

Examples

A star radiates as a blackbody at a temperature of 1700 K. At what wavelength does the peak of the blackbody spectrum occur? If you were to look at the source, what color would it appear to be?

$$\lambda_{\text{Max}} = (0.29 \text{ cm} / T) \quad T \text{ in K}$$

$$\lambda_{\text{Max}} = (0.29 \text{ cm} / 1700) = 1.7 \times 10^{-4} \text{ cm} = 1.7 \times 10^{-6} \text{ m} = 1700 \text{ nm}$$

This is outside of the visible spectrum in the IR region (long wavelength). Therefore, one would expect that only the long wavelength end of the visible spectrum would be present. The star would be red.

Examples

A particular object is moving away from the earth at 50% of the speed of light. What is the wavelength as measured on the earth of an electromagnetic wave which leaves the source with a wavelength of 600 nm? Can this wave be observed with an optical telescope? If not, in what part of the electromagnetic spectrum will it be observed?

$$\lambda_{\text{Apparent}} / \lambda_{\text{True}} = 1 + (\text{speed of source} / \text{wave speed})$$

$$\lambda_{\text{Apparent}} / \lambda_{\text{True}} = 1 + (.5 c / c) = 1.5$$

$$\lambda_{\text{Apparent}} = 1.5 (600 \text{ nm}) = 900 \text{ nm}$$

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