

Your name

Mark your recitation: R01 – R02 – R03 – R04 – R05

A box made of thick wood is closed on all sides. Its inner dimensions are 10x20x25 cm^3 .

(5 points)

What is approximately the lowest resonance frequency in Hz for sound in the box?

In a closed box, for sound, the lowest frequency is the 0,0,1 mode, where the "1" is for the largest dimension. The wavelength is twice that dimension (thus 0.5 m) since both surfaces must be pressure anti-nodes. $f = v/\lambda$, thus $f = 688$ Hz (assuming 344 m/sec for the speed of sound).

(5 points)

We now remove two opposite panels so that the box is open on both sides in the direction of its longest dimension (the 25 cm).

What now is approximately the lowest resonance frequency in Hz for sound in the box?

When you break out the two walls in the longest dimension, the pressure anti-nodes become nodes to meet the boundary conditions: at open ends, no pressure above or below ambient pressure (1 atm) can build up. Thus the lowest frequency is again the 0,0,1 mode. The wavelength is again 0.5 m, and the lowest resonance frequency is again 688 Hz.