Solution (Tutorial-2)

(1) $\mu = \frac{\sin i}{\sin r}$; $\sin r = 0.5317$; $\cos r = 0.8469$

$2\mu t \cos r = n\lambda$; $t = \frac{5890 \times 10^{-10}}{2 \times 1.33 \times 0.8469} = 0.261\ \mu m$

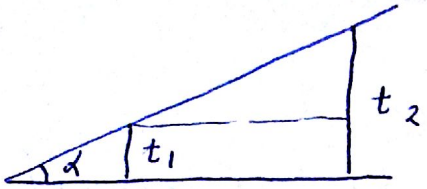
(2) $n\lambda_1 = (n+1)\lambda_2 \longrightarrow n = 60$, $\sin i = \frac{4}{5}$; $\mu = \frac{4}{3}$

$\cos r = 0.8$

$2\mu t \cos r = n\lambda_1$

$t = \frac{60 \times 6100 \times 10^{-10}}{2 \times \frac{4}{3} \times 0.8} = 17.199\ \mu m$

(3)



$\beta = \frac{\lambda}{2\mu\alpha}$; $\mu = 1.5$, $\lambda = 6000\ A^\circ$

$12\beta = \frac{6\lambda}{\mu\alpha}$; $\alpha = \frac{t_2 - t_1}{x}$

$t_2 - t_1 = \frac{6\lambda}{\mu}$

$= 2.4 \times 10^{-4}\ cm$

(4) $2t = (2n+1)\frac{\lambda_1}{2} = (2n+3)\frac{\lambda_2}{2}$

$2t = \frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2}$; $0.25^\circ = \frac{0.25\pi}{180}$ rad

$t = x \tan\theta \simeq x\theta$

$2x\theta = \frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2}$; $x = \frac{5896 \times 10^{-10} \times 5890 \times 10^{-10} \times 180}{6 \times 10^{-10} \times 2 \times 0.25 \times \pi}$

$x = 6.63\ cm$

(5) $t_{min} = \frac{\lambda}{4\mu} = \frac{5500 \times 10^{-10}}{4 \times 1.38} = 996.38\ A^\circ$

(6) $\lambda = \frac{1}{4R}\left[\frac{D_m^2 - D_n^2}{m-n}\right] = \frac{1}{4\times100}\left[\frac{(0.4)^2-(0.2)^2}{5}\right] = 0.485\ cm$

(7) $\mu = \left(\frac{D_{10}}{D'_{10}}\right)^2 = 1.36$

(8) $r_n = \sqrt{n\lambda R}$; $n\lambda_1 = (n+1)\lambda_2$

$n = \frac{\lambda_2}{\lambda_1 - \lambda_2}$; $r_n^{\lambda_1} = \sqrt{\frac{\lambda_1\lambda_2 R}{\lambda_1 - \lambda_2}}$

(9) $r_n = \sqrt{\frac{n\lambda}{\mu}\frac{R_1 R_2}{(R_1+R_2)}}$

$r_{15} - r_5 = \frac{(\sqrt{15}-\sqrt{5})\sqrt{5400\times10^{-8}\times100\times100}}{\sqrt{200}}$

$= 0.553\ cm$

(10) $2t = m\lambda_1 = (m+\frac{1}{2})\lambda_2$ $\quad \lambda_1 > \lambda_2$

$2t = \frac{\lambda_1\lambda_2}{2\Delta\lambda}$ $\quad \lambda_1 = 4002\ A^\circ$, $\lambda_2 = 4000\ A^\circ$

$2t = 0.04\ cm$

$2t = m\lambda_1 \longrightarrow m = \frac{0.04}{4002\times10^{-8}} = 999.5 \sim 1000$

$r_{1000}^{\lambda_1} = \sqrt{m\lambda_1 R}$

$= \sqrt{1000\times4002\times10^{-8}\times400} = 4\ cm$

(11) $\lambda = \frac{2d_0}{N} = \frac{2\times8\times10^{-3}}{250} = 64\times10^{-6}\ cm$

$\lambda = 6400\ A^\circ$

(12) $\lambda_1 - \lambda_2 = \frac{\lambda_1\lambda_2}{2d} \longrightarrow \lambda_1 - \lambda_2 = \frac{\lambda_{av}^2}{2d}$

$d = \frac{(5893\times10^{-8})^2}{2\times6\times10^{-8}} = 0.02894\ cm$