

88. (a) At $r = 40$ m, the intensity is

$$\begin{aligned} I &= \frac{P}{\pi d^2/4} = \frac{P}{\pi(\theta r)^2/4} \\ &= \frac{4(3.0 \times 10^{-3} \text{ W})}{\pi[(0.17 \times 10^{-3} \text{ rad})(40 \text{ m})]^2} \\ &= 83 \text{ W/m}^2 . \end{aligned}$$

(b) $P' = 4\pi r^2 I = 4\pi(40 \text{ m})^2(83 \text{ W/m}^2) = 1.7 \times 10^6 \text{ W}.$