

30. We require  $F_{\text{grav}} = F_r$  or

$$G \frac{mM_s}{d_{es}^2} = \frac{2IA}{c} ,$$

and solve for the area  $A$ :

$$\begin{aligned} A &= \frac{cGmM_s}{2Id_{es}^2} = \frac{(6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2)(1500 \text{ kg})(1.99 \times 10^{30} \text{ kg})(2.998 \times 10^8 \text{ m/s})}{2(1.40 \times 10^3 \text{ W/m}^2)(1.50 \times 10^{11} \text{ m})^2} \\ &= 9.5 \times 10^5 \text{ m}^2 = 0.95 \text{ km}^2 . \end{aligned}$$