.33V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.33V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 1.33V$$

A类不确定度:

$$u_a(V_0) = \sqrt{\frac{\sum\limits_{i=1}^{3}(\Delta V_i - \bar{V}_0)^2}{3 \times 2}} = 0.000V$$

B类不确定度:

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

不确定度:

$$u(V_0) = \sqrt{u_a(V_0)_2 + u_b(V_0)_2} = 0.06V$$

相对不确定度:

$$\eta = \frac{u(V_0)}{V_0} = 0.044$$

最终结果为:

$$V_0 \pm u(V_0) = (1.33 \pm 0.06)V$$

4.V_{G2A} 电压改变为0v

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

$$\bar{V}_0 = \frac{V_4 + V_5 + V_6 - V_3 - V_2 - V_4}{3 \times 3} = 0.89V$$

$$\Delta V_1 = \frac{1}{3}(V_4 - V_1) = 1.33V$$

$$\Delta V_2 = \frac{1}{3}(V_5 - V_2) = 1.00V$$

$$\Delta V_3 = \frac{1}{3}(V_6 - V_3) = 0.33V$$

A类不确定度:

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

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:

$$\eta = \frac{u(V_0)}{V_0} = 0.337$$

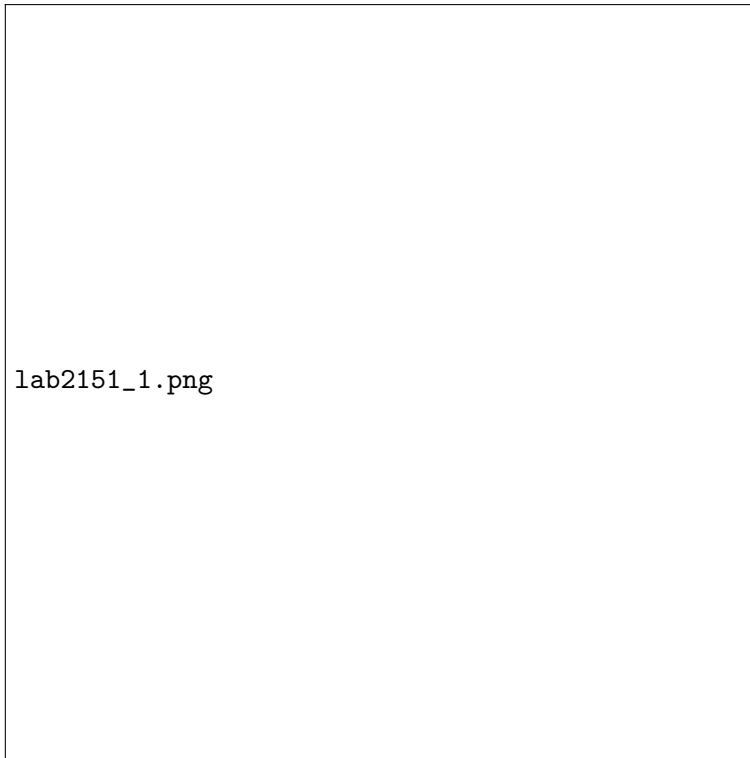最终结果为:

$$V_0 \pm u(V_0) = (0.89 \pm 0.30)V$$

Figure 1: 四条曲线对比图(仅供参考，实际图片请根据实验数据自行绘制)

5.示波器自动测量