

五、实验数据处理

实验 1. 三棱镜顶角的测量

(1) 原始数据记录表格

i	1	2	3	4	5
α_1	82°55'	120°0'	158°38'	43°55'	45°57'
β_1	262°54'	300°0'	338°39'	223°55'	225°57'
α_2	323°0'	0°11'	38°46'	284°0'	287°0'
β_2	142°56'	180°04'	218°45'	104°0'	106°0'
θ	119°57'	119°53'	119°53'	119°55'	119°27'
A	59°58'	59°56'	59°56'	59°58'	59°43'

$$\text{其中 } \theta = \frac{1}{2}[(\alpha_2 - \alpha_1) + (\beta_2 - \beta_1)], \quad A = \frac{1}{2}\theta$$

(2) 不确定度的计算

$$\bar{A} = \frac{1}{5} \sum_{i=1}^5 A_i = 1.046 \text{ rad}$$

A 类误差:

$$u_a(\theta) = \sqrt{\frac{\sum_{i=1}^5 (\theta_i - \bar{\theta})^2}{5 \times (5 - 1)}} = 0.0007995$$

B 类误差:

$$u_b(\theta) = \frac{\Delta_{\text{仪}}}{\sqrt{3}} = \frac{1'}{\sqrt{3}} = \frac{\pi}{180 \times 60 \times \sqrt{3}} = 1.6794 \times 10^{-4}$$

θ 不确定度:

$$u(\theta) = \sqrt{u_a(\theta)^2 + u_b(\theta)^2} = \sqrt{0.0007995^2 + 0.00016794^2} = 0.0008169$$

A 的不确定度:

$$u(A) = \frac{1}{2}u(\theta) = \frac{1}{2} \times 0.0008169 = 0.0004085$$

相对不确定度:

$$\frac{u(A)}{A} = 6.818 \times 10^{-6}$$

最终结果为:

$$A \pm u(A) = 1.0456 \pm 0.0004 \text{ rad}$$