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
α_1	82°5499999999999972’	120°0’	158°37999999999999545’	43°54999999999999
β_1	262°54000000000000205’	300°0’	338°38999999999998636’	223°55000000000001
α_2	323°0’	0°11’	38°46000000000000085’	284°0’
β_2	142°56000000000000023’	180°03999999999999204’	218°44999999999998863’	104°0’
θ	119°57’	119°52’	119°53’	119°55’
A	59°58’	59°56’	59°56’	59°58’

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

(2) 不确定度的计算

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

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：

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

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：

$$A \pm u(A) = 1.0456 \pm 0.0004rad$$