

### Answer on Question#51648 - Physics - Optics

A He-Ne laser emits a beam of diameter  $d = 2 \times 10^{-3}\text{m}$  and wavelength  $\lambda = 630\text{nm}$ . It is directed towards an aeroplane flying at a height of  $H = 11\text{km}$ . Calculate the diameter of the light patch produced on the surface of the aeroplane.

Solution:

The angle of diffraction (first minimum) of the laser with such diameter of the outlet is given by

$$\sin \theta = 1.22 \frac{\lambda}{d}$$

Therefore the diameter of the light patch on the surface of the plane is

$$D = H \cdot \sin \theta = 1.22 \cdot H \frac{\lambda}{d} = 1.22 \cdot 11000\text{m} \frac{630 \cdot 10^{-9}\text{m}}{2 \cdot 10^{-3}\text{m}} = 4.23\text{m}$$

Answer:  $D = 1.22 \cdot H \frac{\lambda}{d} = 4.23\text{m}$ .