Answer on Question #74068, Physics / Quantum Mechanics

Question A very small hole in an electric furnace used for treating metals acts nearly as a blackbody. If the hole has an area 100 m2 and it is desired to maintain the metal at 1100 C, how much power travels through the hole?

Solution The stefans law gives power per square meter:

$$j = \sigma T^4$$

where $\sigma = 5.67 \times 10^{-8}\,\mathrm{W\,m^{-2}K^{-4}}$. Knowing area $A = 100$ m2 we can find the power:

$$P = jA = 5.67 \cdot 10^{-8} \cdot 1100^4 \cdot 100 = 8301447\,W \approx 8.3 \cdot 10^6\,W$$