MATH327: StatMech and Thermo, Spring 2025

Extra practice — 4d sun

What is the colour of the sun in four dimensions?

In more detail: Consider a universe with four spatial dimensions (in addition to the time dimension). Derive the analogue of the Planck spectrum and find the wavelength where this is maximized as a function of temperature. Then insert the surface temperature of the sun, $T \approx 5778$ K, and use the unit conversion factors below to put the wavelength in units of nm:

$k_B \approx 8.617 \times 10^{-5}$ eV·K^{-1}

$\hbar \approx 6.582 \times 10^{-16}$ eV·s

$c \approx 2.998 \times 10^{8}$ m·s^{-1}

As a warm-up, you can check that you're able to get the correct peak wavelength (roughly 500 nm) for our 3d sun, and an infrared wavelength (roughly 10 μm) for a warm-blooded animal.