

HW 13 Key

$$1. \tan \theta = \frac{10.1 \text{ cm}}{3.12 \text{ m}} \Rightarrow \tan^{-1}\left(\frac{10.1 \text{ cm}}{3.12 \text{ m}}\right) = \theta = 1.85^\circ$$

$$\frac{1}{2} \lambda = \frac{1}{2} \times 0.0211 \text{ mm} \times \sin \theta$$

$$\Rightarrow \lambda = 0.0211 \text{ mm} \times \sin 1.85^\circ = \boxed{683 \text{ nm}}$$

$$2. \theta = \frac{1.22 \lambda}{D} = \frac{1.22 \times 5.50 \times 10^{-7} \text{ m}}{2 \times 1.25 \times 10^{-4} \text{ m}} = 0.0027$$

$$D' = 2 \times 1.95 \times \tan 0.00135 = \boxed{0.00527 \text{ m}}$$

$$3. \sin \theta = \frac{1.22 \lambda}{D} \Rightarrow D = \frac{1.22 \lambda}{\sin \theta}$$

$$\Rightarrow D = \frac{1.22 \times 550 \times 10^{-9} \text{ m}}{\frac{0.01 \text{ m}}{21000 \text{ m}}}$$

$$= \boxed{1.41 \text{ m}}$$

