

Doppler effect · supported focus

Supported focus · SL

Supported scope

- Supported SL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Light Doppler · 1.1

Reasoning

A recognizable spectral line appears at a longer wavelength in a distant source. Its shift can provide evidence of recession along the line of sight. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Light Doppler · 2.1

Reasoning

Relative source-observer motion changes observed frequency or wavelength. For light at a relative speed much smaller than c , the magnitude of the fractional wavelength shift is approximately v/c . Recession corresponds to longer wavelength, and approach to shorter wavelength.

redshift	: Shift of an identified line toward longer
wavelength; rest wavelength	: Wavelength of the line measured with no
relative source motion.	

Light Doppler · 3.1

Reasoning

Compare a identified line with its laboratory rest wavelength. Use $z = (\text{observed} - \text{rest}) / \text{rest}$, then v approximately cz in the stated low-speed model. Do not apply this approximation without checking the regime or treating a cosmological redshift as a simple exact velocity. Use attributed spectra with calibration and line identification. Compare several lines for a consistent shift. State uncertainty and distinguish relative line-of-sight motion from an unmeasured transverse component.

Light Doppler · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: a 500 nm rest line is observed at 501 nm. $z = (501 - 500)/500 = 0.002$. With $c = 3.0 \times 10^8$ m/s, v approximately 6.0×10^5 m/s away. The sound-source denominator formula is not the required SL light approximation.

Light Doppler · 4.2

Reasoning

A 600 nm rest line is observed at 601.2 nm. Find $z = (\text{observed} - \text{rest}) / \text{rest}$. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Light Doppler · 5.1

Reasoning

The approximate shift relation does not show that light travels faster from an approaching source. A single unidentified line cannot safely establish a redshift. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Light Doppler · 5.2

Reasoning

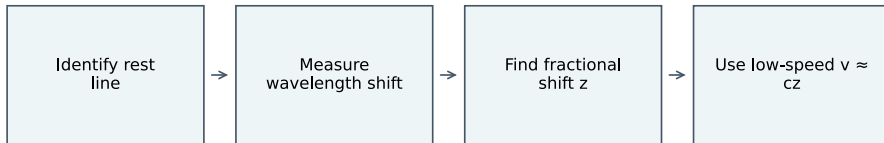
An observed redshift means light speed increased. This claim is false: The approximate shift relation does not show that light travels faster from an approaching source. A single unidentified line cannot safely establish a redshift.

Light Doppler · 5.3

Reasoning

Spectral shifts: a low-speed astronomical estimate: Compare a identified line with its laboratory rest wavelength. Use $z = (\text{observed} - \text{rest}) / \text{rest}$, then v approximately cz in the stated low-speed model. Do not apply this approximation without checking the regime or treating a cosmological redshift as a simple exact velocity.

Light Doppler · diagram



- Original teaching diagram: Spectral shifts: a low-speed astronomical estimate
- Use the labels and the stated model together.

Light Doppler · original transfer

Your turn

A 500 nm rest line is observed at 499 nm. Find z and low-speed radial velocity using $c=3\times 10^8$ m/s. Explain sign and limit.

Light Doppler · transfer reasoning

Method and interpretation

$z = -0.002$; $v \approx cz = -6 \times 10^5$ m/s, approaching under the positive-away convention. This small- $|z|$ kinematic approximation does not cover every origin of redshift.

Check yourself

- Explain redshift using the stated model.
- Explain rest wavelength using the stated model.
- Change one value in the original transfer; explain which assumption still matters.