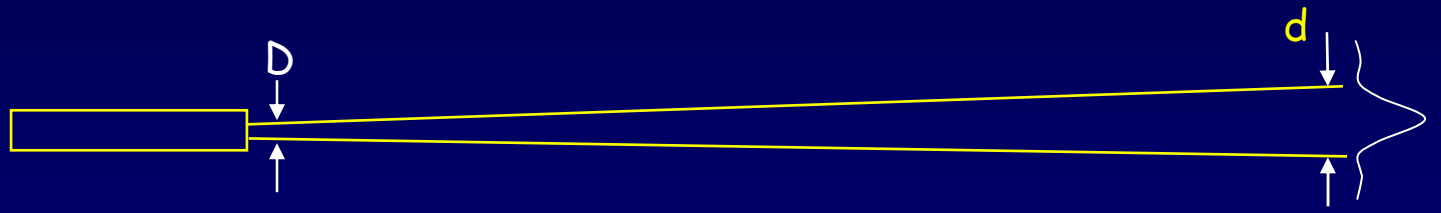
Solution

In 1985, a laser beam with a wavelength of λ = 500 nm was fired from the earth and reflected off the space shuttle Discovery, in orbit at a distance of L = 350 km away from the laser.

If the circular aperture of the laser was D = 4.7 cm, what was the beam diameter d at the space shuttle?



Half-angle-width of diffraction maximum:

$$\theta_o = 1.22\frac{\lambda}{D} = 1.22\frac{500\times10^{-9}}{4.7\times10^{-2}} = 1.3\times10^{-5} \text{ radians}$$

$$d \approx 2\theta_o L = 2(1.3\times10^{-5})(350\times10^{3}\text{m}) = \boxed{9.1\text{ m}}$$