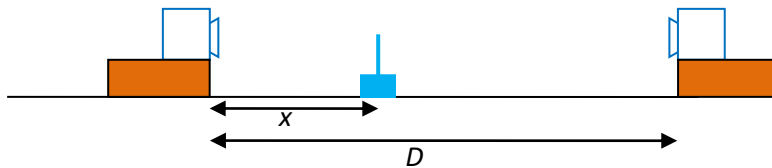


Teacher notes

Topic C

Standing waves or interference

Two microwave sources are placed a distance D apart, facing each other. A microwave detector is placed a distance x from the left source.



The path from the left source has length x and that from the right source a length $(D - x)$.

The path difference is then $(D - x) - x = D - 2x$.

We will have constructive interference when the path difference is an integral multiple of the

wavelength: $D - 2x = n\lambda$ and so at positions given by $x = \frac{D - n\lambda}{2}$. Two consecutive positions where

maxima occur are then separated by a distance $\Delta x = \frac{D - n\lambda}{2} - \frac{D - (n+1)\lambda}{2} = \frac{\lambda}{2}$. This is exactly what we

would deduce if we assumed that the region between the sources were filled by standing waves: maxima (antinodes) are separated by half a wavelength.

Example: Assume $D = 60$ cm and $\lambda = 4.0$ cm. What is the minimum non-zero value of x at which a maximum is observed?

We know that at maxima, $x = \frac{D - n\lambda}{2} = \frac{60 - 4n}{2}$. For $n = 14$ we get the smallest x value which is $x = 2.0$ cm.