

Answer on Question #40568 - Physics - Optics

Question: A STAR EMITTING RADIATION AT A WAVELENGTH OF 5000Å IS AP- PROACHING EARTH AT A VELOCITY OF 1.5×10^6 m/s. THE CHANGE IN WAVELENGTH ON EARTH IS : 2.5Å, 1000Å, ZERO or 25Å Solution. The formula for relativistic Doppler effect is

$$\lambda_o = \sqrt{\frac{1 + \beta}{1 - \beta}} \lambda_s$$

where λ_o is observed wavelength, λ_s is emitted wavelength and $\beta = v/c$ where c is speed of light and $v = 1.5 \cdot 10^6$ m/s. So, we have

$$\delta\lambda = \lambda_o - \lambda_s = \lambda_s \left(1 - \sqrt{\frac{1 + \beta}{1 - \beta}}\right) = \lambda \left(1 - \sqrt{\frac{1 + 1.5 \cdot 10^6/3 \cdot 10^8}{1 - 1.5 \cdot 10^6/3 \cdot 10^8}}\right) \approx 25 \text{ \AA}$$

Answer is 25 Å.