

6. Let the first minimum be a distance y from the central axis which is perpendicular to the speaker. Then $\sin \theta = y/(D^2 + y^2)^{1/2} = m\lambda/a = \lambda/a$ (for $m = 1$). Therefore,

$$\begin{aligned} y &= \frac{D}{\sqrt{(a/\lambda)^2 - 1}} = \frac{D}{\sqrt{(af/v_s)^2 - 1}} \\ &= \frac{100 \text{ m}}{\sqrt{[(0.300 \text{ m})(3000 \text{ Hz})/(343 \text{ m/s})]^2 - 1}} = 41.2 \text{ m} . \end{aligned}$$