

13. The region illuminated on the Moon is a circle with radius $R = r\theta/2$, where r is the Earth-Moon distance (3.82×10^8 m) and θ is the full-angle beam divergence in radians. The area A illuminated is

$$A = \pi R^2 = \frac{\pi r^2 \theta^2}{4} = \frac{\pi (3.82 \times 10^8 \text{ m})^2 (0.880 \times 10^{-6} \text{ rad})^2}{4} = 8.88 \times 10^4 \text{ m}^2 .$$