

12. The rate at which photons are emitted from the argon laser source is given by $R = P/E_{\text{ph}}$, where $P = 1.5 \text{ W}$ is the power of the laser beam and $E_{\text{ph}} = hc/\lambda$ is the energy of each photon of wavelength λ . Since $\alpha = 84\%$ of the energy of the laser beam falls within the central disk, the rate of photon absorption of the central disk is

$$\begin{aligned} R' &= \alpha R = \frac{\alpha P}{hc/\lambda} = \frac{(0.84)(1.5 \text{ W})}{(6.63 \times 10^{-34} \text{ J}\cdot\text{s}) (2.998 \times 10^8 \text{ m/s}) / (515 \times 10^{-9} \text{ m})} \\ &= 3.3 \times 10^{18} \text{ photons/s} . \end{aligned}$$