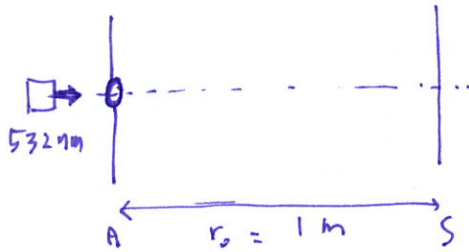


Quiz #7
 May 26, 2021
 EC5103

Laser light whose wavelength is 532nm passes through a circular aperture and the diffracted light is measured on a screen at a distance of 1 m away from the aperture. As the aperture size changes, the intensity of the diffracted light also changes alternatively through maxima and minima. What are the diameters of the aperture that produce:

- (a) the first two maxima?
 (b) the first two minima?

Sol.)

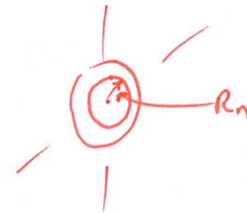


$$r_0 = f = \frac{R_n^2}{n\lambda} \quad (13-20)$$

Maxima : odd n
 Minima : even n

The aperture diameter D_n is :

$$D_n = 2R_n = 2\sqrt{n\lambda r_0}$$



(i) First max ($n=1$) : $D_1 = 2\sqrt{(1)(532 \times 10^{-9})(1)}$
 $= 1.46 \text{ (mm)}$

(ii) Second max ($n=3$) : $D_3 = 2\sqrt{(3)(532 \times 10^{-9})(1)}$
 $= 2.53 \text{ (mm)}$

(iii) First min ($n=2$) : $D_2 = 2\sqrt{(2)(532 \times 10^{-9})(1)}$
 $= 2.06 \text{ (mm)}$

(iv) Second min ($n=4$) : $D_4 = 2\sqrt{(4)(532 \times 10^{-9})(1)}$
 $= 2.92 \text{ (mm)}$

(a) Diameter is 2.53 mm.

(b) Diameter is 2.92 mm.