

185.

Problem 2.47 (R)

A spaceship is receding from the Earth at a speed of $0.2 c$. A light in the spaceship appears blue to the passengers on the ship. We have to find the colour of the light as observed from the Earth.

Solution:

As the observer and the source are moving away from one another with speed $0.2 c$, the observer will see Doppler shifted light. As the light appears to be blue to persons in the spaceship we can assume that the wavelength of light emitted is around 4500 \AA . The wavelength of the light received by an Earth based observer from the spaceship will therefore be

$$\lambda = \lambda_0 \left(\frac{c+v}{c-v} \right)^{1/2},$$

or

$$\lambda = 4500 \times \left(\frac{1.2}{0.8} \right)^{1/2} \text{ \AA} = 5,511 \text{ \AA}.$$

Therefore, the light will appear to be green.

