实验三　掠入射法测折射率

i　原始数据

次数	分界线 α	分界线 β	法线 α′	法线 β′	δ
1	84°50′	274°52′	55°30′	235°27′	39.38°
2	111°30′	251°26′	72°10′	252°41′	38.70°
3	256°57′	76°57′	217°35′	37°39′	39.33°

ii　处理

由公式 $\delta = \frac{1}{2}(\alpha+\beta-\alpha'-\beta')$，若 $\delta<0$，则 $\delta = \delta+180°$ 得

$$\delta = \frac{\sum_{i=1}^{3}\delta_i}{3} = 39.14°$$

取 $A = 60.00°$

$$\therefore\quad n = \sqrt{\left(\frac{\cos A+\sin\delta}{\sin A}\right)^2+1} = 1.645\,1$$

iii　不确定度的计算：

δ 的A类不确定度 $u_a(\delta) = \sqrt{\frac{\sum_{i=1}^{3}(\delta_i-\delta)^2}{3\times 2}} = 0.219°$

δ 的B类不确定度 $u_b(\delta) = \frac{\Delta仪}{\sqrt{3}} = 0.0096°$

$$u(\delta) = \sqrt{u_a(\delta)^2+u_b(\delta)^2} = 0.219° = 3.82\times10^{-3}$$

取 $u(A) = 0.006°$

$$\because\quad u(n) = \sqrt{\left[\frac{\partial n}{\partial\delta}u(\delta)\right]^2+\left[\frac{\partial n}{\partial A}u(A)\right]^2}$$

$$\frac{\partial n}{\partial\delta} = \frac{\left(\frac{\cos A+\sin\delta}{\sin A}\right)\cdot\cos\delta}{\sqrt{\left(\frac{\cos A+\sin\delta}{\sin A}\right)^2+1}} = 0.616$$

$$\frac{\partial n}{\partial A} = \frac{\left(\frac{\cos A+\sin\delta}{\sin A}\right)\cdot\frac{-\sin^2A-\cos A(\cos A+\sin\delta)}{\sin^2A}}{\sqrt{\left(\frac{\cos A+\sin\delta}{\sin A}\right)^2+1}} = \frac{(-1-\cos A\sin\delta)(\cos A+\sin\delta)}{\sin^3A\cdot\sqrt{\left(\frac{\cos A+\sin\delta}{\sin A}\right)^2+1}} = -1.813$$

$$\therefore\quad u(n) = 8.68\times10^{-3} = 0.009$$

$$\therefore\quad n = (1.645\pm0.009)$$