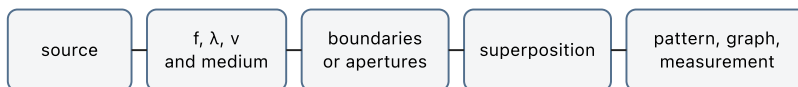


WAVES, SOUND & PHYSICAL OPTICS DAY 16: REVIEW AND FRQ WORKSHOP

CED 14.1-14.9 · Skill 3.C · FRQ: Experimental Design

MIXED RETRIEVAL

1. Find v for $f = 72 \text{ Hz}$, $\lambda = 1.25 \text{ m}$. 2. How many antinodes are in $n = 4$? 3. Narrowing one slit makes diffraction wider or narrower? 4. For one inversion, is a near-zero film bright or dark?

UNIT SYNTHESIS**TRANSLATE BEFORE CALCULATING**

Identify the representation, boundary or path condition, requested quantity, and approximation before selecting an equation.

EXPERIMENTAL-DESIGN FRQ

Design a measurement of an unknown laser wavelength using a grating of known spacing d , a screen, and length tools.

A. Draw and label the setup, including d , L , y_m , m , θ .



B. State the measurements, a repeat strategy, and laser safety step.

A large rectangular box for writing the answer to part B. It is empty and has a light gray background.

C. Derive an expression for λ using exact geometry.

A large rectangular box for writing the answer to part C. It is empty and has a light gray background.

FRQ DATA AND ANALYSIS

A group uses $d = 12.5 \mu\text{m}$, $L = 1.60 \text{ m}$, and measures the $m = 2$ bright fringe at $y_2 = 0.160 \text{ m}$.

D. Calculate θ and λ exactly.

E. Calculate the small-angle estimate and compare it with the exact result.

F. Identify one way to reduce fractional position uncertainty.

MIXED REPRESENTATION SET

1. A closed pipe has $L = 0.625$ m. Find f_3 at 343 m/s.

2. A double slit has $d = 18\ \mu\text{m}$, $\lambda = 540$ nm, and $L = 1.20$ m. Find small-angle spacing.

3. A one-inversion film has $n = 1.40$ and $\lambda_0 = 588$ nm. Find first reflected-bright thickness.

4. State how a pressure pattern identifies an open versus closed pipe.