

Answer on Question 55048, Physics / Astronomy | Astrophysics

Question:

The Sun is a nearly perfect blackbody with temperature of $T_{\text{sun}} = 5800 \text{ K}$. Mars is also a near-blackbody, with temperature T_M , radiating about as much energy as it receives from the Sun at its orbital distance of 1.52 AU. At closest approach to Earth, Mars has an angular diameter of about 18 arcsec.

(a) (2 points) Compute the bolometric solar luminosity.

Solution:

The bolometric solar luminosity can be calculated:

$$L_{\text{Sun}} = 4\pi R_{\text{Sun}}^2 \sigma T^4$$

$$L_{\text{Sun}} = 4\pi(6.96 \times 10^{10})^2 \times (5.67 \times 10^{-8})(5800)^4 = 3.9 \times 10^{33} \frac{\text{ergs}}{\text{sec}}$$

Answer: $L_{\text{Sun}} = 3.9 \times 10^{33} \text{ ergs/sec}$