\[ L = 100 \text{ m} \]

\[ \gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{1}{\sqrt{1 - 0.64}} = \frac{1}{\sqrt{0.36}} = \frac{1}{0.6} \]

\[ \gamma = \frac{5}{3} \]

Length in space ship rest frame is \( L_0 = \frac{5}{3} L = 16.7 \text{ m} \)

Velocity of second ship in first ship's reference frame.

\[ v' = \frac{v_x - V}{1 - \frac{v_x V}{c^2}} \]

\[ v' = \frac{-0.8c - 0.8c}{1 + \frac{(0.8c)(0.8c)}{c^2}} = \frac{-1.6c}{1 + 0.64} = \frac{-1.6c}{1.64} \]

Length of second spaceship

\[ L_2 = \frac{L_0}{\gamma} = \frac{5/3 L}{\gamma} = \frac{5/3}{3} \left(1 - \frac{v'^2}{c^2}\right)^{1/2} \]

\[ L_2 = \frac{5(100 \text{ m})}{3} \left(1 - \left(\frac{1.6c}{1.64}\right)^2\right)^{1/2} = 3.7 \text{ m} \]
\[ \phi = \frac{2\pi}{\lambda} \sin \theta \]

Phasor approach

\[ \phi = \frac{\pi}{2} \]

\[ \frac{\lambda}{4d} \]

\[ \sin \theta = \frac{\lambda}{4d} \]

\[ \theta = \sin^{-1} \left[ \frac{\lambda}{4d} \right] \]
A: front of Born
B: back of Born

In pole's ref. frame, tip of pole hits back of born before tail hits front of born
4. A thicker film can allow a larger phase difference between \( \lambda = 500 \text{ nm} \) and \( \lambda = 600 \text{ nm} \), ideally giving \( \pi \) phase shift difference.

5. The wavelengths of x-rays are similar to the spacing of the atoms.

6. The laws of physics are identical in all inertial reference frames.